1925 Landfill

Corrective Action Monitoring and Maintenance Plan

The Dow Chemical Company
Midland, Michigan 48674
USA

October 1, 2010

CERTIFIED MAIL
7007 2680 0001 3778 5364

Liane J. Shekter Smith, Chief
Department of Natural Resources and Environment
P.O. Box 30241
Lansing, MI 48909

cc: Al Taylor, DNRE – P.O. Box 30241, Lansing, MI 48909;
Trisha Confer, DNRE – Saginaw Bay District Office, 401 Ketchum Street, Suite B, Bay City, MI 48708.

SUBJECT: 1925 LANDFILL CORRECTIVE ACTION MONITORING AND MAINTENANCE PROGRAM (CAMMP); EPA FACILITY NUMBER MID 000 724 724

In accordance with Attachment 28 (Compliance Schedule) of the Act 451 Part 111 Operating License issued to The Dow Chemical Company, Michigan Division, effective June 12, 2003 (Operating License), Dow is submitting the enclosed *1925 Landfill Corrective Action Monitoring and Maintenance Plan* (CAMMP). This report was prepared by URS Corporation on behalf of The Dow Chemical Company, Michigan Operations.

This document, upon DNRE approval, will be incorporated into the appropriate monitoring and inspection sections of the Operating License.

If you have any questions regarding this information, please contact Steve Lucas at 989-638-6012.

Dan Rader
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Enclosure

meh

The Dow Chemical Company
Compliance Schedule Task M-8
1925 Landfill Corrective Action Monitoring and Maintenance Plan (CAMMP)

October 1, 2010

Prepared by URS Corporation

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1925 LANDFILL CORRECTIVE ACTION MONITORING AND MAINTENANCE PROGRAM

1.0 INTRODUCTION

In accordance with the Part XII Compliance Schedule attached to Dow's Facility Operating License issued on June 12, 2003, Dow has prepared this Corrective Action Monitoring and Maintenance Program (CAMMP) for the 1925 Landfill. The CAMMP will provide a plan for long-term maintenance of the 1925 Landfill, including hydraulic monitoring.

2.0 HISTORY

The Dow Chemical Company's (Dow's) 1925 Landfill is located within the Dow Midland Plant Site in Midland, Michigan, and was used for general landfill operations and wastewater solids management prior to the present-day landfill sites.

The 1925 Landfill is underlain by naturally-occurring, low-permeability lacustrine clay and glacial tills which serve as a barrier to vertical migration of waste constituents, and is located upgradient of the Midland Plant's Revetment Groundwater Interception System (RGIS) along the north (or east) bank of the Tittabawassee River. The RGIS lowers the groundwater elevation below river level and therefore collects groundwater from the Midland Plant Site, including any groundwater flowing from the 1925 Landfill.

The areal extent of the Landfill covers several separate areas: the 8-Pond; the former Diversion Basin; the 1005 Hill; and Michigan Operations' Environmental Operations area that includes the current 32 Incinerator. These areas, depicted on Figure 1, were utilized for varying purposes and were closed and brought to grade, then covered with clay, asphalt, or concrete to minimize infiltration. The areas covered with earthen caps were closed as landfills in the late 1960s to early 1980s utilizing a minimum of two (2) feet of compacted clay.

Closure components of the 703/830 incinerators and WSAIIA were also integrated into the existing 1925 Landfill cap system to maintain the functionality of the cap consistent with the provisions of the 703/830 Incinerator, WSAIIA and 1925 Landfill final Closure Plans.

One of the areas adjacent to 1925 Landfill was identified in the early 1980s as an area where Localized Elevated Levels (LELs) of 2,3,7,8 – TCDD (TCDD) existed. The LEL located in the 1925 Landfill is identified as "LEL III". Monitoring and maintenance of LEL III is being addressed in a separate Post-Closure Maintenance and Monitoring Plan (PCLMP) pursuant to the Part XII Compliance Schedule attached to Dow's Facility Operating License.

The objective of this CAMMP for the 1925 Landfill is to provide adequate long-term maintenance and hydraulic monitoring of the 1925 Landfill to ensure the integrity of the cover material; ensure that closure components of the 703/830 Incinerators, WSA IIA and other units within 1925 Landfill remain adequately integrated into the cap system; and minimize the potential for off-site groundwater migration from the unit.

