The Dow Chemical Company
Part III - Remedial Action Plan

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Prepared by URS Corporation

Table of Contents

Tables

Figures

Attachments

Appendices

List of Acronyms and Abbreviations

%	percent
°F	degrees Fahrenheit
µg	microgram
ABS_{GI}	feed absolute bioavailability
AEd	dermal absorption efficiency
AEi	ingestion absorption efficiency
AF	adherence factor
AT	averaging time
AT	averaging time
ATSDR	Agency for toxic Substances and Diseases
bgs	below ground surface
BHC	benzenehexachloride
CF	conversion factor
CF	conversion factor
cm^2	square centimeter
COC	contaminant of concern
COI	constituent of interest
COM	Community
CQA	Certified Quality Auditor
CSM	conceptual site model
DCC	direct contact criteria
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DF	dermal factor
DOS	Dow on-site
Dow	Dow Chemical Company
DU	decision unit
EcoSSLs	Ecological Soil Screening Levels
EDA	Exploratory Data Analysis
EFd	dermal exposure frequency
EFi	ingestion exposure frequency
ESL	Ecological Screening Level
ESLB	Ecological Screening Level Benchmark
EVS	Enterprise Venture Corporation
FS	Feasibility Study
FWS	U.S. Fish and Wildlife Service
GC	gas chromatogram
GIS	Geographic Information System
GPS	global positioning system
GSI	groundwater surface water interface
HMW	High Molecular Weight
HRGC	high resolution gas chromatography
HRMS	high resolution mass spectrometry

IA	Industrial.
IB	Industrial.
IF	ingestion factor
IRA	Interim Response Activity
IRDC	Interim Response Activity Work Plan Designed to Meet Criteria
IS	incremental composite sampling
kg	kilogram
LCMR	Limited Commercial, Manufacturing and Research
License	Part 111 Hazardous Waste Management Facility Operating License
LMW	Low Molecular Weight
LRMS	low resolution mass spectrometry
LULC	Land Use Land Classification
MAS	Midland Area Soils
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
mg	milligram
MISS DIG	Michigan's One-Call Utility Notification Organization
MSU	Michigan State University
ng	nanogram
NOAA	National Oceanic and Atmospheric Administration
NOEL	No Observed Adverse Effects Level
NREPA	Natural Resources and Environmental Protection Act
OS	Office Services
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PCOI	potential constituent of interest
ppb	parts per billion
ppt	parts per trillion
PVC	polyvinyl chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Assurance
RA-3	Residential
RA-4	Residential
RAP	Remedial Action Plan
RB	Residential
RBA	relative bioavailability
RC	Regional Commercial or restrictive covenant
RCRA	Resource Conservation and Recovery Act
RDSF	relative dust:soil concentration factor
RI	Remedial Investigation
RL	reporting limit
RSL	Regional Screening Level

SDCF	soil and dust contribution factor
SE\SC	Soil Erosion and Sedimentation Control
SF	cancer slope (mg/kg-day)-1
SOP	Standard Operating Procedure
SOW	Scope of Work
sq ft	square feet
SSAL	site-specific action level
SVOC	Semivolatile organic compounds
TAL	target analyte list
TCDD	tetrachlorodibenzo-p-dioxin
TEF	toxic equivalency factor
TEQ	toxic equivalent
TR	target risk
UCL	Upper Confidence Limit
UMDES	University of Michigan Dioxin Exposure Study
Ur	Urban Land (Ur)
URS	URS Corporation
USDA	U.S. Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compound
WHO	World Health Organization
yr	year

1.0 Introduction

The Dow Chemical Company (Dow), with oversight from the Michigan Department of Environmental Quality (MDEQ), has investigated the City of Midland Area Soils (MAS). This report (hereafter referred to as the Part III) summarizes the corrective action elements of a Remedial Action Plan and Corrective Measures Implementation Report, pursuant to Condition XI.J.4 of its Part 111 Hazardous Waste Management Facility Operating License (License). Those elements include:

- An overview of the remedial activities that were conducted beginning in 2012;
- A summary of the implementation details;
- Documentation of the completion of remedial actions; and
- On-going response activities relevant for the MAS.

1.1 Purpose and Objectives

The purpose of this report is to identify the appropriate remedy that was implemented to mitigate risk for current land use, fully describe the completion of the remedy and the process for completion of sampling and remedy where it has been deferred, and establish the mechanisms to ensure that changes in the future will not compromise the long-term effectiveness of the remedy. This fulfills Dow's obligations with respect to the historic airborne releases from the Michigan Operations Facility.

2.0 Midland Area Soils Project Overview

The Dow Michigan Operation facility is located in Midland, Michigan. 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 facility location and layout are depicted in Figure 2-1. Specific details regarding the characterization of the site, including nature of the release and extent of contamination and affected media are included in Parts I and II. Detailed information is not repeated in this report; however, the following sections provide a brief description of the site and the nature of the contamination.

2.1 Nature of the Release

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.

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.

2.2 Affected Media

As described in detail in Part II, surface and near-surface soils are the media affected by air emissions and subsequent deposition. The following were the potentially relevant exposure pathways considered for over 200 hazardous substances within the affected media for the Midland Area Soils project:

- 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); and
- Soil-to-groundwater leaching dermal contact (groundwater contact protection).

The evaluation identified dioxin/furan TEQ and arsenic as COCs, and the direct contact pathway to soil as the relevant pathway to be addressed. In addition, the MDEQ has identified a food chain pathway for TEQ for the human consumption of livestock raised on Midland Area Soils. This pathway is addressed via institutional controls (local ordinance) and monitoring.

2.3 Site-Specific Action Level

The site-specific action level (SSAL) is a site-specific criterion that applies in lieu of the MDEQ's default generic direct contact criterion for dioxin and furan TEQ of 90 ppt. The SSAL serves as the threshold trigger level for requiring presumptive response activities at a particular residential property. For the City of Midland, the approved 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 approved action level serves as a "site-specific cleanup criterion" as described in Part 201 of Michigan's Natural Resources and Environmental Protection Act.

Part II further describes that the evaluation demonstrated that where arsenic in soil exceed the generic MDEQ DCC, dioxin and furan TEQ was also greater than the SSAL; and soil with dioxin/furan TEQ less than the SSAL did not contain arsenic at levels above the generic DCC. This relationship was confirmed by MDEQ analysis of retained Midland soil samples. 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, even though arsenic was retained as a COC, samples only required analysis for dioxin/furan TEQ to determine the need for a presumptive remedy.

2.4 Extent of Contamination - Midland Resolution Area

The study area for the Midland Area Soils project covered approximately 1,700 total acres. Part I provides a detailed description of the primary land uses and zoning within the MRA. 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 is largely contiguous to Michigan Operations to the north and east of the Facility Boundary.

Based on the results from the comprehensive sampling and remedy program, the concentration of aerially released dioxin in the soil beyond the MRA is below the residential SSAL. Beginning in 2012, Dow collected and analyzed over 1,633 samples from within and adjacent to the MRA beginning in areas closest to Michigan Operations and then systematically outwards and across the MRA in subsequent years. As described in Part II, these data were used to establish the final boundary for the MRA and identify properties where remedial action was needed to address direct contact with surface soils for current land use. Figure 2-2 displays the final MRA boundary and identifies the DUs where remedial actions were necessary. For each of the remedy properties identified in Figure 2-2, remedial actions discussed in Section 3.0 have been completed.

3.0 Exposure Management and Remedy Summary

This section details the types of remedial action that have addressed and will continue to address each current and potential future exposure scenario within the MRA.

