RCRA FACILITY INVESTIGATION (RFI)
WORK PLAN ADDENDUM NO. 3

GM POWERTRAIN BEDFORD FACILITY
105 GM DRIVE
BEDFORD, INDIANA

EPA ID# IND006036099

MARCH 2004
REF. NO. 13968 (68)
This report is printed on recycled paper.

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(Following Text)

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LIST OF ACRONYMS

Agreement	RCRA Corrective Action Agreement
AOI	Area of Interest
BGS	Below Ground Surface
CRA	Conestoga-Rovers and Associates
Facility	GM Powertrain Bedford Plant
FMG	Field Methods Guideline
GM	General Motors Corporation
PCB	polychlorinated biphenyls
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
STL	Severn Trent Analytical Laboratory
USCS	Unified Soil Classification System
TM	Technical Memorandum
U.S. EPA	United States Environmental Protection Agency

1.0 INTRODUCTION

This document presents an Addendum No. 3 to the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan (RFI Work Plan) for the General Motors Corporation (GM) Powertrain Bedford Plant (Facility) located in Bedford, Indiana (U.S. EPA ID# IND006036099).

1.1 GENERAL

The Facility is located at 105 GM Drive, Bedford, Lawrence County, Indiana, 47421. The Facility produces aluminum casting products, such as transmission cases, pistons, and engine blocks. Major aluminum production processes include die casting and permanent molding. The Bedford Facility has been operating as an aluminum foundry since 1942, with major facility modifications completed in 1950, 1953, 1966, 1971, 1974, 1977, 1979, and 1980.

The Facility, located on 152.5 acres, contains approximately 915,000 square feet of floor space and employs approximately 1,000 people.

1.2 RFI APPROACH

GM signed a Performance-Based RCRA Corrective Action Agreement (Agreement) with the United States Environmental Protection Agency (U.S. EPA) for the Bedford Facility on March 20, 2001, as amended on August 31, 2002. The signed Agreement states that GM will work with the U.S. EPA to identify and define the nature and extent of releases of hazardous waste and/or hazardous constituents at or from the Bedford Facility.

1.3 PURPOSE

On October 29, 2001, GM submitted a RFI Work Plan (CRA, October 29, 2001) for completing the first phase of investigative activities within the Facility property. The RFI Work Plan implementation was initiated on December 17, 2001, and has been completed.

The first RFI Work Plan Addendum (Addendum No. 1) described additional proposed on-Site and off-Site investigative activities based on preliminary RFI results (CRA, November 18, 2002). The purpose of the proposed additional investigative activities

was to further define the extent of hazardous constituents in soil at the Facility, and to obtain additional information on the groundwater-surface water system at and near the Facility. The last three remaining locations, (angled borings, which were originally proposed to be placed on Parcel 3 under the RFI Work Plan Addendum No. 1, November 18, 2002), have been relocated and drilling has been completed on GM property.

The RFI Work Plan Addendum (Addendum No. 2) described additional investigative activities at the Former North Disposal Area; identified as Area of Interest (AOI) 4 in the Current Conditions Report (CRA, May 25, 2001). This work has been completed.

The purpose of this RFI Work Plan Addendum (Addendum No. 3) is to present additional investigative activities at the GM hourly parking lot and in the vicinity of Breckenridge Street and GM Drive. The following describes the areas that will be investigated under this RFI Work Plan Addendum No. 3.

1.4 TASK 1: STORM MANHOLE AND PIPING INVESTIGATION

During implementation of the Upstream Parcels Removal Action Work Plan (Work Plan) (CRA, July 2003) north of AOI 15, brush and vegetation was cleared around a culvert located under the road. This culvert is a 48-inch diameter pipe that runs under GM Drive to the west and represents the beginning of the creek north of AOI 4. A sediment sample was collected from inside of the culvert and shipped to Severn-Trent Analytical Laboratory (STL) in North Canton, Ohio for analysis of polychlorinated biphenols (PCBs). The result of this sample (S-AOI4-092403-KB-4017) was reported at 10,060J[1] mg/kg of PCB.

A review of drawings recently found and provided by GM Plant personnel, indicate that, at one time, stormwater from the western side of GM Drive was discharged, through storm lines which tied to a catch basin and then to the culvert, leading to the ditch between Parcel 401 and the area just north of AOI 15. According to Plant personnel, this portion of the storm sewer, including piping and an existing catch basin (MH-ST-43), was abandoned around the time of the new Stormwater Lagoon installation. All stormwater was at that time diverted to flow into the lagoon, rather than down the tributary.