3.0 CURRENT MONITORING PLAN

The original 1925 Landfill CAMMP, dated February 14, 1989, has previously been described and submitted to the Agency, and is referenced in the Operating License Reapplication, May 6, 2003, Section XVI C- Corrective Action.

Dow conducts periodic assessments of monitoring wells and piezometers for the Facility Shallow Groundwater Monitoring Program as part of the Operating License. The data has consistently shown that shallow groundwater movement is to the southwest, toward the RGIS collection system.

The primary piezometers in the RGIS system are continuously monitored. Proactive response is initiated as specified by the Facility License. Manual piezometer measurements ensure that the system is functioning correctly, and an inward hydraulic gradient is maintained by the RGIS system. Lift stations (groundwater collection points for the system) are sampled and tested for previously detected compounds and tracked to evaluate long-term changes in groundwater chemistry. Periodically, a comprehensive set of analytical work is done consistent with 40 CFR 264 Appendix IX to determine if additional compounds are present. The frequency of the RGIS monitoring activities is specified in the facility Sampling and Analysis Plan (SAP) (Attachment 24) and Part X.G of the Facility License.

A Hydrogeologic Evaluation and Corrective Action Study Plan for the 1925 Landfill was submitted on November 12, 2008. On January 30, 2009, Dow submitted a Pilot Corrective Action Study Monitoring Plan intended to supplement the Corrective Action Study. These documents are included in the CAMMP as Attachments 1 and 2, respectively.

The objective of the Pilot Corrective Action Study is to reduce the hydraulic head within the 1925 Landfill pilot study area to an elevation below the ground surface. This will be accomplished by the willow and aspen tree plot that was planted to supplement existing vegetation. It is expected that the trees will increase transpiration and reduce the volume of water currently infiltrating into the landfill.

The pilot study referenced above includes water level measurements from a network of thirty-six (36) piezometers that are measured to evaluate hydraulic conditions within the study area. Water levels from the piezometers are currently measured on a monthly basis and submitted in the Quarterly and Annual Environmental Monitoring Reports. The Pilot Corrective Action Study is tentatively scheduled to be completed during 2012. Upon conclusion of the study, the SAP and this CAMMP will be revised to include a hydraulic monitoring program for the study area.

4.0 INSPECTION ACTIVITIES

Figure 1 delineates the individual components of the 1925 Landfill. Inspection activities are essentially focused on two broad categories of capped areas covering the 1925 Landfill: vegetated and non-vegetated. Vegetated areas typically entail grass covering. Non-vegetated cap areas may include gravel areas, paved parking lots, or concrete/asphalt process areas. Inspections will include the following activities with observations and corrective measures documented as specified on the Inspection Form (example provided as Attachment 3):

4.1 Security

Dow's perimeter security system is managed by Dow's Emergency Services and Security Department, who conduct routine, drive-by inspections of site facilities. The entire site perimeter is fenced and access gates are staffed by Security personnel and contain other access controls when the gate is open.

4.2 Erosion/Cover Settlement/Cover Condition

A minimum of two annual inspections for erosional effects to finished slopes, cap settlement areas and general cover condition will be conducted each spring and each fall. Cover conditions are also observed during mowing activities.

On September 17, 2010, Dow submitted a proposal to construct onsite storm water detention areas that will include cap enhancements to some areas of the Landfill. The constructed detention basins and restricted outlets will be inspected in the spring, fall, and after every 2-inch or greater rainfall event to ensure proper drainage.

Any potential cap integrity issues are further evaluated and repair action taken as necessary and appropriate. The site Inspection Form contains a more detailed listing of features that are inspected.

4.3 Piezometers

The piezometers will be visually inspected at the time of static water level measuring while the Pilot Study is ongoing with conditions monitored and documented at that time. They are therefore not included on the routine Inspection Form. The specific details of piezometer monitoring and sampling/measuring are included in the Facility SAP (Attachment 24 of the Facility License).

4.4 Asphalt/Stone Mix/Paved Areas

Non-vegetated areas are monitored during routine security patrols and through routine plant traffic. Abnormal conditions that may present the potential for the exposure of subsurface waste are reported to the facility Remediation Group for appropriate action.

5.0 MAINTENANCE ACTIVITIES

Maintenance activities include provisions for the following:

5.1 Erosion

Any repairs to documented breaches of cap integrity are conducted expeditiously, with new cover being placed and vegetation re-established as soon as feasible by seasonal variables.

