



**Worldwide Facilities Group
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June 27, 2005

Mr. Daniel Patulski, DP-8J
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77 West Jackson Boulevard
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Dear Mr. Patulski:

RE: Revised Corrective Measures Proposal
13000 Eckles Road Site (U.S. EPA ID No. MID 005 356 621)
Livonia, Michigan

Enclosed please find the Revised Corrective Measures Proposal. The Corrective Measures Proposal dated April 28, 2005 was revised based on comments from the U.S. EPA dated May 19, 2005 and Response to U.S. EPA Comments dated June 15, 2005. This report presents the proposed corrective measures for the 13000 Eckles Road Site in Livonia, Michigan.

Please feel free to contact me at (586) 986-7530 if you have any questions regarding this document, or if you require any further information.

Yours truly,

GENERAL MOTORS CORPORATION,

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CM/am/12607/Rpt 46/Det.
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LIST OF ACRONYMS

ADD	average daily dose
AMSL	above mean sea level
AOI	area of interest
AST	above-ground storage tank
B _{ca}	bias-corrected and accelerated
bgs	below ground surface
C _{air}	chemical concentration in air
CCR	Current Conditions Report
cf/s	cubic feet per second
CFR	Code of Federal Regulations
cm/s	centimeters per second
CRA	Conestoga-Rovers & Associates
CSM	conceptual Site model
DCC	Direct Contact Criteria
DCA	dichloroethane
DCE	dichloroethene
DWC	Drinking Water Criteria
DWSD	Detroit Water and Sewerage Department
EI	Environmental Indicator
GCC	Groundwater Contact Criteria
GM	General Motors Corporation
gpm	gallons per minute
GVIIC	Groundwater Volatilization to Indoor Air Inhalation Criteria
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
K _p	permeability coefficient for dermal absorption
LADD	lifetime average daily dose
LNAPL	light non-aqueous phase liquid

LIST OF ACRONYMS (continued)

MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
NCEA	National Center for Environmental Assessment
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PIC	Plymouth Industrial Center
PID	photoionization detector
ppm	part per million
PRG	preliminary remediation goal
PSIC	Particulate Soil Inhalation Criteria
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
REALM	Remediation and Liability Management Company, Inc.
Report	RFI Report
RfCs	chronic inhalation reference concentrations
RfDs	chronic reference doses
RFI	RCRA Facility Investigation
RME	reasonable maximum exposures
SFs	cancer slope factors
Site	13000 Eckles Road, City of Livonia, Wayne County, Michigan
STL	Severn Trent Laboratories
SVIIC	Soil Volatilization to Indoor Air Inhalation Criteria
SVOC	semi-volatile organic compound
TAL inorganics	TAL list minus earth metals (aluminum, calcium, iron, magnesium, potassium, sodium)
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethene
TCL	Target Compound List
TSCA	Toxic Substances Control Act

LIST OF ACRONYMS (continued)

U.S. EPA	United States Environmental Protection Agency
UCLs	upper confidence limits
URFs	inhalation unit risk factors
UST	underground storage tank
VOC	volatile organic compound
VSIC	Infinite Source Volatile Soil Inhalation Criteria
WMU	Western Michigan University
WWTP	wastewater treatment plant

1.0 INTRODUCTION

1.1 PURPOSE

Conestoga-Rovers & Associates (CRA) has prepared this Resource Conservation and Recovery Act (RCRA) Corrective Measures Proposal (CMP) on behalf of General Motors Corporation (GM) and the Remediation and Liability Management Company, Inc. (REALM), an environmental subsidiary of GM, for the property located at 13000 Eckles Road in the City of Livonia, Wayne County, Michigan (Site). The Site's United States Environmental Protection Agency (U.S. EPA) Identification Number is MID 005 356 621. GM/REALM is currently implementing performance-based RCRA Corrective Action at the Site pursuant to an October 16, 2001 performance-based RCRA Corrective Action Agreement between the U.S. EPA and GM/REALM.

GM/REALM conducted a RCRA Facility Investigation (RFI) to investigate the areas of interest (AOIs) identified in the Site's Current Conditions Report (CCR) (CRA, June 2002a) for the presence of releases of hazardous waste or hazardous constituents that could pose an unacceptable risk to human health or the environment. The RFI was conducted in accordance with an RFI Work Plan (CRA, September 2002) and supplemental data submittals and work plans for additional stages of field investigation that were submitted to the U.S. EPA (see Section 7.0 – References). An RFI Report (CRA, February 2004) was submitted to the U.S. EPA summarizing the results of Stages I through V of the RFI. The RFI Report was revised based on comments from the U.S. EPA and submitted as the RFI Report – Revision 1 (CRA, March 2005) (RFI Report). A Supplement to the RFI Report (CRA, April 2005c) was submitted to the U.S. EPA summarizing the results of Stages I through X of the RFI. In addition, although the constituent concentrations in two AOIs did not pose an imminent and substantial threat, GM/REALM has implemented Interim Measures to address impacted soil identified through field investigations conducted prior to and during the RFI to facilitate redevelopment. Additionally, groundwater impacted with constituents greater than screening criteria defined in section 4.0 of the RFI Report (CRA, March 2005) was identified off-Site near Area 1 and AOI 31. Interim Measures have been performed to address the off-Site migration of impacted groundwater. The Interim Measures were implemented in accordance with work plans that were submitted to the U.S. EPA and are further discussed in Section 3.10. These Interim Measures are being proposed as part of the final Corrective Measures for the Site.