[1] J = The associated value is an estimated quantity.

A letter describing proposed activities for cleaning and inspecting the catch basin and associated piping, including grouting up the culvert, was submitted to the U.S. EPA on – October 28, 2003 (Appendix A). This work is more fully detailed in an Amendment to the Upstream Parcels Removal Action Work Plan, pursuant to the Administrative Order on Consent between the U.S. EPA and GM.

1.5 TASK 2: GM HOURLY PARKING LOT INVESTIGATION

Discussions with a local resident and review of recently found drawings has indicted that part of the GM hourly parking lot was at one time the beginning of the creek that currently starts east of Breckenridge Road. Figure 1.1 presents historical contours obtained from Facility files indicating a drainage feature running to the northeast across the location of the current hourly parking lot (prior to filling), as well as two additional drainage features (one to the north and one to the east). Stormwater from the Northern Plant area historically entered this creek, which runs north of AOIs 4 and 15, through the 48-inch diameter culvert under GM Drive. By 1987, this portion of the stormwater drainage was re-routed through underground piping along the north side of AOI 15 and into the current stormwater pond (AOI 10).

The recently found drawings also indicated that there was a northern drainage feature along the extreme northwest portion of the property. It appears that this drainage was the start of the Northern Tributary to Bailey's Branch and was filled on both sides of Breckenridge Road (currently, much of the area where this drainage feature was located on the south side of Breckenridge Road is now the location of a substation, which is owned by Cynergy).

A third, smaller drainage feature could also be observed on these drawings. This feature appears to have directed surface water to the Former Stormwater Pond (AOI 7). This feature has also been filled.

CRA proposes to further evaluate these areas and determine whether additional contamination could be present.

2.0 SCOPE OF WORK

2.1 DIRECT-PUSH DRILLING INVESTIGATION

In order to evaluate the existing conditions during the RFI investigation beneath the GM hourly parking lot area, CRA had previously completed three overburden borings (B-X080Y210, B-X097Y232 and B-X130Y215) to bedrock (see Figure 2.1 for locations and Appendix B for borehole logs). The borings were advanced utilizing a Direct-Push Drill rig. However, because the historical drainage area under the parking lot is narrow, the previous borings did not encounter the drainage feature.

CRA proposes to advance up to four additional borings to the bedrock surface to characterize the soil and to verify the location of the former drainage, determined from the historical drawings of the former drainage feature (Figure 2.1). In addition, eight soil borings will be advanced to approximately ten feet below ground surface (bgs). Four of the soil borings will be located along Breckenridge Road, and four will be advanced along GM Drive to determine whether past stormwater may have been the source for the contaminants in the culvert (Figure 2.1 for locations).

Two soil borings will be advanced along the former trend of the eastern drainage feature and one soil boring will be completed to the top of the bedrock surface along the northern drainage feature.

Samples will be collected at each boring location in accordance with the procedures and protocols identified in the RFI Work Plan.

2.2 TEST PIT INVESTIGATION

To further investigate conditions of the catch basin adjacent to the culvert it is proposed that a test pit investigation be conducted. CRA suggests that up to two test pits be excavated in the vicinity of a catch basin located on the west side of GM Drive and the intersection of Breckenridge Street (see Figure 2.1 for proposed locations).

The test pit excavation would allow for the collection of subsurface soil samples and for visual examination of stratigraphic conditions around the catch basin.

Once locations have been selected, the regional utility clearance contractor will be contacted, and CRA will also clear the local utilities with plant engineering prior to excavation. Plastic sheeting will be placed on the ground downwind of the test pit and

excavated soil will be piled on top of the sheeting to protect surface soil. All excavated soil and will be covered with plastic sheeting prior to replacement. Any surface water runoff from the soil pile will be directed back into the excavation.

Soil samples will be collected from the backhoe bucket or from the excavation face. PID screening will be completed to help determine sample intervals. Soil samples will be described in the field using the modified Unified Soil Classification System (USCS). In addition, the test pit log will also contain information regarding the presence of groundwater, appearance of weathering and any staining. Soil samples will be collected in accordance with the procedures and protocols identified in the RFI Work Plan, the QAPP and Field Method Guidelines (FMGs).

At the completion of the test pit, the excavation will be backfilled using the soil excavated from the pit. Excavated materials will be replaced into the test pit in the same order they were extracted. If any soil/fill saturated with separate phase liquids (other than water) are encountered, the soil/fill containing such liquids will be segregated, characterized, properly disposed, and a separate work plan will be generated describing any interim action, as necessary.