5.2 Cover Settlement

Areas identified where final cover settlement results in ponding outside of the engineered storm water detention areas will be graded and vegetated to re-establish appropriate drainage.

5.3 Vegetative Cover

The vegetative cover is routinely maintained through re-seeding (as necessary) and mowing during the growing season as appropriate.

5.4 Asphalt/Stone Mix Cover

Areas of bituminous or aggregate cover identified to have cracked or settled, that may expose in-place waste or contamination will be repaired by filling or sealing.

5.5 Run-off and Run-on Control

Maintenance of the newly-constructed detention basins will consist of inspecting the basin's restricted outlet to ensure they are not clogged and are functioning properly. If water drainage patterns suggest a blockage or obstruction has occurred, an inspection of the area will be conducted and corrective measures to restore proper functionality will be implemented (i.e. jetting of drain, cleanout of restricted outlet, etc).

6.0 DATA EVALUATIONS AND CORRECTIVE MEASURES ASSESSMENTS

The inspection and maintenance programs outlined in this CAMMP are required by the June 12, 2003 Operating License. If corrective measures are determined to be necessary as a result of information obtained through these programs, a work plan will be prepared and submitted to the Michigan Department of Natural Resources and Environment (DNRE) for review and approval prior to implementation.

ATTACHMENTS

ATTACHMENT 1

Hydrogeologic Evaluation and

Corrective Action Study Plan

The Dow Chemical Company
Midland, Michigan 48674
USA

November 12, 2008

CERTIFIED MAIL
7007 2680 0001 3709 3933

George Bruchmann
WHMD-MDEQ
P.O. Box 30241
Lansing, Michigan 48909-7741

cc: Cheryl Howe WHMD - MDEQ P.O. Box 30241 Lansing, Michigan 48909-7741
Allan Taylor WHMD -MDEQ-P.O. Box 30241 Lansing, MI 48909

Subject: 1925 Landfill Pilot Corrective Action Study Submittal

In correspondence dated August 29, 2008, Dow provided updated information related to a hydrogeologic investigation of portions of the 1925 Landfill where seepage had previously been identified. Dow noted that it would submit a hydrogeologic evaluation and proposed corrective action by November 12, 2008. In accordance with that correspondence, attached you will find the 1925 Landfill Pilot Corrective Action Study to address the area of seepage previously identified.

If you have any questions regarding this Study, please contact Steve Lucas at (989) 638-6012.

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mdc

The Dow Chemical Company
1925 Landfill Seepage
Pilot Corrective Action Study

November 12, 2008

Prepared by URS Corporation

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Figures

1.0 Introduction

MDEQ periodically inspects Final Cover over capped areas at Michigan Operations, located in Midland, Michigan (see Figure 1). MDEQ conducted a Final Cover Inspection of the Localized Elevated Level Sites II and III on June 27, 2007, and provided subsequent written documentation of the inspection dated September 28, 2007. As part of that inspection, MDEQ also inspected portions of the 1925 Landfill adjacent to Sites II and III. Figure 2 presents the location of Sites II and III. Corrective measures recommended by MDEQ included an area of apparent seepage in the 1925 Landfill. In a response to the MDEQ Final Cover Inspection Report for Localized Elevated Level Sites II and III, dated November 21, 2007, it was noted that hydraulic investigation work had been initiated to determine the source of the seepage. It was originally anticipated that the investigative work could be completed by June 2008 and a corrective action plan submitted by August 2008. However additional data were needed, to propose a corrective action plan for the cover in the seepage areas. An interim update letter was submitted to MDEQ on August 29, 2008, summarizing work that had been done to date, and committed to submittal of a hydrogeologic evaluation and proposed corrective action by November 12, 2008. This document is intended to fulfill that commitment.

A summary of existing hydrogeologic conditions is presented, along with a Pilot Corrective Action Plan which is proposed to alleviate hydraulic head within the 1925 Landfill adjacent to the seepage area and subsequently stop and prevent on-going seepage. In addition to the Pilot Corrective Action Plan, numerous older piezometers that were in a state of disrepair within the 1925 Landfill were closed coincident with the hydrogeologic investigation.

2.0 Existing Conditions

To conduct the investigation, 11 soil borings were completed, with installation of 17 piezometers, including 6 vertical clusters (see Figure 3). Water level readings from the piezometers were taken on May 13 and August 15, 2008. A groundwater contour map was prepared utilizing these data, and it is presented as Figure 4. To observe vertical hydraulic gradients, a hydrologic cross section was also prepared, and is presented as Figure 5.