The CMP describes the proposed Corrective Measures for areas of the Site that pose a potentially significant risk, and the rationale for their selection. The areas for which Corrective Measures are proposed include:

1. Site-wide Groundwater
2. Area 1 – Former Plating Area
3. AOI 5 – Mud House
4. AOI 27 – Diesel AST/Powerhouse Area
5. AOI 31 – Former Fire Training Area
6. AOI 37 – Historical Coal Pile Area
7. AOI 39 – North Boundary Area

The U.S. EPA will select final Corrective Measures for the Site after the public comment period. This CMP references more detailed information that can be found in the RFI Report – Revision 1 (CRA, March 2005), the Supplement to the RFI Report (CRA, April 2005), and in other documents submitted to the U.S. EPA during the RCRA Corrective Action process. Appendix B contains excerpts of key information from the RFI Report and the Supplement to the RFI Report. A repository of submitted documents has been maintained at the Livonia Civic Center Public Library located in Livonia, Michigan throughout the RCRA Corrective Action.

1.2 REPORT ORGANIZATION

This Report is organized as follows:

- Section 2.0 provides a summary of the proposed Corrective Measures.
- Section 3.0 provides a summary of the Site background information and an overview of the RFI including a summary of the areas of interest (AOIs) and other areas investigated during the RFI, a summary of the stages of the RFI, and Interim Measures conducted during the RFI.
- Section 4.0 provides a summary of the Site risks.
- Section 5.0 provides a detailed summary of the Corrective Measures options.
- Section 6.0 provides an evaluation of the proposed Corrective Measures.
- Tables and figures cited in the text of the Report are found at the end of the text.
- Appendix A contains the criteria for evaluating groundwater monitoring data.
- Appendix B contains background RFI information referenced in the text.

2.0 PROPOSED CORRECTIVE MEASURES

The proposed Corrective Measures for the Eckles Road Site includes: 1) the implementation of a groundwater monitoring program; 2) installation of a groundwater collection and treatment system and supplemental barrier wall at Area 1; 3) removal of soil from AOIs 5 and 31 to facilitate redevelopment; 4) removal of soil from AOIs 27 and 37; 5) chemical oxidation of impacted groundwater at AOI 31; and 6) implementation of engineering/institutional controls to ensure that the presence of hazardous constituents in environmental media at the Site does not pose a significant risk to humans and the environment under current and reasonably expected future land use at the Site.

1. The long-term groundwater monitoring program will be implemented to confirm that concentrations of constituents remain below human health risk-based criteria at the upgradient property boundary, on-Site, at property boundary monitoring wells, and at off-Site monitoring wells downgradient of the Site. Specifically, the groundwater monitoring program will include annual groundwater sampling at the Site's perimeter and off-Site monitoring wells downgradient of Area 1 and AOI 31 to confirm that concentrations in these areas continue to decline and the off-Site migration of impacted groundwater is being controlled through the implemented Interim Measures. Additionally, monitoring wells at the interior of the Site will be sampled to confirm that concentrations of constituents remain at or below levels that are protective of human health and the environment under current and reasonably expected future land use at the Site. Monitoring wells located at upgradient boundary locations will also be sampled to identify concentrations of constituents migrating onto the Site in the vicinity of AOI 33. A groundwater monitoring program is currently being conducted pursuant to the RCRA Environmental Indicator CA 750 Report – Determination of Migration of Contaminated Groundwater Under Control (Environ, October 2004). A long-term groundwater monitoring plan will be developed and submitted to the U.S. EPA as part of the long-term operation and maintenance plan. This long-term groundwater monitoring plan will define the monitoring wells to be sampled, the analyses to be performed, and the frequency and expected duration of the long-term monitoring program.
2. As described below in Section 3.10, a French drain collection system was installed in 1980 south of Area 1 to control the off-Site migration of chromium and nickel-impacted groundwater. The collected groundwater is treated at an on-Site treatment plant. The French drain collection system was supplemented in 2004 with a barrier wall surrounding Area 1. The barrier wall will eliminate the migration of nickel-impacted groundwater off-Site. The effectiveness of the French drain collection

system and Area 1 barrier wall will be monitored with the long-term groundwater monitoring program.