The field notes will be recorded on a field form as well as in a bound field survey book. All entries will be made in ink and any changes and/or corrections will be stricken with a single line, initialed, and dated, in accordance with the Quality Assurance Project Plan (QAPP, CRA 2001).

Prior to use and between each test pit the soil sampling equipment, as well as the bucket and arm of the backhoe, will be decontaminated in accordance with the procedures and protocols identified in the RFI Work Plan (CRA, 2001).

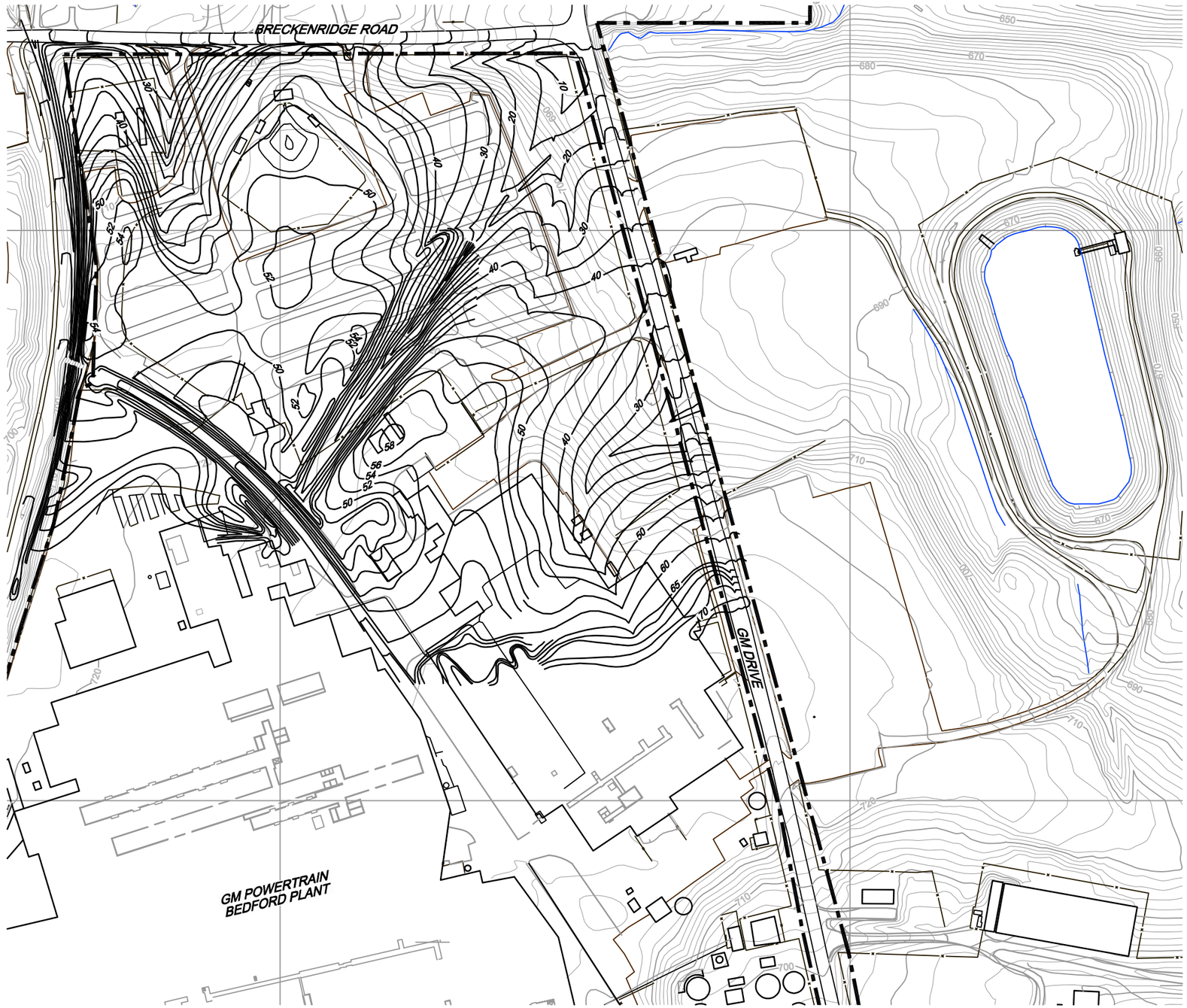
2.3 LABORATORY ANALYSIS

All soil samples collected from the overburden during this investigation will be submitted to Severn Trent Analytical Laboratories (STL) in North Canton, Ohio for analysis of the Target Compound List (TCL) for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), PCBs, and the site-specific inorganics, in accordance with the QAPP. All sampling procedures and protocols will be followed, as described in the RFI Work Plan.