2.1 Seepage

The seepage identified during the June 27, 2007 Final Cover Inspection was discovered by Dow prior to the Final Cover Inspection, and was repaired on June 4, 2007. Since that time, ground water levels measured in piezometers immediately adjacent to the seepage area indicate ground water head at an elevation above the top of the ground surface. This condition, if on-going, would likely result in additional seepage. Although excess hydraulic head is observed in this area, on-going seepage is not currently occurring. This area is inspected frequently and observed for signs of seepage. If, during the Pilot Corrective Action, seepage is observed, repairs will be made consistent with those made on June 4, 2007. Active seepage from this area appears to be under control; however the underlying cause of the seepage needs to be addressed and is the focus of this Pilot Corrective Action Study.

2.2 Ground Water Flow

Ground water contour data and the hydraulic cross section indicate two distinct areas of ground water recharge. Ground water is migrating downward both to the north and south from these recharge areas. Ground water seeping to the south is captured by the Revetment Ground water Interception System (RGIS). Ground water seeping to the north appears to be migrating in the direction of one of the plant sewer lines.

The first area of ground water recharge is immediately adjacent to MW-3 vertical piezometer cluster at the apex of the 1925 Landfill Cap. This is expected, and represents a normal condition for this type of closed waste management unit. A second area of ground water recharge is located just to the north of

MW-4 vertical piezometer cluster. This area of recharge is likely the underlying cause of the seepage adjacent to piezometer PZ-2 (the area identified during the June 27, 2007 Final Cover Inspection).

A simplified conceptual site model of the 1925 Landfill in this area is presented as Figure 6. This model indicates that sources of inflow into the Landfill area are from other ground water seepage and infiltration through the cap. Based on the downward vertical gradients within most of the landfill area, it is unlikely that seepage from beneath the landfill area significantly contributes to the hydraulic head within the landfill. Therefore, infiltration through the cap is hypothesized to provide the main contribution of hydraulic head within the landfill.

Utilizing the conceptual site model, corrective measures to reduce the hydraulic head in the landfill can be accomplished by reducing the main hydraulic inputs to the landfill. This would be accomplished by the following:

- Increasing the runoff
- Increasing the evapotranspiration; and
- Decreasing the infiltration.

The focus of this Pilot Corrective Action Plan is to effectively reduce the hydraulic head within the landfill area by accomplishing the above tasks.

3.0 Corrective Measures

This objective of the Pilot Corrective Action Study is simply to reduce the hydraulic head within the 1925 Landfill in this area to an elevation below the ground surface. This should effectively eliminate any seepage through the cap.

3.1 Implementation Plan

A stand of approximately 650 willow trees will be established by planting willow shoots approximately 18" below ground surface on 10-foot centers over approximately 1.5 acre area which overlaps the groundwater recharge area identified adjacent to the MW-4 vertical piezometer cluster (see Figure 7). The trees will be maintained and protected from damage by deer and other animals that can impact the saplings. In addition to the tree stand, several piezometers will be installed in the area to allow for monthly water level monitoring.