3.1 Response Actions to Mitigate Direct Contact Exposures for Current Land Use

As presented in the approved IRDC (Appendix A) and summarized below, the remedial objective for the Midland Resolution Area for residential and residential-like properties was to reduce the dioxin and furan TEQ in impacted areas to a concentration that is below the SSAL, and thereby also address co-located arsenic. The objective was achieved by implementing remedial action for any area that has dioxin and furan TEQ at concentrations greater than the SSAL in the top six inches of soil as determined by incremental composite sampling. As described in Part II, a phased approach that involved sampling and analysis to identify properties where a remedial action was necessary was used to systematically work through the properties located within the MRA. The sampling and analysis were 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* (URS, January 2012), included as Appendix C. The samples collected were analyzed for dioxins and furans. Decision rules established standards for determining whether or not remedial action was warranted and is discussed in further detail in this Part II.

3.1.1 Decision Unit

A decision unit (DU) was defined as an area for which an individual remedial decision was made. A DU was equivalent to an exposure area or represented an agglomeration of exposure areas with similar characteristics within a parcel (e.g., all the lawn areas within a residential parcel). Typically, a DU consisted of one residence and extended to the farther of the property line, an adjoining fence, curb line, pavement edge, or the top edge of a drainage ditch or creek. DUs also included outlawns associated with the property that were not owned by the property owner but were functional parts of the owner's property, provided that separate sampling access for these areas was obtained. Wooded areas above a 7,200 square feet were not included as part of the residential use DU, but were managed as a separate DU. Decision rules were utilized to

compare the results of soil testing at each DU to determine if remedial action was necessary at that DU.

3.1.2 Property-Specific Remedial Action Plan

In general, remedial actions for each residential or residential-like property undergoing remediation included removal of the upper twelve inches (12") of existing landscaping and soil, followed by replacement with new soil, lawn, and landscaping which was maintained through the end of the growing season. Adjustments to this default plan were made for properties as required to preserve non-replaceable plants and mature trees. Based on the conclusion of the evaluation of vertical extent of dioxin and furan contamination in soil, as summarized in Section 8.1.3 of Part II, the highest dioxin and furan TEQs appeared to be in the top six inches of soil. Furthermore, the result of the multiple comparison tests showed that concentrations decreased in the six to twelve inch depth. Characterization samples from 2010 were tested below twelve inches showing that the only soil above the SSAL was located in the top twelve inches. Therefore, since the remedy involved excavation of all twelve inches, the soil that would be above the SSAL would all be removed. Confirmation sampling was therefore not necessary and was not implemented as part of the remedy.

For those properties where remedial actions were determined to be necessary, an evaluation of whether additional action to address dust accumulated in the duct work of the dwelling(s) was needed. Where found to be necessary, the dwelling(s) ducts were professionally cleaned. This is further discussed in Section 3.1.3.1, below.

In all cases where properties required remedial action to address direct contact to soil for current land use, Dow obtained appropriate access from the property owners for implementation of the property-specific remedial actions. During a property visit, Dow, along with the property owner, developed and documented property-specific remedial action plans that meet the remedial objectives and address special concerns of the property owner. At that time, the property owner had the opportunity to communicate specific concerns regarding unique features of their property. These unique features were documented on the agreement form along with approval to access the property to implement actions and complete follow-up activities. Access agreement

forms are included in the approved IRDC (Appendix A).

A schedule of field activities was provided to the property owner. Coordination of field activities was 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.

3.1.3 Remedial Construction

Remedy implementation included utility identification, erosion control, soil removal and management, backfill and site restoration and vegetation replacement. In addition, duct cleaning was offered on an as-needed basis, as described below.

Prior to conducting any excavation, Dow's contractors notified Michigan's One-Call Utility Notification Organization (MISS DIG) that fieldwork had been scheduled. MISS DIG was 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 provided public underground utility locating and marking services. Property owners were also asked to identify any additional underground features that they were aware of that may not have been identified by MISS DIG.

Storm water protection was implemented throughout the project as necessary, in accordance with permits and the Project Soil Erosion and Sedimentation Control Plan, included in the approved IRDC (Appendix A). A Soil Erosion and Sedimentation Control (SE\SC) permit was obtained for the approximately 1,700 acres that made 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 was obtained for the MRA, 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 were minimized, to the extent practicable as described in the approved IRDC (Appendix A). Where feasible, soils were 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 were considered part of the foot print of the homes and therefore, in general, no excavation of surface soils was conducted beneath these structures. In the cases where decks were elevated to the degree that they reasonably allowed for use of the ground beneath them, excavation was completed to the extent necessary and practical. In some cases, new cover and/or a barrier was placed to reduce contact to the existing soils. Soils adjacent to other structures (e.g., sidewalks, garages, slab foundations and homes) were excavated at a slope that did not undermine the structures. Surface soils adjacent to mature trees were removed in a "cone" method to prevent damage to the root system. Soils were removed to the extent possible between the trunk and the drip line (approximate extent of canopy) to minimize adverse effects to the tree. A temporary construction barricade was placed around the excavation to prevent unpermitted entry, while construction crews were not present.

The excavated soils were placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility. After loading, the trucks were tarped for transport. Restoration of disturbed areas included backfilling and replacing vegetation. New topsoil and backfill were 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 were suitable for use, topsoil from borrow sources was tested for the presence of dioxins and furans as well as metals, herbicides, volatile and semi volatile compounds, and/or index properties such as organic content and grain size as a measure of topsoil quality. These data have previously been provided as part of the Implementation Annual Reports (Appendix E). Replacement soils were clean topsoil or topsoil blended with sand, with the final four to six inches of surface backfill materials being topsoil. Excavated areas were re-vegetated with sod or seed, as appropriate for the area. Previously landscaped areas were replanted with similar plants (flower gardens, etc.) and all structures (swing sets, etc.) displaced during the removal process were replaced, consistent with the property-specific plan developed with the property owner.

Dust management and trackout control measures were performed for the duration of the project on all areas involved in the soil removal work. Dust was managed with water and/or dust palliatives. Trackout was managed by removing all visible soil from vehicles and equipment

prior to exiting the work site. Soil removal was performed with brooms, brushes, shovels, etc., but no water was used. All soil removed during this process was placed in trucks and sent to Michigan Operations for reuse or properly disposed of. A wet vacuum street sweeper was utilized to clean the roadway in the event of observable trackout.

Workers were provided with hand wash stations and restroom facilities. Rubber boots or project-specific footwear and/or disposable track mats were 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 in the approved IRDC (Appendix A).

3.1.3.1 Construction Quality Assurance

Construction activities were documented for each property to record the details of construction, ensure they were consistent with the presumptive remedy, and noted exceptions. Documentation took the form of a log that was kept for each DU. The area of soil removal was recorded on the log. The depth of removal was measured and recorded at approximately three (3) to nine (9) locations per DU, depending on size and geometry of the excavation. The number of truckloads of soil removed from each property was recorded. CQA documentation was maintained throughout the project for MDEQ review, and has been provided in the Implementation Annual Reports (Appendix E).

In some cases, portions of a DU receiving cleanup were not disturbed. These were areas that are typically not accessible for human contact (such as the soil remaining beneath appurtenant structures such as decks and pools). However, sufficient soil removal was conducted to ensure that the average concentration of dioxin and furan TEQ on the property after cleanup was less than the SSAL. A demonstration of DU weighted average concentration was provided in the Implementation Annual Reports (Appendix E), for each DU where excavation and replacement was done. The total undisturbed and/or inaccessible areas were assumed to be equal to the concentration determined for the DU prior to cleanup. Remedy areas were assumed to have the concentrations from the borrow source. Land under permanent in-ground structures such as houses and driveways were not considered in the calculation. This evaluation also confirmed the

percentage of undisturbed remaining soil post-remedy and identified if remedial actions were required for accumulated dust, as described below. For the undisturbed limited-use wooded areas that were sampled, the evaluation were made using the known concentration for the wooded areas.