3.0 REPORTING AND SCHEDULE

Upon completion of all field activities and upon receipt of all final, validated analytical data, a Technical Memorandum (TM) will be prepared describing the activities and results of the completed work.

The fieldwork, as described above, will be initiated during the fourth calendar quarter 2003. Once all work activities are complete, CRA will prepare the TM for this scope of work and will submit it to U.S. EPA upon completion.



0 100 200ft

LEGEND

- EXISTING GROUND SURFACE ELEVATION CONTOURS (feet AMSL)
- EXISTING BUILDINGS
- RAILROAD TRACKS
- DIRT ROADS
- ROADS / UNPAVED AREAS
- ROADS / PAVED AREAS
- APPROXIMATE SURFACE WATER LOCATION
- APPROXIMATE GM PROPERTY BOUNDARY
- HISTORICAL GROUND SURFACE ELEVATION CONTOURS (feet, SITE SPECIFIC) SOURCE: GM SITE DRAWING

figure 1.1

SUSPECTED LOCATION OF FORMER RAVINE BENEATH THE HOURLY PARKING LOT
GM POWERTRAIN BEDFORD PLANT
Bedford, Indiana

SOURCE:
BASE MAP COMPLETED BY AIR-LAND SURVEYS, FLINT, MI. APRIL 2001

13968-00(068)GN-WA001 DEC 09/2003

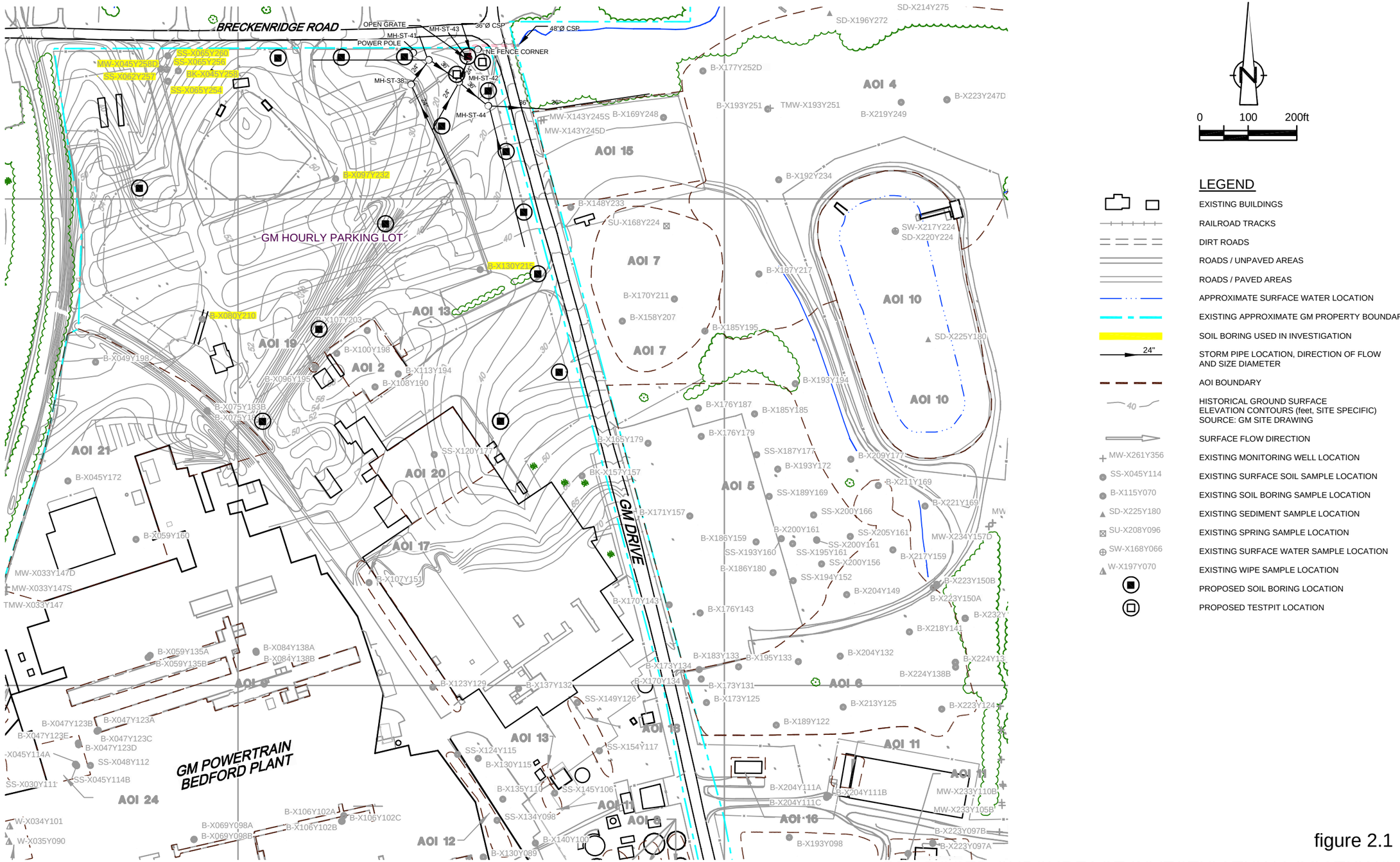


figure 2.1

PROPOSED SUBSURFACE INVESTIGATION LOCATIONS
GM POWERTRAIN BEDFORD PLANT
Bedford, Indiana

SOURCE:
BASE MAP COMPLETED BY AIR-LAND SURVEYS, FLINT, MI. APRIL 2001

13968-00(068)GN-WA003 FEB 23/2004

APPENDIX A

LETTER WORK PLAN TO U.S. EPA DESCRIBING CULVERT CLEANING AND INSPECTION

CONESTOGA-ROVERS & ASSOCIATES

9033 Meridian Way, West Chester, Ohio 45069
Telephone: (513) 942-4750 Fax: (513) 942-8585
www.CRAworld.com

FACSIMILE

DATE: October 28, 2003

REFERENCE NO.: 13968

TO: Brad Stimple, On-scene Coordinator
United States Environmental Agency

FACSIMILE NO.: 440-250-1750

FROM: Jeroen Winterink

Total Pages (Including Cover Page) _____

☒ **Facsimile is Receiver's Original**

Original Will Follow By:

☐ Mail
☐ Overnight Courier
☐ E-mail

MESSAGE

Re: **Work Plan – Culvert Cleaning and Investigation**
North East Corner of Employee Parking Lot/ GM Drive
General Motors Powertrain Facility Removal Action
Bedford, Indiana

This memorandum presents the Work Plan for the removal of sediments found in an existing culvert that is located under GM drive. The culvert formerly drained the area now known as the employee parking lot, prior to the installation of the present day storm water collection system. Sediments will be removed through the use of a truck-mounted high-powered vacuum. The removed sediments will be transferred to the soil staging pad that is located on AOI4. The sediments will be disposed of as waste material containing PCBs over 50 mg/kg at the Heritage facility in Roachdale, Indiana.