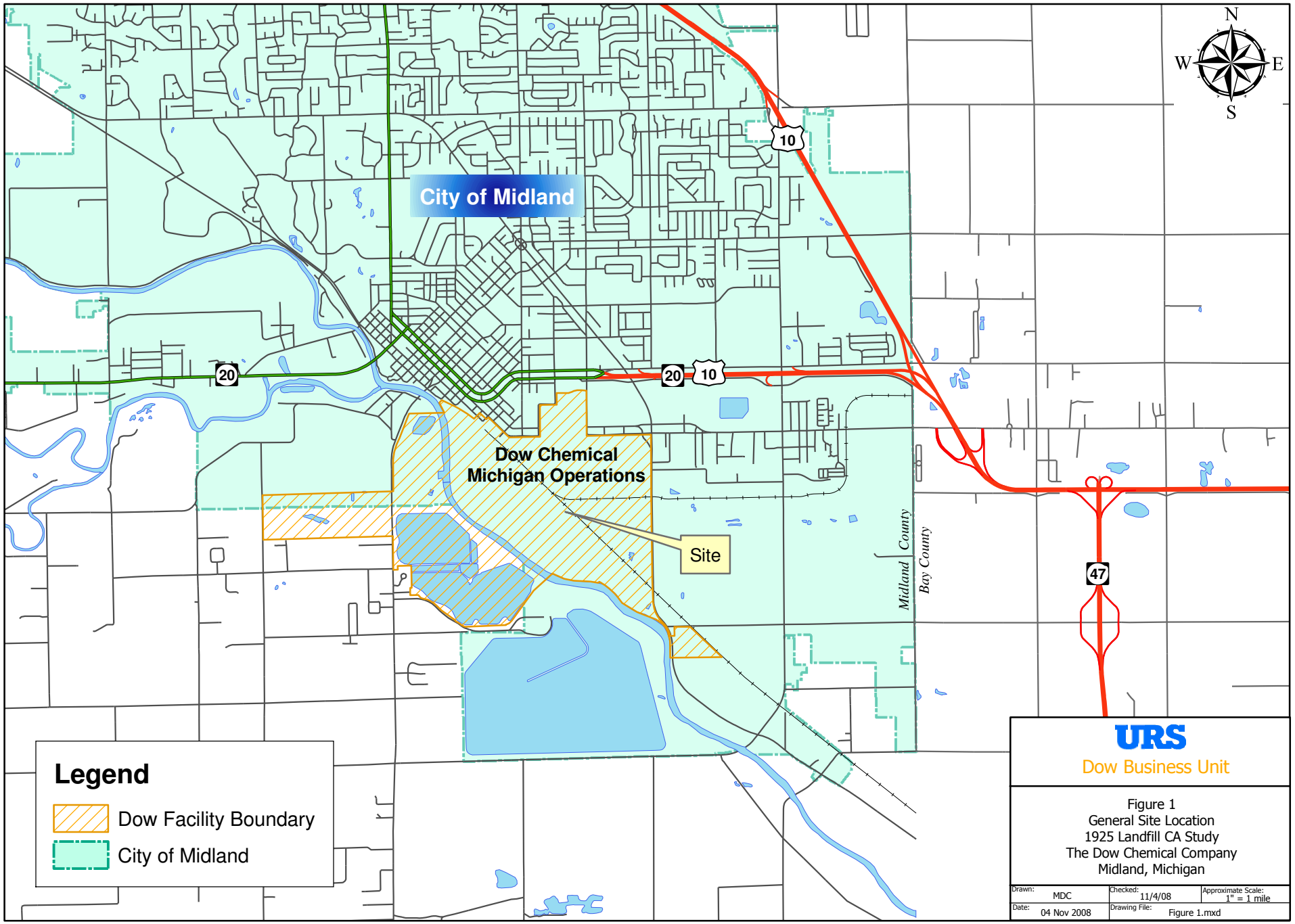
3.2 Schedule

The optimal time to conduct the planting and early phases of tree stand establishment is in the late spring. It is therefore anticipated that planting of the willow shoots will begin prior to May 31, 2009. Once the trees have been planted, additional piezometers will be installed within the tree stand to allow for monthly hydraulic monitoring. On-going inspections of the area of identified seepage will continue throughout the Pilot Corrective Action Study.

4.0 Performance Monitoring

As noted above, the pilot corrective action objective is to reduce the hydraulic head within the 1925 Landfill in this area to an elevation below the ground surface. This should effectively eliminate any seepage through the cap. Water levels within the 1925 Landfill will be measured to evaluate the performance of this pilot corrective action. Two areas of ground water recharge have been identified during the hydrogeologic investigation. Because of this fact, water levels from both recharge areas will be monitored on a monthly basis throughout the study, with the recharge area adjacent to MW-3 vertical piezometer cluster being utilized as a control area to evaluate the net benefit caused by the willow tree stand. Hydraulic monitoring data obtained during this study will be summarized and reported in the relevant Quarterly Michigan Operations Environmental Monitoring Report. It is anticipated that piezometers in and adjacent to the willow tree stand should show a long-term downward trend in ground water elevations as compared to the control area.

If it becomes clear that the objective cannot be achieved utilizing these methods, further corrective measures will be proposed to reduce the hydraulic head within the 1925 Landfill to an elevation below ground surface, and therefore eliminate seepage.