3. As described in Section 3.10, impacted soil identified in AOI 5 (benzo(a)pyrene) and AOI 31 (PCBs) was delineated during the RFI and excavated and disposed at appropriate licensed off-Site disposal facility in 2003. The impacted soil contained these constituents at concentrations above screening criteria, however, no unacceptable risks were identified in the RFI Report or RCRA Environmental Indicator CA 725 Report – Determination of Current Human Exposures Under Control (Environ, February 2005). The Interim Measures at AOI 5 and AOI 31 were implemented to facilitate the potential sale and redevelopment of portions of the Site. Complete documentation of the Interim Measures is presented in the PCB Cleanup Report, AOI 31 – Former Fire Training Area (CRA, April 2005) and the AOI 5 Soil Remediation Completion Report (CRA, April 2005).
4. Impacted soil identified in AOIs 27 and AOI 37 will be excavated and disposed at an appropriate licensed off-Site disposal facility. The extent of soil removal has been determined based on protection of workers who might come into contact with soil at these areas during redevelopment and subsequent use of the Site. Verification sampling will be performed during the soil removal.
5. As described in Section 3.10 and in the Amendment to Interim Measures Work Plan for AOI 31 Groundwater (CRA, January 2005) (Amendment), a field pilot test was performed at AOI 31 to evaluate the effectiveness of treating the TCE-impacted groundwater at AOI 31 with chemical oxidation. The full-scale on-Site Interim Measures activities described in the Amendment will be implemented during 2005 to control the migration of TCE-impacted groundwater off-Site.
6. Engineering/institutional controls to be implemented at the Site will include a soil management plan to control particulate emissions from surface soil (i.e. dust control) at certain parts of AOI 39 and a groundwater management plan to control redevelopment worker contact with groundwater during excavation activities during redevelopment of the Site. In addition, the Site will be restricted to industrial/commercial use and the use of groundwater will be restricted through the implementation of a Site-wide deed restriction.

3.0 SITE BACKGROUND

3.1 SITE DESCRIPTION

The Site is located at 13000 Eckles Road, in the City of Livonia, Wayne County, Michigan. The Site is part of the northeast quarter of Section 30, Township 1 South, Range 9 East. The Site encompasses approximately 120 acres on the western edge of Livonia, east of Interstate Highway 275 and south of Interstate Highway 96, approximately 24 miles northwest of the downtown area of the city of Detroit, Michigan. The Charter Township of Plymouth is located on the west side of Eckles Road. The Site is surrounded by industrial or commercial properties with the exception of a residential neighborhood, located southeast of the Site. The general geographic location of the Site and surrounding land use of the Site are presented on Figure 3.1. Coil spring and bumper manufacturing was historically conducted in the approximately 2.1 million square-foot former main building and associated support buildings at the Site.

At the time of GM's purchase in 1953, the Site was used for agricultural activities. The spring and bumper building was constructed between 1953 and 1954 as the initial phase of development of the Site. Additional development at the Site continued until 1989. The Site was used for the fabrication of coil springs, bumpers, and strut assemblies for vehicles from the Site's development in 1953/54 to approximately July 2000.

3.1.1 HISTORICAL OPERATIONS

The Site was operated by GM as a spring and bumper plant from development in 1953/54 until approximately 1998. The primary activities at the Site were production of vehicle bumpers, coil springs, and leaf springs. Strut assembly was included in 1966 with the construction of the Marshalling Building. Bumper manufacturing and plating operations ceased in 1993. From approximately 1998 to July 2000, the eastern most portion of the main plant was occupied and operated by Chasco Systems, Inc. and continued coil spring manufacturing and warehousing. The locations of the historical processes/buildings are presented on Figure 3.2.

Based on information previously reviewed, the following additional manufacturing processes have been conducted at the Site: metal stamping, heat treating, metal plating/finishing, and assembly. In addition, the following support processes were conducted: industrial wastewater treatment, recycling of quench/lubricating oils, and degreasing/parts cleaning.

Historically, the Site contained the following buildings: a two story spring and bumper plant with substation and fan house buildings situated on the plant's roof, a single-story Marshalling Building, a three-story new industrial wastewater treatment plant (WWTP), a three-story powerhouse, a two-story incinerator building, a single-story mud house (for handling sludge), a single-story oil storage building, a single-story older industrial WWTP, a single-story meter house, a single story sampling building, and two single-story gatehouses. The spring and bumper plant and powerhouse were steel-framed structures with basement areas. The remainder of the buildings were steel-framed structures with concrete slab-on-grade floors. Two below-grade water reservoirs were also located at the northwest end of the Site.

3.1.2 CURRENT OPERATIONS

Figure 3.3 presents the current Site plan. All Site structures, except the groundwater collection/treatment operation buildings on the southwest corner of the Site, have been environmentally decommissioned and demolished. Former building concrete floor slabs remain in place, with the exception of the Marshalling Building slab that has been removed. A six-foot high security fence topped with barbed wire is located along the perimeter of the Site and all gates are locked when the Site is inactive (e.g., when WWTP operators are not on Site, no field work is being conducted, etc.).

The groundwater collection/treatment operation in the southwest corner of the Site collects groundwater impacted by the historical chrome plating operations through a French drain system. Groundwater is collected and treated by pH adjustment, addition of sodium bisulfite, lime, a polymer flocculent, and a final pH adjustment. The water is treated at a maximum rate of approximately 70 gallons per minute, then batch discharged to the Detroit Water and Sewerage Department (DWSD). No other activities are currently conducted at the Site.

3.2 CLIMATE

The Dearborn Station is the closest weather station to the Site and is located at the Dearborn campus of the University of Michigan. Meteorological data from the National Climatic Data Center for the Dearborn Station are summarized as follows:

	<i>Temperature (°F)</i>	
	<i>January</i>	<i>July</i>
Maximum Daily Average	31.5	84.7
Minimum Daily Average	17.0	62.0
Mean Daily Average	24.2	73.3

The record high and low temperatures measured at the station are 102°F and -17°F, respectively.