Upon completion of the remedy, an evaluation of possible exposure to dust accumulated within dwelling(s) ducts was 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 used to develop the SSAL were used in the site-specific algorithm equation to solve for target risk (TR). Duct cleaning was offered for all DUs with calculated TR values greater than 1E-05. If remedy of accumulated dust was warranted, Dow provided the property owner with a voucher and a list of vendors that conducted duct cleaning. Dow scheduled the duct cleaning service at the owner's convenience during the six months following issuance of the voucher. Dow was invoiced and paid for the service.

3.1.3.2 Post Remedy Care and Maintenance

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

3.2 Response Actions to Mitigate Direct Contact Exposures for Potential Future Land Uses

Monitoring and institutional controls will be implemented for properties within the MRA to address potential future changes in land use. The goals of the institutional controls are as follow:

- Maintain existing uses for non-residential properties;

- Provide site development standards for certain types of residential and residential-like uses to ensure protection of human health, where allowable under current zoning;
- Identify and manage properties that are eligible for remedial action, but have not yet participated;
- Track and manage properties that convert from non-residential use to residential or residential-like use, and provide for appropriate protective measures;
- Regulate the movement and disposal of soil from MRA properties that have not been sampled and/or remediated; and
- Maintain the current restrictions on raising poultry and other farm animals that could ingest impacted soil from within the City.

For the Midland Area Soils, institutional controls will take the form of ordinances, restrictive covenants (RCs), environmental license agreements, and a contract between Dow and the City of Midland. This section briefly summarizes the institutional controls that are anticipated to control future land use. For a complete discussion of monitoring and maintenance activities, see the *Midland Area Soils Institutional Control Plan* which is included as Attachment A.

3.2.1 Institutional Controls

3.2.1.1 Zoning Ordinance

The City of Midland has both a "Code of Ordinances," which is the City's general municipal or "police power" code, and a "Zoning Ordinance." Generally speaking, the purpose of the Code of Ordinances is to regulate people's activities, while the purpose of the Zoning Ordinance is to regulate land use.

The existing Zoning Ordinance currently prohibits most residential uses within the office, commercial, and industrial districts in the MRA, and makes many "residential-like" uses subject to site development standards or conditional approval. Attachment A provides more details on the City of Midland Zoning Ordinance.

The current City's Code of Ordinances makes it unlawful to keep or breed any "farm animal" except for animals in areas of the City that are zoned agricultural, parade/show animals, and miniature pigs. There are currently nine areas of the City that are zoned agricultural, four along the west edge of the city (west of Poseyville Road) and five along the east edge (generally along or near Highway 10). None of these areas are in the MRA. Dow will propose an amendment (included in Attachment A) that adds a provision to the existing farm animal ordinance declaring that the DEQ relies on the ordinance to help address historic dioxin contamination in soil, and requiring that the DEQ be notified if the ordinance is amended or lapses. Attachment A provides further details on the City's Code of Ordinances. Attachment B provides a discussion of monitoring that will occur for properties zoned agricultural within the City of Midland.

The proposed ICs will rely on the current prohibitions already included in the existing City of Midland Zoning Ordinance and Code of Ordinances, in conjunction with the proposed supplemental amendment and will implement a monitoring system to identify changes in land use that require follow-up (e.g., a switch from commercial to residential or residential-like use). The current City ordinances already prohibit residential use in much of the MRA. While there are and will be exceptions to the general prohibition, those should be limited in number, and can be addressed through the monitoring program discussed below.

3.2.1.2 Restrictive Covenant

A number of properties will have declarations of restrictive covenant recorded with the Midland County Register of Deeds. This level of control will be enacted for property owned by Dow and the City of Midland, as described in Attachment A.

The declarations of land or resource use restrictions will include:

- Prohibit uses that are inconsistent with generic non-residential land use exposure assumptions;
- A provision that the restrictive covenant will continue in effect until the site is remediated or it is determined that the regulated substances no longer present an unacceptable risk to the public health, safety, or welfare, or the environment;

- Prohibit the keeping or raising of farm animals that may ingest impacted soil on Dow-owned or City of Midland-owned property zoned agricultural within the City of Midland;
- Legal descriptions of the property that are subject to the land and/or resource use restrictions; and
- Where applicable, approval and consent of the property owners other than Dow will be obtained prior to recording with the Register of Deeds.

3.2.1.3 Environmental License Agreement

The Michigan Department of Transportation (MDOT) holds easements for the M-20 right of way from the various underlying property owners. This is the only area of MDOT property within the MRA. The documents grant to the State easements for "highway purposes" that are 80 feet wide for each lane of M-20. The easements are expressly perpetual; therefore, there is no need to place further restrictions on the property in order to prohibit future residential use, given that the property will always be used for highway purposes.

The easements grant to the State the express right to remove trees, shrubs and other vegetation, and impliedly grant the right to grade and remove soil. Therefore, while restrictions are not needed to prohibit residential use, precautions are appropriate to protect against the movement and/or improper disposal of excavated soil. To this end, Dow proposes to enter into an "Environmental License Agreement" with MDOT, as described in Attachment A.

3.2.1.4 Contract Between Dow and City of Midland

The City is in a unique position to help track ownership and land use changes because a number of local and state requirements alert the City to those changes:

- Conditional use applications for residential or residential-like uses.
- Certificates of compliance for new "dwellings" and "habitable rooms."
- Site plan approvals and soil erosion and sedimentation control permits for large construction projects.
- Variances or planned use development approvals for residential or residential-like uses.

- Changes in property ownership (through filings of property transfer affidavits with the City).

The proposed contract would:

- Require Dow to provide the City on a regular basis an updated list of properties that have not yet been addressed in the MRA ("MRA Eligible Properties"), and a copy of the proof of financial assurance documents in accordance with MDEQ's Part 111 rules.
- Provide that the City notify Dow when it learns of a relevant proposed change in use or ownership for an MRA Eligible Property, and provide a clear mechanism for giving such notice to Dow (contact information, etc.) so that Dow can take appropriate action.
- Provide that the City notify Dow prior to the amendment or lapsing of the existing Farm Animal Ordinance and/or instances of refusals to comply with the ordinance after being cited for non-compliance.
- Provide for the proper management of excavated soil from projects that the City or its contractors undertake (e.g., road repair, etc.).

3.2.1.5 Institutional Control Monitoring

This section describes the monitoring activities proposed to monitor and maintain the integrity of the Institutional Controls. In order to fully assure continued implementation and compliance, Dow proposes to periodically review the ordinance provisions, check the MISS DIG system (as described in Attachment B), and assess the City's implementation and enforcement using the Task List contained in Attachment A. Dow will submit an Annual Report to the MDEQ discussing the results of the review, proposing solutions if there are any deficiencies identified, and proposed changes to the monitoring plan, as necessary. The schedule for monitoring and reporting is specified in Attachment B, Property Monitoring Plan.