URS

Dow Business Unit

Figure 1
General Site Location
1925 Landfill CA Study
The Dow Chemical Company
Midland, Michigan

Drawn: MDC	Checked: 11/4/08	Approximate Scale: 1" = 1 mile
Date: 04 Nov 2008	Drawing File: Figure 1.mxd	


N
W
E
S
Seepage Area Identified in June 27, 2007 Inspection
LEL II
LEL III
1925 Landfill Area
Legend
LEL 2
LEL 3
URS
Dow Business Unit
Figure 2
Seepage Location Map
1925 Landfill CA Study
The Dow Chemical Company
Midland, Michigan
Drawn: MDC
Checked: 11/4/08
Approximate Scale: 1" = 500'
Date: 04 Nov 2008
Drawing File: Figure 2.mxd

URS

Dow Business Unit

Figure 3
Piezometer Map
1925 Landfill CA Study
The Dow Chemical Company
Midland, Michigan

Drawn:	Checked:	Approximate Scale:
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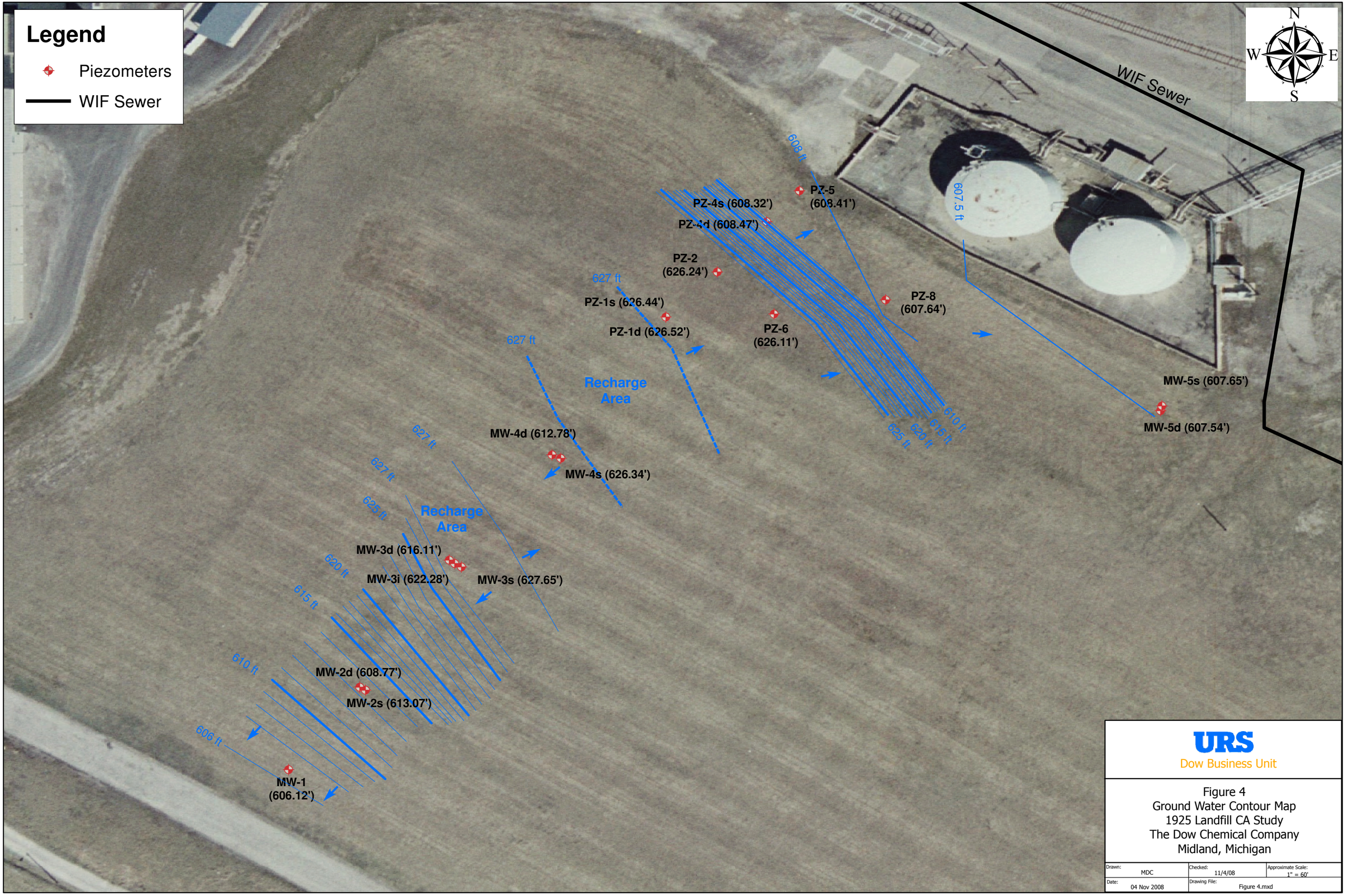
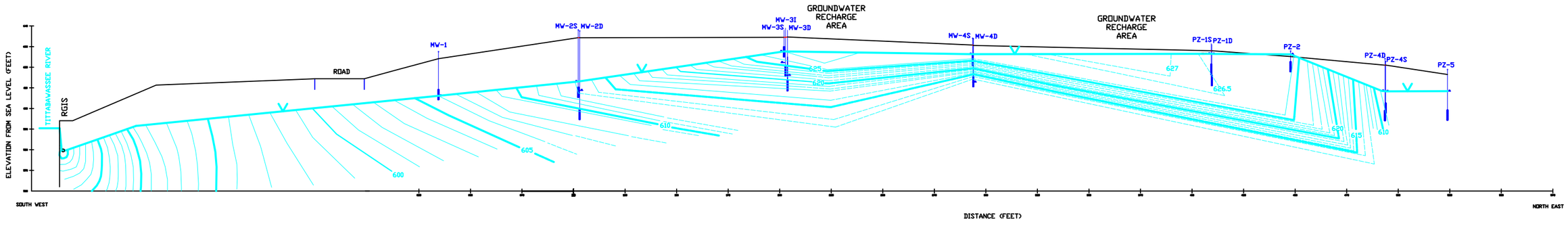
Date:	Drawing File:	
04 Nov 2008	Figure 3.mxd	