<i>Precipitation (inches)</i>	<i>January</i>	<i>July</i>
Mean (rainfall)	1.70	3.00
Mean (snowfall)	8.00	0.00

Mean annual rainfall is 30.9 inches. Mean annual snowfall is 30.7 inches.

The prevailing wind direction is to the northeast, averaging 10 miles per hour.

3.3 SURFACE WATER HYDROLOGY

No surface water bodies exist at the Site. The Rouge River and Newburgh Lake are the prominent hydrologic features in the vicinity of the Site. Newburgh Lake is located approximately ¼-mile south of the Site, and the Middle Rouge River is located approximately ¼-mile southwest of the Site. In addition, Gunn Branch Creek was historically located on the adjacent property to the north of the Site (beyond the Chesapeake and Ohio Railroad tracks).

The Rouge River is used for flood control and recreational purposes. The northern and central portion of Wayne County is located within the Rouge River Drainage Basin and consists of an area of approximately 187 square miles. It includes three tributaries prior to discharging into the Detroit River: Upper Rouge River, Middle Rouge River, and Lower Rouge River. The Detroit River discharges into Lake Erie, which is located approximately 40 miles southeast of the Site.

The Rouge River Station is located at 42°22' north latitude and 83°15' west longitude in Redford Township. Daily mean flow statistics at the Rouge River Station, based on 69 years of records (USGS, 2001), are summarized as follows:

- Minimum 15 cubic feet per second (cf/s)
- Mean 104 cf/s
- Maximum 820 cf/s

3.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

3.4.1 OVERBURDEN

The bedrock of Wayne County is covered with glacial deposits deposited on the glacial lake bottoms, leaving lacustrine plains as the glacial lakes receded. These lacustrine plains are common throughout southeastern Michigan, especially in Wayne County.

The glacial drift thickness in the vicinity of the Site is in the range of 51 feet to 200 feet as identified in the Western Michigan University (WMU) Hydrogeologic Atlas of Michigan map "Glacial Drift Thickness" (WMU, 1981). The overburden of the majority of Wayne County, including the area of the Site, consists of a relatively thin silty sand unit, which overlies a regional lacustrine clay unit. The silty sand unit ranges in elevation from approximately 640 feet AMSL at its western margin to approximately 620 feet AMSL at its eastern margin.

Beneath the silty sand unit is a clay unit, which is present regionally over all of Wayne County. A characteristic of this unit includes a medium bluish-gray clay with well rounded to subangular pebbles and cobbles. A discontinuous sand, gravel, and cobble layer is present in some locations beneath the clay unit and overlies the bedrock (Clayton, 1996).

3.4.2 BEDROCK

The bedrock of Wayne County is comprised of evaporates, carbonates, and clastics that are Paleozoic in age from the Devonian period. These evaporates, carbonates, and clastics were formed in the Michigan Basin, which had developed by late Silurian time. The topography of the bedrock surface for Wayne County is in the range of 400 feet AMSL to 650 feet AMSL.

Immediately beneath the glacial overburden of Wayne County are three primary bedrock formations. The lowest unit is the Dundee Limestone Formation, which underlies the southeastern and eastern portions of Wayne County. The Dundee Limestone Formation is a fossiliferous limestone. It ranges in thickness from about 150

feet to 350 feet from the western half towards the east-central portion of the Michigan Basin.

The Traverse Group consisting of Rogers City Limestone and Bell Shale lies on top of the Dundee Limestone Formation and covers a portion of Wayne County running in a southwestern to northeastern direction. The Traverse Group consists of a thick sequence of alternating shales and limestones ranging in thickness from 100 feet to 800 feet. The shales of the Traverse Group are not aquifers. The Bell Shale is considered a confining layer. The limestone units are "karst aquifers" and are therefore able to supply large volumes of groundwater.

The uppermost bedrock covering the northwestern portion of Wayne County is that of the Antrim Shale Formation. The Antrim Shale is comprised of hard, dark gray to black or brown, pyritiferous shale that contains abundant silt, making this unit a confining layer. The Antrim Shale ranges in thickness from zero feet to 100 feet in Wayne County. The shale unit is generally too impermeable to be an aquifer and the abundance of pyrite restricts its water quality for use as a potable water supply.

3.4.3 REGIONAL HYDROGEOLOGY

As stated previously, the glacial overburden of Wayne County consists of lacustrine deposits comprised of silt and clay and may be several tens of feet thick with low relief. Lacustrine sediments have low permeability and porosity and do not yield large quantities of water. Lake beds may contain isolated sands and are therefore sometimes able to meet localized water needs.

The groundwater within the upper silty sand unit is unconfined and is found generally from 8 to 12 feet below ground surface (bgs). The hydraulic conductivity value for this unit ranges between 1×10^{-6} centimeters per second (cm/s) and 1×10^{-2} cm/s (Clayton, 1996). Groundwater in this unit is generally discontinuous or intermittent in nature and not present in large volumes. Groundwater flow within this unit is generally in an east-southeast direction following regional topography and hydrology towards the Detroit River.