After the sediments have been removed, the interior of the culvert will be visually inspected for both cleanliness and any connections with other sewers/ culverts. To gain access to the interior to conduct the inspection, confined space entry procedures will be utilized, that include the posting of a confined space entry permit. If necessary, the interior will be flushed with potable water, with the wash water recovered and transferred to the GMPT wastewater treatment facility.

Once the inside has been washed (if needed), the ends of the culvert will be blocked with either sandbags, fill or bricks, and the interior will be filled with a low strength concrete mix (50 psi flowable fill).

The cleaning work will start during the week of October 28, 2002. Please let me know if any questions or comments.

Distribution:

John Gunter – IDEM
Cheryl Hiatt – GM
Ed Peterson – GM
Glenn Turchan - CRA
Jim McGuigan – CRA
Jeff Daniel – CRA
Jim Pazderski - Sevenson

APPENDIX B

SOIL BORING LOGS

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: B-X080Y210
DATE COMPLETED: February 14, 2002
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. GROVES

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	BOREHOLE	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (ft)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	718.1						
0	ASPHALT	717.8	ASPHALT	1	P/S	2.0		<1
2	SP-SAND (FILL), trace gravel, fine grained, poorly graded, brown (10YR 4/3), moist			2	P/S	2.0		<1
4				3	P/S	2.0		<1
6	CL-CLAY, trace silt, soft, low plasticity, dark olive gray (5Y 3/2), moist	712.1		4	P/S	2.0		3.1
8	- 2-inch trace black staining at 6.5ft BGS			5	P/S	2.0		<1
10	- becomes stiff, turns yellowish brown (10YR 5/6) at 10.0ft BGS			6	P/S	2.0		<1
12	- becomes very stiff at 13.0ft BGS			7	P/S	2.0		0
14				8	P/S	2.0		0
16				9	P/S	2.0		0
18	- turns light grey (2.5Y 7/2) at 18.0ft BGS		BENTONITE CHIPS	10	P/S	2.0		0
20				11	P/S	2.0		0
22	- turns yellowish brown (10YR 5/6) at 21.0ft BGS			12	P/S	2.0		0
24				13	P/S	2.0		0
26				14	P/S	2.0		0
28				15	P/S	2.0		0
30				16	P/S	2.0		0
32	fractured rock	685.1		17	P/S	2.0		0
34	- refusal at 34.5ft BGS	683.6						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval)