Legend
Piezometers
WIF Sewer
N
W
E
S
WIF Sewer
608 ft
607.5 ft
PZ-5
(608.41')
PZ-4s (608.32')
PZ-4d (608.47')
PZ-2
(626.24')
627 ft
PZ-1s (626.44')
PZ-1d (626.52')
PZ-8
(607.64')
PZ-6
(626.11')
627 ft
Recharge
Area
MW-5s (607.65')
MW-5d (607.54')
610 ft
615 ft
620 ft
625 ft
MW-4d (612.78')
MW-4s (626.34')
627 ft
627 ft
625 ft
Recharge
Area
MW-3d (616.11')
620 ft
MW-3i (622.28')
MW-3s (627.65')
615 ft
610 ft
MW-2d (608.77')
MW-2s (613.07')
606 ft
MW-1
(606.12')
URS
Dow Business Unit
Figure 4
Ground Water Contour Map
1925 Landfill CA Study
The Dow Chemical Company
Midland, Michigan
Drawn: MDC
Checked: 11/4/08
Approximate Scale: 1" = 60'
Date: 04 Nov 2008
Drawing File: Figure 4.mxd

GROUNDWATER ELEVATION DATA				
	WELL	CASING ELEV	SWL	ELEVATION
	MW-1	627.43	21.31	606.12
	MW-2S	637.99	24.92	613.07
	MW-2D	637.47	28.70	608.77
	MW-3S	638.01	10.36	627.65
	MW-3I	639.00	16.72	622.28
	MW-3D	637.97	21.86	616.11
	MW-4S	633.93	7.59	626.34
	MW-4D	633.68	20.90	612.78
	MW-5S	620.36	12.71	607.65
	MW-5D	621.52	13.98	607.54
(SB-1B)	PZ-1S	631.06	4.62	626.44
(SB-1A)	PZ-1D	631.51	4.99	626.52
	PZ-2	627.75	1.51	626.24
(SB-4A)	PZ-4S	622.64	14.32	608.32
(SB-4B)	PZ-4D	624.06	15.59	608.47
	PZ-5	618.80	10.39	608.41
	PZ-6	626.11	0.00	626.11
	PZ-8	622.56	14.92	607.64