The types of aquifer material and their formation in Wayne County are related to the potential for groundwater impact. According to the "Aquifer Vulnerability to Surface Contamination in Michigan" map (WMU, 1981), the majority of Wayne County contains low permeability soil over low sensitivity overburden. The majority of southeastern Michigan, including the area of the Site, consists of aquifers that are classified as

“protected.” Protected aquifers are those that are protected from surface contamination by a minimum of 15 feet of vertically continuous clay in the subsurface or 20 feet of vertically continuous clay from the ground surface above the aquifer (WMU, 1981). The lower confined aquifer in the vicinity of the Site, if present, is protected from surficial contamination by the regionally extensive lacustrine clay aquitard, which exists across Wayne County.

3.5 SITE GEOLOGY AND HYDROGEOLOGY

3.5.1 GEOLOGY

Numerous soil borings and monitoring wells have been completed at the Site as part of the RFI sampling program and historical investigations completed by various environmental consultants. A summary of historical soil borings and monitoring wells are presented in the CCR. The stratigraphic and instrumentation logs from the soil borings and monitoring wells completed for the RFI are presented in the RFI Report and Supplement to the RFI Report. Geologic data from these soil borings and monitoring wells were used to determine the Site overburden geology and hydrogeology.

The surficial glacial deposits in the area of the Site generally consist of a fine to medium grained sand of approximately 20 to 33 feet in thickness underlain by a continuous clay layer. Geotechnical testing was performed on numerous samples throughout the Site as part of the RFI and as presented in the RFI Report. As discussed in the RFI Report, the results indicate that the upper sands are primarily fine and medium grained sands with a trace of silts and clays. Laboratory permeability tests performed on four soil samples collected from the clay material at opposite corners of the Site indicate that the permeability of the continuous clay beneath the Site is 1.55×10^{-8} cm/s. Continuous sampling was conducted to 25 feet below the top of clay at these four locations. The soil encountered consisted of homogenous clay with no interbedded granular soil.

The sand unit is typically poorly graded and interbedded with lenses of silty sand and occasionally coarse sand and gravel to a depth of 20 to 33 feet bgs. A thin sandy silt to silty sand unit is present at the base of the sand unit throughout much of the Site. The silty sands and sandy silts become more predominant off-Site to the southeast. Based on information from the RFI, the clay layer underlying the glacial sand deposit is greater than 25 feet thick and is a laterally extensive unit that is present beneath the entire Site. Based on water well logs and regional data, the clay beneath the Site is approximately 50 feet thick.

Based on water well logs and regional data, the clay is underlain by interbedded gravel, boulders, sands and clays to approximately 145 feet bgs, to the top of the Antrim Shale bedrock. The Antrim Shale is comprised of hard, dark gray to black or brown, pyritiferous shale that contains abundant silt making it a confining layer. The shale is generally too impermeable to be an aquifer and the abundance of pyrite restricts its water quality for use as a potable water supply.

3.5.2 HYDROGEOLOGY

Historical soil and groundwater investigations indicate shallow groundwater at the Site is present within the fine to medium grained surficial sand unit. This surficial water-bearing zone has an average saturated thickness of 15 feet. The depth to groundwater is generally 8 to 12 feet bgs although it was identified up to 3.5 feet bgs in a slightly depressed area in the northwest portion of the Site and down to 14 feet bgs in the southeast corner (in AOI 31) and 15.5 feet bgs at the southwest corner (in Area 1 near the French drain).

Groundwater contour maps from November 2002, March 2003, and August 2003 are presented in the RFI Report and a groundwater contour map from March 2004 is presented in the Supplement to the RFI Report. The groundwater flow direction across the Site is generally in a southeasterly direction except near the western portion of the Site where it's in a southerly direction toward the French drain collection system. However, based on the implementation of the Area 1 Interim Measure (barrier wall) between October 2004 through December 2004, groundwater elevations and flow directions are expected to change in the vicinity of Area 1. Site-wide groundwater flow in the southwest portion of the Site is expected to diverge around the barrier wall, having a due east component north of the barrier wall and a due south component west of the slurry wall. Groundwater elevations in the vicinity of the barrier wall are being monitored and will be reported to the U.S. EPA when conditions appear to stabilize. Based on the August 2003 groundwater contour map, the hydraulic gradient across the Site was 0.0042. However, the gradient generally steepens to the southeast. The hydraulic gradient at and downgradient of AOI 31 was 0.0058. The groundwater flow directions and hydraulic gradients have been similar between November 2002 and August 2003. Additionally, groundwater contour maps based on the shallow wells were very similar to the groundwater contour maps based on the deep wells.

The calculated geometric mean of acceptable results for Site slug tests and pumping tests are 3×10^{-3} cm/s and 2.7×10^{-2} cm/s, respectively.

Based on the permeability tests performed as part of the RFI, the permeability of the continuous clay unit beneath the Site is 1.55×10^{-8} cm/s. Based on information obtained from the RFI, the clay aquitard represents a barrier to vertical migration of groundwater.

3.6 WATER SUPPLY AND GROUNDWATER USE

The DWSD provides the potable water supply to the Site and the local area from its Springwells Plant, located near Warren Road and Wyoming Avenue in Detroit, Michigan. The Springwells Plant is located approximately 10 miles southeast of the Site. The water source for the Springwells Plant is the Detroit River.

Based on documents reviewed, one water supply well historically existed on the Site. The water supply well was installed in 1954 and was located approximately 135 feet east of Eckles Road on the west side of the Site. The well was used for the sprinkler system at the Site. This well was 145 feet deep; however, the screened interval was unknown.