3.2.2 Long-term Monitoring and Maintenance

Remedial actions to address known direct contact exposure to soil for current land use have been completed; however, there are residential or residential-like properties where access was not granted for sampling and properties used for non-residential purposes where sampling may be

warranted under certain circumstances. Ongoing efforts to monitor and obtain access to properties where sampling is necessary will be performed. Certain circumstances that necessitate future access for sampling and remedy, if warranted, for eligible properties, include but are not limited to:

- Clearing or development of undeveloped of woodlands (discussed further in Section 5.7); or
- Construction and development on specific non-residential properties that are currently predominantly paved or covered by structures (discussed further in Section 5.11); or
- Change in use of a property from non-residential to residential or residential-like; or
- As determined appropriate by Dow and approved by MDEQ for the intended purpose of reducing long-term monitoring and maintenance efforts.

Long-term monitoring will periodically evaluate the condition of these properties to determine if action is necessary. Furthermore, monitoring of properties addressed by the proposed Institutional Controls will be necessary to identify future changes in use. As part of the long-term monitoring activities, a MISS DIG notification system will also be implemented for the MRA.

This section briefly summarizes the long-term monitoring and maintenance activities that are anticipated to address these scenarios. For a complete discussion of monitoring and maintenance activities, see the *Midland Area Soils Property Monitoring Program* which is included as Attachment B.

3.2.2.1 Properties Where Access was Not Granted

Residential and residential-like properties where owners declined participation in the program have the sampling and possible remedy deferred until such time as access is granted. For these properties, Dow has used best efforts to obtain appropriate access from property owners to conduct sampling on their property. Best efforts are defined as follows: an initial letter, a first and second follow-up telephone call, certified letter, and an in-person visit. There has been no response from some property owners and others have denied access. Property owners where

access has not been granted will be advised that they are eligible for sampling and remedy, if warranted, periodically until such time as access has been granted. These properties will also be monitored for change in ownership as described in Attachment B. If a change in ownership is identified, the new owners will be advised that they are eligible for sampling and remedy, if warranted. The sampling and remedy will be performed in accordance with the approved IRDC (Appendix A). Attachment B identifies the specific properties subject to monitoring and provides methods and details of monitoring.

3.2.2.2 Changes from Current Land Use

There are currently a number of non-residential properties where some "residential-like" uses (such as child care centers or nursing homes) are permitted or allowed. Some non-residential properties in the MRA may exceed the SSAL (250 ppt TEQ) but are less than Generic Part 201 Non-Residential Cleanup Criteria (990 ppt TEQ). There is no remediation warranted for these properties due to the current non-residential land use, however, in order to be protective of all future land uses, these properties will be monitored. In the event that land use changes for any of these properties, sampling and remedy, if necessary, will be performed. Attachment B identifies the specific properties subject to monitoring and provides methods and details of monitoring.

3.2.2.3 MISS DIG

Dow will implement a MISS DIG monitoring and notification program, as described in Attachment B. This program will provide property owners or their contact with information on how to properly manage soils, as well as Dow contact information to obtain additional guidance and assistance.

3.2.2.4 Contingency Plan

Approval of ordinances, covenants and contracts are outside of Dow's control. In the event that something occurs to prevent implementation, a contingency plan will be developed and applied, as shown in Attachment A.

4.0 Response Action Completion Summary

For the historical aerial releases, response actions to address direct contact to soil for current land use were completed over three years, beginning in 2012. Interim monitoring was also conducted, pursuant to the IRDC during the implementation. The following sections provide the details of response actions completed during each of the three years of implementation.

At the time of completion of 2014 (Year 3) implementation activities, greater than 98% of the residential or residential-like properties within the MRA have granted access, been tested, and results are available. The measured impacts are consistent with those anticipated to result from an off-site aerial release. Based on sample results, a total of 134 properties required remedy while over 1,500 properties required no further action.

The sections below summarize the final total number of DUs that were sampled, and results of that sampling for each of the corresponding areas shown in Figure 7-5 of Part II.

4.1 2012 (Year 1) Summary

As presented in Part II, the overall results from the Year 1 sampling activities are shown below.

Totals	Number of DUs
Year 1 Properties Sampled	168
Number of Properties with No Further Action	140
Number of Properties where Remedy was Completed	28

Dow provided written notification of the results of soil sampling to the individual property owners in a timely manner. The written communication briefly described the next steps for the property owner based on the sampling results, as described below. The notification included contact information for both MDEQ and Dow representatives that were available to discuss the information reported to the property owners.

4.1.1 Properties with No Further Action

Based on the sampling results, no further action was warranted for 140 properties included in the Year 1 activities. After review and concurrence from MDEQ, these property owners were notified that no further action was necessary on their property by Dow to address dioxin

contamination. MDEQ subsequently sent letters confirming no further action is necessary for these properties. The letters provided by MDEQ are included in Appendix F.

4.1.2 Properties with Remedy

Analytical results for 28 properties indicated that remedy was necessary. For the properties where remedy was determined to be necessary based on analytical results, Dow made best efforts and obtained appropriate access from the property owners for implementation of the property-specific presumptive remedy. The presumptive remedy for each residential or residential-like property undergoing remediation included removal of the upper twelve inches (12") of existing landscaping and soil, followed by replacement with new soil, lawn, and landscaping. The excavated soils were placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility.

Dow representatives worked with individual property owners to define individual property-specific work plans during remedy planning. During the property visit, Dow communicated details regarding the presumptive remedy sampling effort and possible implications based on analytical results. Dow, along with the property owner, developed and documented property-specific remedy plans that met the approved Work Plan objectives set forth in the approved IRDC (Appendix A) and addressed any special concerns of the property owner. At that time, the property owner had the opportunity to communicate specific concerns regarding unique features of their property and these unique features were documented on the property-specific work plan.

4.1.2.1 Completed Remedies and Construction Quality Assurance

The remedy activities were completed in accordance with the approved IRDC (Appendix A). Any property-specific adjustments were documented. The completed remedies are summarized on maps in Appendix E. Areas that were not removed are noted on the drawings.

Construction activities were documented by property to record the details of construction, ensure consistency with the presumptive remedy, and note exceptions. The following information was documented as part of construction quality assurance (CQA):

- Area of soil removal;
- Area of undisturbed soil;
- Number of cubic yards of soil removed from the property; and
- Notations for areas where less than 12" of soil were removed (e.g., near tree roots).

The 2012 Implementation Annual Report (Appendix E) presents the information collected on each of the remedy properties used to complete the construction quality assurance. Construction quality assurance field forms are included in Appendix E.

4.1.2.2 Indoor Dust Evaluation

As stated in the approved IRDC (Appendix A) and in Part II, duct cleaning is offered for all DUs with calculated TR values greater than 1E-05. The indoor dust evaluation was completed for 19 properties. Three (3) of the 19 properties had no structure present on the property; therefore evaluation of indoor dust and duct cleaning was not necessary. These evaluations were presented in Appendix E. Based on the SWAC values calculated as part of the CQA evaluations, there is no unacceptable risk remaining post-remedy at any of the subject properties. Therefore, duct cleaning was not necessary.

4.2 Verification of Non-Residential Properties

In accordance with the approved IRDC (Appendix A), a site visit or survey was conducted to verify that non-residential properties (e.g., businesses) were not currently used as a residence or in a manner which constitutes residential-like use. Additionally, non-residential properties bordering residential properties were evaluated for the potential for soil and sediment erosion and transport by surface water runoff. The findings from the survey were summarized and presented in Table 4-1.

During the land use survey, the property at 1184 James Savage Road was determined to be a daycare facility and, therefore, considered residential-like in use. Due to the nature of the land use and the proximity to Michigan Operations, Dow chose to implement presumptive remedy on this property. Dow obtained appropriate access from the property owner for implementation of

the remedy. The remedy plan developed for this property met the approved Work Plan objectives and addressed concerns of the daycare facility that uses this property.