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: B-X080Y210
DATE COMPLETED: February 14, 2002
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. GROVES

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	BOREHOLE	SAMPLE				
				NUMBER	INTERVAL	REC (ft)	'N' VALUE	PID (ppm)
	END OF BOREHOLE @ 34.5ft BGS							
36								
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ( )

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: B-X097Y232
DATE COMPLETED: February 14, 2002
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. GROVES

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	BOREHOLE	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (ft)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	712.1						
0	ASPHALT	711.8	ASPHALT	1	P/S	2.0		0
	SP-GP SAND AND GRAVEL (FILL), poorly graded							
2	CL-CLAY, trace silt, soft, low plasticity, light olive brown (2.5Y 5/4), moist	710.1		2	P/S	2.0		<1
4				3	P/S	2.0		<1
	- turns stiff, becomes reddish yellow (7.5YR 7/8) at 5.0ft BGS							
6				4	P/S	2.0		<1
8				5	P/S	2.0		<1
	- becomes red (2.5YR 4/6) at 9.5ft BGS		BENTONITE CHIPS					
10				6	P/S	2.0		<1
12				7	P/S	2.0		0
14				8	P/S	2.0		0
16				9	P/S	2.0		0
18	- some silt, becomes yellow brown (10YR 5/6) at 18.0ft BGS			10	P/S	2.0		0
20	weathered rock, refusal	692.6						
	END OF BOREHOLE @ 20.0ft BGS	692.1						
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval)

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: B-X130Y215
DATE COMPLETED: February 13, 2002
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. GROVES

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	BOREHOLE	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (ft)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	709.5						
0	ASPHALT	709.1	ASPHALT	1	P/S	2.0		0
	GRAVEL (FILL)	708.9						
2	CL-CLAY, trace sand and gravel, stiff, low plasticity, olive brown (2.5Y 4/2), moist - trace silt, soft at 2.0ft BGS			2	P/S	2.0		<1
4				3	P/S	2.0		<1
6				4	P/S	2.0		0
8				5	P/S	2.0		0
10	- becomes very stiff, turns yellowish red (5YR 4/6) at 9.5ft BGS - very hard at 10.0ft BGS			6	P/S	2.0		0
12				7	P/S	2.0		0
14	- some silt, stiff at 14.5ft BGS			8	P/S	2.0		0
16				9	P/S	2.0		0
18			BENTONITE GROUT	10	P/S	2.0		0
20				11	P/S	2.0		0
22	- turns dark red (2.5YR 3/6) at 21.0ft BGS			12	P/S	2.0		0
24	- yellowish brown (10YR 5/6) at 23.5ft BGS			13	P/S	2.0		0
26				14	P/S	2.0		0
28				15	P/S	2.0		0
30				16	P/S	2.0		0
32				17	P/S	2.0		0
34		675.0			P/S			

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (1)

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: B-X130Y215
DATE COMPLETED: February 13, 2002
DRILLING METHOD: GEOPROBE
FIELD PERSONNEL: M. GROVES

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	BOREHOLE	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (ft)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
36	weathered and fractured rock - refusal at 35.5ft BGS END OF BOREHOLE @ 35.5ft BGS	674.0		18	P/S	1.5		0
38								
40								
42								
44								
46								
48								
50								
52								
54								
56								
58								
60								
62								
64								
66								
68								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval)

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: MW-X045Y258D
DATE COMPLETED: May 14, 2002
DRILLING METHOD: 14-INCH TRI-CONE & HQ CORE
FIELD PERSONNEL: K. VANDER MEULEN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (ft)	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	TOP OF RISER	702.4						
	GROUND SURFACE	699.2						
0	TOPSOIL	698.6						
2	ML-CL SILT & CLAY (FILL), trace to little very fine grained sand, trace gravel, medium dense, low plasticity, strong brown (7.5YR 4/6), moist	697.2	CEMENT / BENTONITE GROUT	1				0
4	CL-CLAY, with silt, stiff, low to medium plasticity, moist		10" DIA. STEEL CASING	2				0
6	ML-SILT, trace clay, trace gravel, dense, light brownish gray (10YR 6/2), moist	693.2		3				
8	END OF OVERBURDEN HOLE @ 8.0ft BGS							
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
32								
34								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS (oval) GRAIN SIZE ANALYSIS (rectangle)