During RFI activities, three water supply wells were identified in the residential neighborhood located southeast of the Site. Two of the wells are inactive and the third well is used for non-potable use (e.g., "kiddie" pool, lawn/garden watering, etc.). As discussed in the RFI Report, these wells are located outside of the defined AOI 31 groundwater plume. In addition, during the RFI, seven water samples were collected from the two inactive residential well pipes, the one active residential non-potable well, and three residential sumps downgradient of AOI 31 to characterize the nature of groundwater in the residential neighborhood downgradient of AOI 31. No constituents in the residential groundwater samples were detected above human health risk-based criteria. Sample locations and analytical results were presented in the RFI Report and Supplement to the RFI Report.

3.7 ECOLOGY

A habitat characterization and ecological pathways assessment was conducted for the Site and was presented in Appendix C of the RFI Report. The assessment was performed to support a screening-level ecological risk assessment as described in U.S. EPA guidance. Its objective was to provide a defensible conclusion that negligible ecological risk exists or that certain contaminants and exposure pathways can be eliminated from further consideration in the assessment process.

The assessment included a Site visit and a review of CCR and RFI data. A habitat assessment decision matrix was developed to identify those areas at the Site that may provide terrestrial and aquatic habitats. Sensitive environments and species were identified.

The ecological assessment determined that there is adequate information to conclude that ecological risks are negligible at the Site. Currently, only the areas east of Area 2 and in the vicinity of AOI 31 were found to provide habitat for ecological receptors. No further ecological risk assessment tasks were recommended for the Site because there are no releases of hazardous constituents associated with areas that currently provide potential habitat. In addition, these areas currently provide limited habitat and are likely to be significantly altered during the course of planned development.

3.8 RFI

In total, the CCR and RFI work plans and sample matrices recommended the following AOIs for further investigation:

- Area 1, which includes:
 - AOI 1 - The old WWTP
 - AOI 3 - Stormwater Clarifier
 - AOI 14 - Old Nickel Bright Tanks
 - AOI 15 - Waste Sump under Plating Line
 - AOI 18 - French Drain System
 - AOI 20 - Plating Line
- Area 2, which includes:
 - AOI 17 - Quench Oil Tank under the Coil Spring Building
 - AOI 34 - Coil Spring Building
- Area 3 - Subsurface Conditions beneath the existing concrete slab
- AOI 2 - WWTP
- AOI 5 - Mud House
- AOI 19 - Trichloroethane (TCA) Still
- AOI 21 - Former Pickling Machines / Flat Polish Area
- AOI 22 - Press Pit Basements
- AOI 24 - Pedestrian Clock Tunnel
- AOI 27 - Diesel Above-Ground Storage Tank (AST)/Powerhouse Area
- AOI 28 - Oil Storage Building
- AOI 30 - Former USTs No. 6, 7, and 8
- AOI 31 - Fire Training Area

- AOI 33 – Plymouth Industrial Center (PIC) Property
- AOI 37 – Historical Coal Pile
- AOI 39 – North Boundary Area (formerly “Background” in RFI Work Plan and sample matrices for subsequent stages)
- General
 - East half of the Site
 - Southwestern Boundary Area
 - Southeastern Boundary Area
 - Northeastern Boundary Area

All AOIs identified in the CCR and during the RFI are presented on figure 3.4.

3.9 PRE-RFI

Extensive environmental investigations had been conducted at the Site prior to the RFI. Historical data in addition to other existing information have been evaluated qualitatively and quantitatively to identify conditions that warrant further investigation. The qualitative review considered sample locations and depths, constituents analyzed, analytical methods, and any related field observations. The quantitative review was based on a comparison of the historical data for soil and groundwater samples with Michigan Act 451, Part 201 generic cleanup criteria that the Michigan Department of Environmental Quality (MDEQ) has developed under the authority of the Natural Resources and Environmental Protection Act (1994 PA 451, as amended).

The results of the comparisons of pre-RFI data to the Part 201 generic criteria are presented in the CCR. These comparisons facilitated the development of the RFI scope of work since this historical data had been collected from a majority of the AOIs identified in the CCR. In addition, a pre-RFI investigation conducted in 1980 provided data which prompted GM to proactively install the groundwater extraction system (French drain) in Area 1. This system likely significantly reduced the off-Site migration of nickel and chromium-impacted groundwater. Further information is provided in Section 3.10.1.

3.10 COMPLETED INTERIM MEASURES

In addition to the French drain groundwater collection system installed in 1980-81, Interim Measures have been recently implemented in Area 1 and AOIs 5 and 31. Based on data collected during the RFI, the concentrations of certain constituents in soil in AOI

31 and AOI 5 were identified to exceed the screening criteria discussed in the RFI Report that were used for identifying the presence of a potentially significant release. Although the constituent concentrations at these AOIs did not pose an imminent and substantial threat, soil was removed during the RFI to expedite potential redevelopment of these portions of the Site as discussed below. Additionally, groundwater with concentrations of nickel (Area 1) and trichloroethene (AOI 31) greater than screening criteria was identified at off-Site monitoring well locations. Interim Measures were implemented at Area 1 and AOI 31 in 2004 to control the off-Site migration of impacted groundwater. Additional Interim Measure activities are being performed at AOI 31 during 2005 as described in the Amendment to Interim Measures Work Plan for AOI 31 Groundwater (CRA, January 2005).