4.3 Land-Use Monitoring

Some businesses are located in areas that may allow for conversion to residential or residential-like use. To address this possibility, non-residential properties within the Resolution Area were identified and will be monitored for changes to residential or residential-like land use, as described in the *Midland Area Soils Property Monitoring Program* (Attachment B). Table 4-1 presents the properties that will be monitored for any changes in land use.

Residential and residential-like properties where owners declined participation in the program in 2012 had the remedy deferred. The cost of completing the work at these properties in the future is included in the corrective action cost estimate (Attachment C), and financial assurance will be provided as described in Section 6. If changes in ownership or use are identified, the new owners will be advised of options for testing and/or cleanup.

These properties will be monitored for change in ownership and/or changes in use, as described in the *Midland Area Soils Property Monitoring Program* (Attachment B).

4.4 2013 (Year 2) Summary

As presented in Part II, the overall results from the Year 2 sampling activities are shown below.

Totals	**Number of DUs**
Year 2 DUs Sampled	848
Number of DUs with No Further Action	774
Number of DUs Requiring Remedy	74

Dow provided written notification of the results of soil sampling to the individual property owners in a timely manner. The written communication briefly described the next steps for the property owner based on the sampling results, as described below. The notification included contact information for both MDEQ and Dow representatives that were available to discuss the information reported to the property owners.

4.4.1 Properties with No Further Action

Based on the sampling results, no further action was warranted for 774 DUs included in the Year 2 activities. These property owners were notified that no further action was necessary on their property by Dow. MDEQ has reviewed the information provided and sent letters confirming no further action is necessary for these properties. The letters provided by MDEQ are included in Appendix F.

4.4.2 Properties with Remedy

Analytical results for 73 DUs indicated that remedy was necessary and one (1) remedy was completed presumptively without prior soil testing. Section 3 describes the remedy activities that were completed at these properties. For those 74 properties where remedy was determined to be necessary, Dow made best efforts and obtained appropriate access from the property owners for implementation of the property-specific presumptive remedy. The presumptive remedy for each residential or residential-like property undergoing remediation included removal of the upper twelve inches (12") of existing landscaping and soil, followed by replacement with new soil, lawn, and landscaping. The excavated soils were placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility.

Dow representatives worked with individual property owners to define individual property-specific work plans during remedy planning. Dow, along with the property owner, developed and documented property-specific remedy plans that met the approved IRDC (Appendix A) objectives and addressed any special concerns of the property owner. At that time, the property owner had the opportunity to communicate specific concerns regarding unique features of their property and these unique features were documented on the property-specific work plan.

4.4.2.1 Completed Remedies and Construction Quality Assurance

The remedy activities were completed in accordance with the approved IRDC (Appendix A). Any property-specific adjustments were documented. A complete set of remedy documentation for each DU is provided in the 2013 Implementation Annual Report (Appendix E). Areas that were not removed are noted on the Remedy Completion Summary drawings.

Construction activities were documented by property to record the details of construction, ensure consistency with the presumptive remedy, and note exceptions. The following information was documented as part of construction quality assurance (CQA):

- Area of soil removal;
- Area of undisturbed soil;
- Number of cubic yards of soil removed from the property; and
- Notations for areas where less than 12" of soil were removed (e.g., near tree roots).

The 2013 Implementation Annual Report (Appendix E) presents the information collected on each of the remedy properties used to complete the construction quality assurance. Completed construction quality assurance field forms are included in Appendix E.

4.4.2.2 Indoor Dust Evaluation

As stated in the approved IRDC (Appendix A) and in Part II, duct cleaning is offered for all DUs with calculated TR values greater than 1E-05. The indoor dust evaluation was completed for 74 properties. These evaluations are included in Appendix E. Based on the SWAC values calculated as part of the CQA evaluations, there was potentially unacceptable risk remaining post-remedy for five (5) properties and duct cleaning for these properties was warranted. During 2013, duct cleaning was offered to the five properties with potentially unacceptable risk. For the property with a presumptive remedy that was completed without sampling, duct cleaning was also performed prior to the spring of 2014.

4.4.2.3 Verification of Non-Residential Properties

In accordance with the approved IRDC (Appendix A), a site visit or survey was conducted to verify that non-residential properties (e.g., businesses) were not currently used as a residence or in a manner which constitutes residential-like use. Additionally, non-residential properties bordering residential properties were evaluated for the potential for soil and sediment erosion and transport by surface water runoff. The findings from the survey were summarized and presented in Table 4-1.

4.4.2.4 Land-Use Monitoring

Some businesses are located in areas that may allow for conversion to residential or residential-like use. To address this possibility, non-residential properties within the Resolution Area were identified and will be monitored for changes to residential or residential-like land use as described in the *Midland Area Soils Property Monitoring Program* (Attachment B). Table 4-1 presents the properties that will be monitored periodically for any changes in land use.

Residential and residential-like properties where owners declined participation in the program in 2013 had the remedy deferred. The cost of completing the work at these properties in the future is included in the corrective action cost estimate (Attachment C), and financial assurance will be provided as described in Section 6. If changes in ownership or use are identified, the new owners will be advised of options for testing and/or cleanup.

These properties will be monitored for change in ownership and/or changes in use, as described in the *Midland Area Soils Property Monitoring Program* (Attachment B).

4.5 2014 (Year 3) Summary

As presented in Part II, the overall results from the Year 3 sampling activities are shown below.

Totals	Number of DUs
Year 3 DUs Sampled	619
Number of DUs with No Further Action	587
Number of DUs Requiring Remedy	32

Dow provided written notification of the results of soil sampling to the individual property owners in a timely manner. The written communication briefly described the next steps for the property owner based on the sampling results, as described below. The notification included contact information for both MDEQ and Dow representatives that were available to discuss the information reported to the property owners.

4.5.1 Properties with No Further Action

Based on the sampling results, no further action was warranted for 587 DUs included in the Year 3 area. These property owners were notified that no further action was necessary on their

property by Dow. MDEQ has reviewed the information provided and sent letters confirming no further action is necessary for these properties. The letters provided by MDEQ are included in Appendix F.

4.5.2 Properties with Remedy

Analytical results for 32 DUs indicated that remedy was necessary. For the properties where remedy was determined to be necessary, Dow made best efforts and obtained appropriate access from the property owners for implementation of the property-specific presumptive remedy. The presumptive remedy for each property undergoing remediation included removal of the upper twelve inches (12") of soil and existing landscaping, followed by replacement with new soil, lawn, and landscaping. The excavated soils were placed into trucks for transport to the Michigan Operation plant site for re-use or to an appropriate disposal facility.

Dow representatives worked with individual property owners to define individual property-specific work plans during remedy planning. Dow, along with the property owner, developed and documented property-specific remedy plans that met the approved IRDC (Appendix A) objectives and addressed any special concerns of the property owner. At that time, the property owner had the opportunity to communicate specific concerns regarding unique features of their property and these unique features were documented on the property-specific work plan.

4.6 Completed Remedies and Construction Quality Assurance

The remedy activities were completed in accordance with the approved IRDC (Appendix A). Any property-specific adjustments were documented. A complete set of remedy documentation for each DU is provided in Appendix E. Areas that were not removed are noted on the drawings.

Construction activities were documented by property to record the details of construction, ensure consistency with the presumptive remedy, and note exceptions. The following information was documented as part of construction quality assurance (CQA):

- Area of soil removal;
- Area of undisturbed soil;

- Number of cubic yards of soil removed from the property; and
- Notations for areas where less than 12" of soil were removed (e.g., near tree roots).