OVERBURDEN LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: MW-X045Y258D
DATE COMPLETED: May 14, 2002
DRILLING METHOD: 14-INCH TRI-CONE & HQ CORE
FIELD PERSONNEL: K. VANDER MEULEN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
	ML-SILT, trace clay, trace gravel, dense, light brownish gray (10YR 6/2), moist	693.2				
8	LIMESTONE (ST. LOUIS FORMATION), fine grained, micritic, gray, thin bedded	691.2				
10						
12						
14	- 4-inch layered section at 14.0ft BGS					
	- 2-inch medium porous section at 15.2ft BGS					
16	- styloite at 15.4ft BGS					
18	- horizontal fracture at 17.8ft BGS			1	100	100
	- horizontal fracture at 19.5ft BGS					
20	- open styloite at 20.6ft BGS					
	- moderate porosity, fossils, light brown at 21.6ft BGS					
22						
	- vugs at 23.4ft BGS					
24	- 3-inch vertical section of vugs at 24.4ft BGS					
	- 2-foot section of numerous vugs at 25.6ft BGS		4" DIA. HQ COREHOLE			
26						
	- horizontal fracture at 27.3ft BGS					
28	- horizontal fracture at 27.7ft BGS			2	100	100
	- 4-inch vuggy section at 28.8ft BGS		SAMPLE ZONE 3			
30						
32			DOW PACKER			
34						
36						
38				3	100	100
	LIMESTONE (SALEM FORMATION),granular, very thick bedding, medium to coarse grained	660.2				
40	- styloite at 39.6ft BGS					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭

BEDROCK LOG 13968_20031028.GPJ CRA_CORP.GDT 10/31/03

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: MW-X045Y258D
DATE COMPLETED: May 14, 2002
DRILLING METHOD: 14-INCH TRI-CONE & HQ CORE
FIELD PERSONNEL: K. VANDER MEULEN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
42	- vuggy section at 41.7ft BGS					
44	- styloite at 43.3ft BGS - styloite at 43.5ft BGS - styloite at 44.6ft BGS			4	100	100
46						
48	- styloite at 48.8ft BGS					
50	- styloite at 50.0ft BGS		4" DIA. HQ COREHOLE			
52	- styloite at 51.5ft BGS - styloite at 52.5ft BGS - styloite at 53.3ft BGS			5	100	100
54						
56	- styloite at 55.6ft BGS - styloite at 56.3ft BGS					
58						
60	- styloite at 59.6ft BGS - 2-foot vertical fracture at 59.7ft BGS					
62	- styloite at 61.8ft BGS - styloite at 62.1ft BGS					
64	- styloite at 63.6ft BGS					
66				6	100	100
68	- styloite at 67.4ft BGS					
70	- styloite at 69.0ft BGS - styloite at 70.0ft BGS		NON-MONITORING ZONE			
72						
74	- styloite at 74.1ft BGS - styloite at 74.8ft BGS					

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

PROJECT NAME: GM BEDFORD RFI
PROJECT NUMBER: 013968
CLIENT: GENERAL MOTORS CORPORATION
LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

HOLE DESIGNATION: MW-X045Y258D
DATE COMPLETED: May 14, 2002
DRILLING METHOD: 14-INCH TRI-CONE & HQ CORE
FIELD PERSONNEL: K. VANDER MEULEN

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
78	- open styloite at 78.3ft BGS - fossiliferous, well cemented, grannular at 79.0ft BGS			7	100	100
80	- styloite at 80.1ft BGS					
82	- horizontal fracture at 81.3ft BGS - horizontal fracture at 82.4ft BGS					
84						
86	- open styloite at 86.8ft BGS					
88	- horizontal fracture at 88.4ft BGS			8	100	100
90	- horizontal fracture at 89.5ft BGS - horizontal fracture at 90.8ft BGS					
92						
94	- horizontal fracture at 93.3ft BGS		4" DIA. HQ COREHOLE			
96						
98	- styloite at 97.9ft BGS			9	100	100
100						
102						
104	- styloite at 103.4ft BGS					
106						
108				10	100	100
110	- open styloite at 109.8ft BGS - styloite at 110.2ft BGS		DOW PACKER			

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CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭