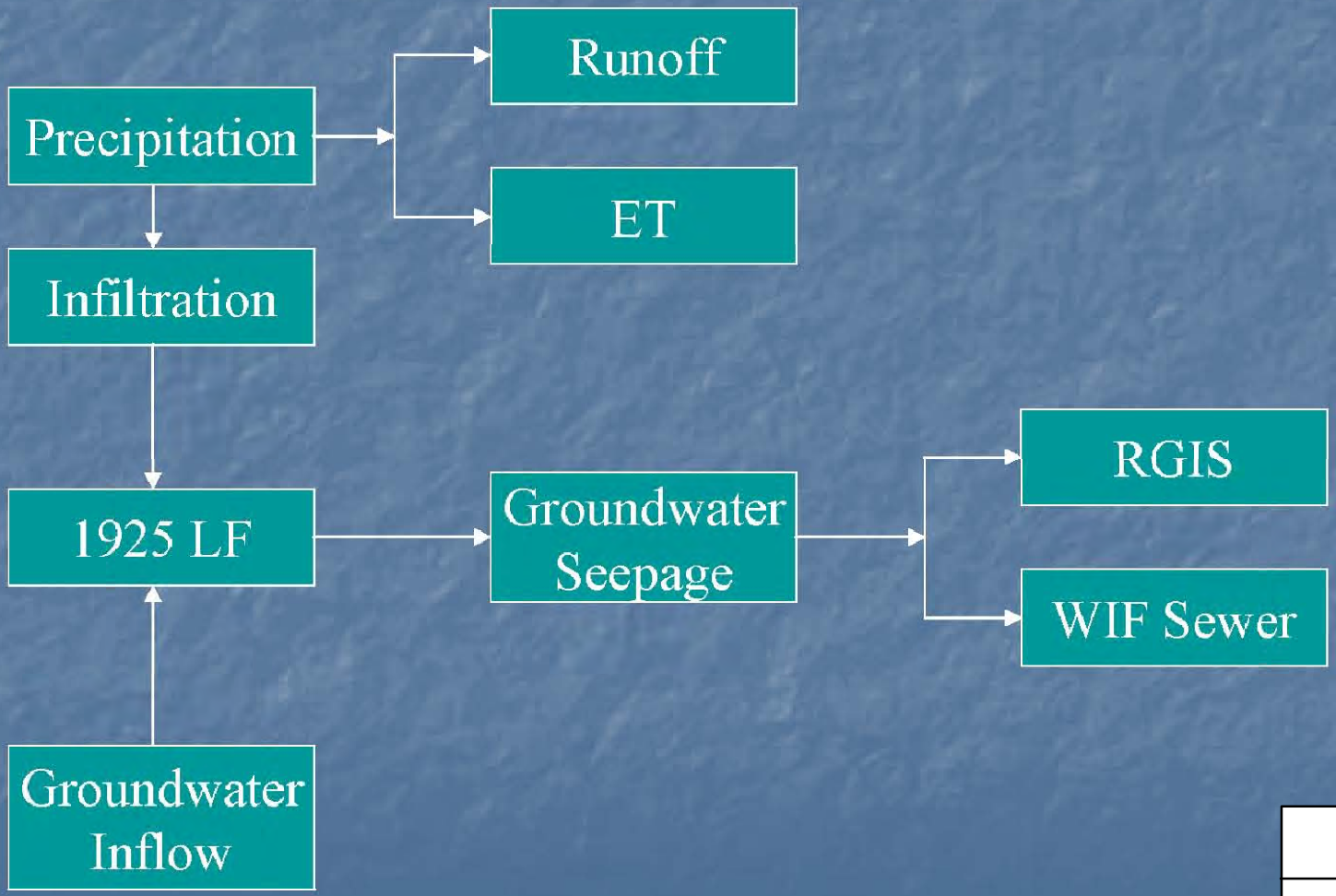
TITLE

FIGURE 5
HYDROLOGIC CROSS SECTION

URS CORPORATION – DOW BUSINESS UNIT – MIDLAND, MICHIGAN (989)–638–1696

DATE	JOB NO.
11/01/08	41567461
DR. MDC	SKETCH NO.
CK. MS	Section1_1925Landfill–MC.dwg

1925 Landfill Water Balance



URS
Dow Business Unit

Figure 6
Site Conceptual Model
1925 Landfill Pilot CA Study
The Dow Chemical Company
Michigan Operations

Drawn:	Checked:	Approximate Scale:
MDC	11/3/08	NONE
Date: 28 Nov. 2007 - rev	Drawing File: Figure 6.mxd	

URS
Dow Business Unit

Figure 7
Willow Tree Stand Area
1925 Landfill CA Study
The Dow Chemical Company
Midland, Michigan

Drawn:	Checked:	Approximate Scale:
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Date:	Drawing File:	
04 Nov 2008	Figure 7.mxd	