The 2014 Implementation Annual Report (Appendix E) presents the information collected on each of the remedy properties used to complete the construction quality assurance. Construction quality assurance field forms are included in Appendix E.

4.6.1.1 Indoor Dust Evaluation

As stated in the approved IRDC (Appendix A) and in Part II, duct cleaning is offered for all DUs with calculated TR values greater than 1E-05. The indoor dust evaluation was completed for 29 DUs. Two DUs were vacant lots and one DU is a wooded area. These evaluations are included in Appendix E. Based on the SWAC values calculated as part of the CQA evaluations, there was potentially unacceptable risk remaining post-remedy for five properties and duct cleaning for these properties was warranted. During 2014, duct cleaning was offered to the five properties with potentially unacceptable risk. Two of the properties in Phase III Boundary Verification where duct cleaning was offered had hot water heat and therefore cleaning is not necessary as those systems do not have duct work.

4.7 Verification of Non-Residential Properties

In accordance with the approved IRDC (Appendix A), a site visit or survey was conducted to verify that non-residential properties (e.g., businesses) that were not sampled during the implementation of 2014 Phase IA or Phase II are not currently used as a residence or in a manner which constitutes residential-like use. The findings from the survey were summarized and presented in Table 4-1.

4.8 Land-Use Monitoring

Non-residential properties with sufficient area for sampling located adjacent to contiguous residential areas surrounded by or located within predominantly residential land-use areas were included in the 2014 Phase II implementation. It is possible that non-residential properties that were not sampled during 2014 Phase II implementation could be converted to residential or residential-like use in the future. To address this possibility, non-residential properties within the

MRA were identified and will be monitored for changes to residential or residential-like land use as described in the *Midland Area Soils Property Monitoring Program* (Attachment B). Table 4-1 presents the properties that will be monitored periodically for any changes in land use.

Properties where owners declined participation in the program had the remedy deferred. The cost of completing the work at these properties in the future is included in the corrective action cost estimate (Attachment C), and financial assurance will be provided as described in Section 6. If changes in ownership or use are identified, the new owners will be advised of options for testing and/or cleanup. These properties will be monitored, as described in the Midland Area Soils Property Monitoring Program (Attachment B).

5.0 MRA Remedy Outcome

Table 5-1 and Figure 5-1 summarize the remedy outcome for all property types and scenarios encountered within the MRA. This table and figure document that all properties within the MRA are being addressed by an appropriate remedial action, as discussed below.

5.1 Residential Property with Soils Less than SSAL

The residential or residential-like DUs in the MRA where soils were sampled and results were less than or equal to the SSAL, pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A) are listed in Table 5-2, and their locations are shown in Figure 5-2. For these DUs, soils do not exceed the SSAL and based on these results, exposures are within acceptable limits suitable for unrestricted residential land use. Therefore, they are not considered 'facilities,' pursuant to 324.20101(1)(s), as a result of a historical aerial release from Dow and no further action is necessary. Appendix F contains correspondence from MDEQ for each of these properties indicating no further action is needed.

5.2 Non-Residential Property with Soils Less than SSAL

The non-residential DUs in the MRA where soils were sampled and results were less than or equal to the SSAL, pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A) are listed in Table 5-3, and their locations are presented in Figure 5-3. For these DUs, soils do not exceed the SSAL and based on these results, exposures are suitable for unrestricted residential land use. Therefore, they are not considered 'facilities', pursuant to 324.20101(1)(s) as a result of a historical aerial release from Dow and no further action is necessary. Appendix F contains correspondence from MDEQ for each of these properties indicating no further action is needed.

5.3 Residential Property with Soils Greater than SSAL

The residential or residential-like DUs in the MRA where soils were sampled and results were greater than the SSAL, pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A) are listed in Table 5-4, and their locations are presented in Figure 5-4. For each of these DUs, the remedy was implemented consistent with Section 3.1 and the approved IRDC (Appendix A), and Remedy Completion Drawings were completed that

delineate any areas that were not remediated, including but not limited to, under decks or porches, utility sheds or above-ground pools. Remedy Completion Drawings for all of the DUs in Table 5-4 were previously submitted in the individual Implementation Annual Reports, which are provided as Appendix E. Portions of soil that remained undisturbed by cleanup activities (such as soil remaining beneath appurtenant structures such as decks and pools) together with the replacement soil, resulted in a DU weighted average concentration that was less than the SSAL. Documentation that each DU remedy met the SSAL was provided in the Implementation Annual Reports, included as Appendix E of this report. Appendix F contains correspondence from MDEQ for each of these properties indicating no further action is needed.

The remedial action is appropriate for these DUs because upon completion of the remedy, direct contact exposure to soils greater than the SSAL has been eliminated and these DUs are now suitable for unrestricted residential land use. No further action is necessary for current or potential future land use and they are not considered 'facilities', pursuant to 324.20101(1)(s).

5.4 Non-Residential Property within Residential Neighborhoods with Soils Greater than SSAL

The non-residential DUs in the MRA that are located within residential neighborhoods and had soil results greater than the SSAL, pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A) are listed in Table 5-5, and their locations are presented in Figure 5-5. Current zoning in these areas does not prohibit residential-like uses; therefore, to be protective of all potential future uses, remedy was completed to the SSAL. For each of these DUs, the remedy was implemented consistent with Section 3.1 and the approved IRDC (Appendix A), and Remedy Completion Drawings were completed that delineated any areas that were not remediated, including but not limited to, under decks or porches, utility sheds or above-ground pools. Remedy Completion Drawings for all of the DUs in Table 5-5 were previously submitted in the individual Implementation Annual Reports, which are provided as Appendix E. Portions that remained undisturbed by cleanup activities (such as soil remaining beneath appurtenant structures such as decks and pools) together with the replacement soil, resulted in a DU weighted average concentration that was less than the SSAL. Documentation that each DU remedy met the SSAL was provided in the Implementation Annual Reports, included as

Appendix E of this report. Appendix F contains correspondence from MDEQ for each of these properties indicating no further action is needed.

The remedial action is appropriate for these DUs because upon completion of the remedy, direct contact exposure to soils greater than the SSAL has been eliminated and these DUs are now suitable for unrestricted residential land use. No further action is necessary for current or potential future land use and they are not considered 'facilities', pursuant to 324.20101(1)(s).

5.5 Non-Residential Property Apart from Residential Neighborhoods with Soils Less than Generic Non-Residential Cleanup Criteria but May Exceed SSAL

The non-residential DUs in the MRA where dioxin and furan TEQ is less than the MDEQ generic non-residential Direct Contact Criteria (990 ppt TEQ) but may exceed the SSAL are listed in Table 5-6, and their locations are presented in Figure 5-6. Current data indicate that non-residential properties in the MRA are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use. Current land use was verified by site visits, and each was evaluated for the potential for soil and sediment erosion and transport by surface water runoff. Results of site visits for all of the properties in Table 5-6 have been previously submitted in the individual Implementation Annual Reports, which are provided as Appendix E.

These properties are currently used for non-residential purposes but they are located in a zoning district that does not currently prohibit all residential or residential-like uses in the future. These properties will be subject to long-term monitoring discussed in Section 3.2.2. A detailed discussion of the land use monitoring is included in the Property Monitoring Plan (Attachment B). In the event that a change in land use is indicated and confirmed, the owners will be advised that they are eligible for sampling and remedy, if warranted.