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DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
112	- 6-inch vertical partally calcite filled fracture at 110.3ft BGS - horizontal fracture at 111.7ft BGS	586.8				
114	LIMESTONE (UPPER HARRODSBURG FORMATION), moderate porosity, vugs, fossils (bryozoan and brachipods), calcarenite and calcirudite limestone - 5-foot section highly porous, vugs at 113.0ft BGS					
116	- horizontal fracture at 115.3ft BGS					
118	- 5-inch vertical fracture at 117.5ft BGS - horizontal fracture at 118.0ft BGS - styloite at 118.7ft BGS		SAMPLE ZONE 2	11	100	100
120						
122			DOW PACKER			
124	- shale parting at 124.6ft BGS					
126						
128	- horizontal fracture at 128.5ft BGS		4" DIA. HQ COREHOLE	12	100	100
130						
132	- horizontal fracture at 131.0ft BGS					
134	- horizontal fracture at 134.2ft BGS - horizontal fracture at 135.0ft BGS					
136	- horizontal fracture at 136.9ft BGS - styloite at 137.3ft BGS					
138	- horizontal fracture at 138.0ft BGS - half-inch horizontal fracture at 139.0ft BGS			13	100	100
140	- 3-inch vertical styolite at 140.4ft BGS - styloite at 140.8ft BGS					
142	- horizontal fracture at 142.6ft BGS					
144	- styloite at 143.9ft BGS - horizontal fracture at 144.6ft BGS - styloite at 145.0ft BGS					

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CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭

DRAFT STRATIGRAPHIC AND INSTRUMENTATION LOG (BEDROCK)

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LOCATION: BEDFORD, INDIANA
DRILLING CONTRACTOR: RDNP

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DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
148	- styloite at 146.3ft BGS - styloite at 147.0ft BGS - styloite at 147.5ft BGS			14	100	100
150	- styloite at 149.8ft BGS - vertical styloite at 150.4ft BGS		NON-MONITORING ZONE			
152	LIMESTONE (LOWER HARRODSBURG FORMATION), horizontal fracture (shale bed)	547.0				
154	- 4-inch vertical fracture at 153.2ft BGS					
156	- styloite at 155.8ft BGS			15	100	100
	- styloite at 157.0ft BGS					
158	- styloite at 157.9ft BGS - horizontal fracture at 158.0ft BGS					
	- 5-inch geode at 159.6ft BGS					
160	- styloite at 160.4ft BGS - styloite at 161.0ft BGS					
162	- styloite at 162.0ft BGS		4" DIA. HQ COREHOLE			
164	- horizontal fracture at 163.6ft BGS					
	- styloite at 164.7ft BGS					
166	- 2.5-foot dark gray section at 165.2ft BGS					
168	- 2-inch geode (filled) at 167.8ft BGS			16	100	100
170	- styloite at 170.2ft BGS - styloite at 170.7ft BGS					
172	- horizontal fracture at 171.2ft BGS - horizontal fracture at 172.5ft BGS					
	- horizontal fracture at 172.9ft BGS					
174	- styloite at 173.6ft BGS					
176	LIMESTONE (RAMP CREEK FORMATION), very fine grained, contains small amounts of shale, even bedded - 1-inch geode at 176.1ft BGS	524.4	DOW PACKER			
178	- 1-inch geode at 179.0ft BGS			17	100	100
	- half-inch geode at 179.4ft BGS					
180	- 7-inch section of high calcite present at					

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CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭

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DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft AMSL	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
182	180.0ft BGS					
	- half-inch geode at 183.0ft BGS					
184	- horizontal fracture at 184.4ft BGS					
186	- horizontal fracture at 185.9ft BGS					
	- half-inch vug at 187.6ft BGS					
188				18	100	100
190						
	- horizontal fracture at 191.2ft BGS - horizontal fracture at 191.7ft BGS - horizontal fracture at 192.5ft BGS		4" DIA. HQ COREHOLE			
192						
	- 1-inch vertical fracture at 193.4ft BGS					
194						
	- 2-foot fine grained section at 195.0ft BGS - vug at 195.2ft BGS					
196						
	SHALE (EDWARDSVILLE FORMATION), soft, gray/green, pyrite	502.2				
198				19	100	100
200			SAMPLE ZONE 1			
202						
	END OF BOREHOLE @ 203.5ft BGS	495.7				
204						
	Overburden pilot boring advanced utilizing 4-1/4 inch hollow stem augers and samples collected by STP method					
206						
208						
210						
212						
214						

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CHEMICAL ANALYSIS ⬭ GRAIN SIZE ANALYSIS ▭