These Interim Measures are further discussed in the following sections.

3.10.1 GROUNDWATER COLLECTION/TREATMENT SYSTEM

In 1980-81, a French drain collection system was installed along the southwest boundary of the Site to collect groundwater with elevated concentrations of nickel and chromium. The elevated concentrations of these metals in groundwater resulted from the nickel and chrome plating of bumpers conducted at the Site from 1954 until 1993. The system collects approximately 100,000 gallons per day of impacted groundwater. The collected groundwater is treated at an on-Site treatment plant and then batch discharged to the DWSD municipal sewer system. Additional information on the groundwater collection/treatment system is presented in the CCR.

3.10.2 AOI 31 SOIL

Due to potential redevelopment activities in AOI 31, the presence of polychlorinated biphenyls (PCBs) in soil in AOI 31 was characterized and delineated on an accelerated schedule from the main RFI activities. GM/REALM submitted a PCB Investigation Summary and Self-Implementing Cleanup Plan (CRA, 2003d) to the U.S. EPA under the self-implementing option set forth under Title 40 of the Code of Federal Regulations, Part 761.61(a) (40 CFR 761.61(a)). As outlined in the Cleanup Plan, the cleanup goal for PCBs in soil was a conservative 1 part per million (ppm) (i.e., 1 mg/kg) to facilitate the redevelopment of the property, even though concentrations higher than this goal also would be protective of future uses. During August 2003, approximately 28 tons of soil with PCB concentrations ≥ 50 ppm were excavated and disposed of at the EQ Toxic Substances Control Act (TSCA) landfill in Wayne, Michigan and approximately 360 tons

of soil with PCBs < 50 ppm were excavated and disposed of as non-hazardous soil at Waste Management's Woodland Meadows landfill in Romulus, Michigan.

Based on laboratory and field screening results, an additional stage of excavation activities was conducted in November 2003. Approximately 26.5 tons of soil containing PCBs > 50 ppm were excavated and disposed of at the EQ Wayne TSCA landfill. Additionally, approximately 275.3 tons of soil with PCBs < 50 ppm were excavated and disposed of at Woodland Meadows landfill.

A final stage of excavation activities was conducted in December 2003 to remove the remaining PCB-impacted soils as identified by the November 2003 confirmatory sample analytical results. Approximately 22.5 tons of soil with PCBs < 50 ppm were excavated and transported to Woodland Meadows landfill for disposal. Discrete soil samples were collected from the floor and sidewalls of the excavation and field screened. All results of the field screening indicated that PCBs were below 1 ppm. Subsequently, discrete confirmatory samples were again collected consistent with §761 Subpart O and submitted to the laboratory for compositing and analysis. All composite sample analytical results were below 1 ppm.

Complete documentation of the activities conducted as part of the PCB Investigation Summary and Self-Implementing Cleanup Plan (CRA, July 2003d) are presented in the PCB Cleanup Report (CRA; April 2005a).

3.10.3 AOI 5 SOIL

During Stage I of the RFI, benzo(a)pyrene was detected in a shallow soil sample (0 to 2 feet bgs) from soil boring SB-5-1 at a concentration that was higher than the Part 201 generic industrial direct contact criterion. The impacted soil was vertically and horizontally delineated during Stage II of the RFI. Due to potential redevelopment, an AOI 5 - Mud House Interim Measures Proposed Scope of Work (CRA, August 2003) was submitted to the U.S. EPA detailing the removal of benzo(a)pyrene-impacted soil. As outlined in the scope of work, the cleanup goal for benzo(a)pyrene in soil was a conservative 8 ppm (the Part 201 generic industrial direct contact criterion) to facilitate the redevelopment of the property, even though concentrations higher than this goal also would be protective of future uses. In August 2003, soil from an excavation approximately 10 feet by 10 feet by 3 feet deep was removed surrounding SB-5-1 (approximately 15 tons of soil) and disposed of as non-hazardous soil at the Waste Management Woodland Meadows landfill in Romulus, Michigan. Floor and sidewall samples were collected based on the April 1994 Michigan Department of Natural

Resources (MDNR) Verification of Soil Remediation guidance document and delivered to the analytical laboratory for the analysis of benzo(a)pyrene. Analytical results indicated that benzo(a)pyrene remained in the east sidewall sample at a concentration above the cleanup goal of 8 ppm.

In November of 2003, an additional volume of soil approximately 10 feet by 5 feet east by 3 feet deep (14 tons) was removed from the eastern side of the existing excavation and disposed of as non-hazardous soil at the Waste Management Woodland Meadows landfill. An additional sample was collected from the new eastern sidewall based on the April 1994 MDNR Verification of Soil Remediation guidance document and delivered to the analytical laboratory for the analysis of benzo(a)pyrene. Laboratory analytical results were below the cleanup goal of 8 ppm.

Complete documentation of the excavation activities are presented in the AOI 5 Soil Remediation Completion Report (CRA; April 2005b).