These remedial actions are appropriate for these DUs because the long-term monitoring will identify changes from current land use in the future, and soil sampling, performed pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A), will determine if remedy is necessary. If the sample results are less than the SSAL, the properties are not

considered 'facilities,' pursuant to 324.20101(1)(s) and no further action is necessary. If remedy is warranted, it will be implemented consistent with Section 3.1 and the approved IRDC (Appendix A), and upon completion of the remedy, no further action will be necessary for current or potential future land use and they will not be considered 'facilities.' The properties where sampling was not completed are not currently considered 'facilities', pursuant to 324.20101(1)(s); however, a limited number of properties were sampled and results indicate that the properties are considered 'facilities.'

5.6 Property Where Access has not been Granted

The DUs in the MRA where access to perform soil sampling has been requested and has not been granted are listed in Table 5-7, and their locations are presented in Figure 5-7. For these DUs, Dow has used best efforts to obtain appropriate access from property owners to conduct sampling on their property, which included the following: an initial letter, a first and second follow-up telephone call, certified letter, and an in-person visit. While there has been no response from some property owners, others have denied access. Dow will continue to submit requests for access from current owners annually. These properties will also be monitored for a change in ownership as described in Attachment B. Properties where owners decline participation in the program will have the remedy deferred. If a change in ownership is identified, the new owners will be advised that they are eligible for sampling and remedy, if warranted. Attachment B identifies the specific properties subject to monitoring and provides the methods and details of monitoring.

These remedial actions are appropriate for these properties because the long-term monitoring will identify opportunities to obtain access in the future. If access is granted, soil sampling, performed pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A), will determine if remedy is necessary. If the sample results are less than the SSAL, the properties are not considered 'facilities,' pursuant to 324.20101(1)(s) and no further action is necessary. If remedy is warranted, it will be implemented consistent with Section 3.1 and the approved IRDC (Appendix A), and upon completion of the remedy, no further action will be necessary for current or potential future land use and they will not be considered 'facilities.'

5.7 Undeveloped Woodlands

The undeveloped woodland properties in the MRA are listed in Table 5-8, and their locations are presented in Figure 5-8. Current data indicate that non-residential properties in the MRA (including undeveloped woodlands) are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use. Wooded areas may be converted by the owner into residential or residential-like use. Under these specific circumstances, undeveloped wooded areas larger than 7,200 square feet will necessitate access for sampling and remedy, if warranted.

These undeveloped woodland properties will be monitored for a change in land use, specifically if the property is sufficiently cleared for residential or residential-like use. Similar to properties where access has not yet been granted, these properties will continue to be eligible for remedial action. If a change from current land use is identified (e.g. clearing), the owner will be advised that they are eligible for sampling and remedy, if warranted. Attachment B identifies the specific properties subject to monitoring and provides methods and details of monitoring.

Once site access is granted to an undeveloped woodland property, sampling will be performed pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A). If the dioxin and furan TEQ is found to be greater than the SSAL, remedial actions will be implemented consistent with Section 3.1 and the approved IRDC (Appendix A) upon change in current land use.

These remedial actions are appropriate for these DUs because the long-term monitoring will identify changes from current land use in the future, and soil sampling will identify if remedial action is necessary. If remedy is necessary, post-remedy soil concentrations will be less than the SSAL, and they will be suitable for unrestricted residential land use. No further action will be necessary for current or potential future land use and they will not be considered ‘facilities’, pursuant to 324.20101(1)(s).

5.8 Non-Residential Property within Residential Neighborhoods that are Predominantly Paved or Covered by Structures

The non-residential DUs located within residential neighborhoods in the MRA where there is currently insufficient exposed soil or lawn area to conduct representative sampling are listed in Table 5-9, and their locations are presented in Figure 5-9. Current data indicate that non-residential property in the MRA are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use. However, during future property development or construction, there is the potential for direct contact to soils above the SSAL in limited lawn areas or below existing pavement if soil becomes exposed or is relocated into a residential land use setting. At this time, the owner will be advised that they are eligible for sampling and remedy, if warranted. If remedy is warranted, it will be completed in accordance with the approved IRDC (Appendix A).

Current land use was verified by site visits. Because each of these properties has little to no exposed soil, there is limited potential for exposure and no potential for soil and sediment erosion and transport by surface water runoff. Results of site visits for all of the properties in Table 5-9 have been previously submitted in the individual Implementation Annual Reports, which are provided as Appendix E.

These properties are used for non-residential purposes but they are located in a zoning district that does not currently prohibit all residential or residential-like uses in the future. These properties will be subject to long-term monitoring discussed in Section 3.2.2 and Attachment B.

These remedial actions are appropriate for these DUs because the long-term monitoring will identify changes from current land use in the future, and soil sampling, performed pursuant to the sampling design and decision rules outlined in the approved IRDC (Appendix A), will determine if remedy is necessary. If the sample results are less than the SSAL, the properties are not considered ‘facilities,’ pursuant to 324.20101(1)(s) and no further action is necessary. If remedy is warranted, it will be implemented consistent with Section 3.1 and the approved IRDC (Appendix A), and upon completion of the remedy, no further action will be necessary for current or potential future land use and they will not be considered ‘facilities.’ The properties

where sampling was not completed are not currently considered 'facilities', pursuant to 324.20101(1)(s).

5.9 Dow-Owned Property

The parcels in the MRA that are currently non-residential and are in the exclusive ownership and control of Dow are listed in Table 5-10, and their locations are presented in Figure 5-10. Current data indicate that non-residential properties in the MRA are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use.

These properties are used for non-residential purposes but they are located in a zoning district that does not currently prohibit all residential or residential-like uses in the future. To prohibit future residential or residential-like use, institutional controls will be implemented, consistent with Section 3.2.1.

The Dow-owned properties will have declarations of restrictive covenants recorded with the Midland County Register of Deeds. For a complete discussion of institutional controls, see the *Institutional Control Plan*, Attachment A.

The declarations of land or resource use restrictions will include:

- Maintain existing land uses for non-residential properties;
- Provision that the restrictive covenant will continue in effect until it is determined that the regulated substances no longer present an unacceptable risk to the public health, safety, or welfare, or the environment; and
- Legal descriptions of the property that are subject to the land and/or resource use restrictions.

The remedial actions to address the Dow-owned properties within the MRA are appropriate because the institutional controls and monitoring will protect against potential changes in land use that may result in unacceptable exposure in the future.

5.10 City of Midland Property

The parcels in the MRA that are currently in non-residential use and are in the exclusive ownership and control of the City of Midland are listed in Table 5-11, and their locations are presented in Figure 5-11. Current data indicate that non-residential property in the MRA are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use. The properties where sampling has not been completed are not currently considered 'facilities', pursuant to 324.20101(1)(s).

These properties are used for non-residential purposes but they are located in a zoning district that does not currently prohibit all residential or residential-like uses in the future. To prohibit future residential or residential-like use, institutional controls will be implemented, consistent with Section 3.2.1 and these properties will be subject to long-term monitoring discussed in Section 3.2.2 and Attachment B. The City of Midland waste water treatment plant property will have a declaration of restrictive covenant recorded with the Midland County Register of Deeds, if necessary and approved by City of Midland. For a complete discussion of institutional controls, see the Institutional Control Plan, Attachment A.

For both property scenarios discussed above, Dow may elect to obtain access to some or all of the properties in order to identify those properties that are less than or equal to the SSAL and do not require institutional controls.

The declarations of land or resource use restrictions will include:

- Maintain existing land uses for non-residential properties;
- Provision that the restrictive covenant will continue in effect until it is determined that the regulated substances no longer present an unacceptable risk to the public health, safety, or welfare, or the environment; and
- Legal descriptions of the property that are subject to the land and/or resource use restrictions.

The remedial actions to address the properties within the MRA owned by the City of Midland are appropriate because the institutional controls and monitoring will protect against potential changes in land use that may result in unacceptable exposure in the future.

5.11 Dow Owned Property Operated by Others

The parcels in the MRA that are currently in non-residential use and the land is owned by Dow, but the property is operated by others are listed in Table 5-12, and their locations are presented in Figure 5-12. Current data indicate that non-residential property in the MRA are below the generic MDEQ non-residential soil direct contact cleanup criteria and, therefore, no further evaluation or remedial action is necessary for current land use.

These properties are used for non-residential purposes but they are located in a zoning district that does not currently prohibit all residential or residential-like uses in the future. To prohibit future residential or residential-like use, institutional controls will be implemented, consistent with Section 3.2.1 and will be subject to long-term monitoring discussed in Section 3.2.2 and Attachment B.

After Dow provides appropriate notice to the operators, Dow-owned properties will have declarations of restrictive covenants recorded with the Midland County Register of Deeds. For a complete discussion of institutional controls, see the *Institutional Control Plan*, Attachment A.

The declarations of land or resource use restrictions will include:

- Maintain existing land uses for non-residential properties;
- Provision that the restrictive covenant will continue in effect until the site has been remediated or it is determined that the regulated substances no longer present an unacceptable risk to the public health, safety, or welfare, or the environment; and
- Legal descriptions of the property that are subject to the land and/or resource use restrictions.

The remedial actions to address the Dow-owned properties within the MRA are appropriate because the institutional controls and monitoring will protect against potential changes in land use that may result in unacceptable exposure in the future.

5.12 M-20 Expressway Right of Way

In the MRA, the MDOT holds highway easements for each lane of M-20. The locations of these Easements are shown in Figure 5-13. Five DUs included within these easements were sampled and results were less than or equal to the SSAL, pursuant to the sampling design and decision rules outlined in approved IRDC (Appendix A). While these data indicate that the DUs listed are below the SSAL, not all areas within these easements have been sampled; therefore, the potential exists for future movement or improper disposal of excavated soil from the area included within these easements. Dow may elect to obtain access to some or all of the MDOT easement property described above and, if granted, will sample the property in order to identify those properties that are less than or equal to the SSAL and do not require institutional control. Institutional controls will be implemented as the remedial action for the areas as summarized in Section 3.2.1.3 and Attachment A.

The remedial actions to address these non-residential DUs are appropriate because the institutional controls will protect against potential changes in land use that may result in unacceptable exposure in the future.

5.13 Non-Residential Property Potentially Greater than Generic Non-Residential Direct Contact Criterion

Currently, there are no properties that exceed the MDEQ generic non-residential Direct Contact criterion (990 ppt TEQ). If future monitoring identifies a non-residential property that falls under this category, Dow will either address the property through remedy as outlined in the approved IRDC (Appendix A) or take steps to demonstrate compliance with an approved site-specific non-residential criteria.

5.14 All City of Midland Property Outside of the MRA Boundary

The MRA is defined as the study area of the MAS project and the geographic extent of the impacts above the SSAL from the historical aerial release. The boundary of the MRA was confirmed through extensive studies and sampling efforts. The conclusion of the MAS project verified the final extent of the MRA boundary. Based on the boundary verification sampling together with the sampling results in the outer extent of the MRA, sampling is not required beyond the boundary. Therefore, the properties beyond the MRA boundary are not considered 'facilities', pursuant to 324.20101(1)(s), as a result of a historical aerial release from Dow.

Due to the current City of Midland Code of Ordinances, keeping farm animals within the majority of the City is already prohibited. The existing Code of Ordinances makes it unlawful to keep or breed any farm animal except for animals in areas of the City that are zoned agricultural. There is no agriculturally zoned property within the boundaries of the MRA. However, there are currently nine areas of the City, outside of the MRA boundary, that are zoned agricultural, four along the west edge of the city (west of Poseyville Road) and five along the east edge (generally along or near Highway 10). Dow will place a restrictive covenant on Dow-owned property zoned agricultural that prohibits keeping or raising poultry or livestock on the Property for human consumption. The City of Midland will place a restrictive covenant on its property located outside of the MRA boundary that is zoned agricultural that prohibits the keeping or raising of poultry or livestock for human consumption. The properties zoned agricultural will be subject to long-term monitoring until the agricultural zoning is changed or other institutional controls are implemented to prevent the presence of farm animals or to otherwise address unacceptable risks to public health or the environment. Attachment A summarizes the existing Code of Ordinances. Attachment B presents the monitoring program for properties zoned agricultural.

6.0 Financial Assurance

The administrative rules promulgated pursuant to Part 111, Hazardous Waste Management, of Michigan's Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), R 299.9713 establishes requirements for providing financial assurance for corrective action. Specifically, R 299.9712 prescribes the preparation of associated cost estimates and Attachment C has been prepared pursuant to those requirements. Elements of the remedial actions for the MAS project will be on-going, and financial assurance will be provided to manage the following:

- Exposures for current land use where access has not been granted; and
- Exposures for potential future changes in land use from non-residential to residential.

A cost estimate for on-going remedial actions was prepared and is included as Attachment C. The primary components of the financial assurance include a guarantee of funding for sampling and implementation of remedial action for those property owners who have declined to participate in the MAS remedial action program, for undeveloped wooded lots that have not been sampled, and for properties that may be converted to residential or residential-like use in the future. The cost estimate was developed using the amount equal to the average cost of performing the presumptive remedy at residential properties, which was determined during the first construction season, multiplied by the number of properties that deferred or declined to have the remedy implemented. The estimate assumed that each of the currently residential or residential-like use or undeveloped wooded properties would need to be sampled, and in accordance with the findings of DU sampling from 2012 through 2014, that roughly 20% of those DUs would require remedy. The cost estimate includes an allowance for non-residential properties by conservatively estimated that 20% of the remaining non-residential properties may require some sampling and 5% may require presumptive remedy if converted to residential or residential-like use in the future. The cost estimate also includes reasonably anticipated costs related to ongoing monitoring and maintenance, as described in Attachment C. Dow will update the corrective action cost estimate for the Facility to include these elements, and will provide financial assurance consistent with Operating License Condition II.N.3.

7.0 Reporting and Schedule

A schedule for providing the RI Deliverables was presented in the IRDC and Part I. The schedule provided below reflects several updates in deliverable deadlines based on an approved accelerated sampling and remedy schedule achieved based on Adaptive Management as described in Section 9.0 of the approved IRDC (Appendix A). Annual reports will be submitted to document each year of long-term monitoring. Details of the implementation of remedy for current land use are provided in Section 5 of this report; however, ICs have not been fully implemented. The details for the RAP Completion Summary Report with regards to implementation of the ICs will be included in the first Annual Report. In the future, Dow may propose changes in reporting frequency for MDEQ approval.

Key RI deliverables and the schedule are listed below:

RI Deliverable	**Timeframe/Duration**
Revised SOW and RIWP (Part I)	December 2014
Updated Revised SOW and RIWP (Part I)	May 2016
RI Report (Part II)	December 2014
Revised RI Report (Part II)	May 2016
Implementation of Remedy	2012 - Ongoing
RAP/CMI (Part III)	December 2014
Revised RAP/CMI (Part III)	May 2016
RAP Completion Report for ICs	January 2017

Attachment A includes a more detailed schedule for the IC implementation activities. Attachment B includes an overview of the monitoring activities.

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