3.10.4 AOI 31 GROUNDWATER

Based on results of the RFI, trichloroethene (TCE) was detected in groundwater samples collected from AOI 31 monitoring wells at on-Site and off-Site locations at concentrations greater than screening criteria. All residences located southeast of AOI 31 are connected to municipal water. As described in the RFI Report, AOI 31 is located at the southeast corner of the Site, with groundwater flowing in an east-southeast direction. As presented in the Interim Measures Work Plan for AOI 31 Groundwater (CRA, March 2004) and reported in the Amendment to Interim Measures Work Plan for AOI 31 Groundwater (CRA, January 2005), potassium permanganate (KMnO_4) solution was applied to the excavation floor (identified above in Section 3.10.2) in April 2004. Following the application to the excavation floor and subsequent groundwater monitoring, five injection wells and ten monitoring wells were installed upgradient and downgradient of existing on-Site monitoring wells which have historically had the highest concentrations of TCE in groundwater. Following initial groundwater sampling, KMnO_4 solution was injected into the groundwater at the five injection wells via pump in July 2004.

As reported in the Amendment to Interim Measures Work Plan for AOI 31 Groundwater (CRA, January 2005), results of the field pilot tests were favorable and full scale on-Site implementation of the Interim Measure has been proposed for May 2005.

Results of the on-Site implementation of the Interim Measure for AOI 31 groundwater will be reported under separate cover.

3.10.5 AREA 1 GROUNDWATER

Based on historical and RFI results, nickel and hexavalent chromium (chromium VI) were detected in groundwater samples collected from Area 1 monitoring wells. As described in Section 3.10.1, a collection trench has been collecting hexavalent chromium and nickel impacted groundwater since 1980 along the south boundary of the Site. Based on results of the RFI, nickel was identified in groundwater samples collected from monitoring wells south of Amrhein Road at concentrations greater than screening criteria. All industrial and commercial properties located south of Area 1 are connected to a municipal water supply.

As described in the Supplemental Interim Measures Work Plan – Area 1 (CRA, August 2004), a soil-bentonite and jet grout barrier wall was installed around Area 1 to control the migration of nickel impacted groundwater and to reduce the total quantity of groundwater requiring collection and treatment. The barrier wall was installed during October 2004 through December 2004 and appears to be controlling groundwater flow from this area of the Site.

Complete details of the Supplemental Interim Measures for Area 1 will be reported under separate cover.

3.11 PLYMOUTH INDUSTRIAL CENTER (PIC) PROPERTY PLUME

As described in the RFI Report and Supplement to the RFI Report, the Plymouth Industrial Center (PIC) Property is located west of the Site. Historically, VOCs originating from former disposal trenches located at the northwest portion of the PIC Property have impacted groundwater, which has then migrated eastward into the Site. During the RFI, the VOC-impacted groundwater was delineated on Site and is known to extend into Area 1, Area 2, and AOI 19. Currently the Michigan Department of Environmental Quality (MDEQ) is responsible for the PIC Property plume investigation and remediation, as there is no longer a viable liable party. Based on groundwater samples collected during the RFI and from PIC Property sample results transmitted by the MDEQ, concentrations of VOCs in groundwater only exceed drinking water criteria and do not present any unacceptable exposures as there are no potable uses of groundwater at the Site. Additionally, based on information received from the MDEQ,

the majority of the source area disposal trenches were excavated during the summer of 2004.

4.0 SUMMARY OF RISK ASSESSMENT

The RFI was conducted in a phased approach, with ten phases of field investigation being implemented during the period of September 2002 through October 2004. Additionally, due to potential redevelopment, four stages of the RFI were conducted at AOI 31 on an accelerated timetable during the period of June 2002 through December 2002. One additional round of groundwater monitoring at AOI 31 (RFI – AOI 31 Stage V) was conducted in July 2003. Field investigations were focused on the areas and AOIs identified in Section 3.8. The findings from each phase of field investigation were communicated to the U.S. EPA through data packages, meetings, and conference calls. The data from the entire field investigation are presented in the RFI Report (CRA, March 2005) and Supplement to the RFI Report (CRA, April 2005).

The RFI field investigation was designed to determine if a release of hazardous waste or hazardous constituents had occurred, and where a potentially significant release is identified, to characterize the nature and extent of hazardous constituents in the environmental media. After each phase, the adequacy of the data was evaluated to determine whether additional data collection was warranted. As indicated above, several field events were conducted to collect soil, groundwater, and borehole water data necessary to achieve the RFI objectives.

When data of sufficient quality and quantity had been collected, the data were used to support decisions regarding the need for Interim or Corrective Measures. Human health and ecological risk assessments were conducted to provide a basis for determining whether the presence of hazardous constituents in environmental media at the Site poses a significant risk to human health and the environment that would warrant Corrective Measures. Details of the risk assessments and their findings are presented in the RFI Report (CRA, March 2005) and the Supplement to the RFI Report (CRA, April 2005). The risk assessment findings are summarized below.

4.1 SUMMARY OF HUMAN HEALTH RISK EVALUATION

During the implementation of the RFI, the sampling results for each area were compared with conservative generic and/or Site specific risk-based screening criteria to identify whether a potentially significant release of hazardous constituents to the environment has occurred and to assess the adequacy of characterization of potentially significant releases. As documented in Section 4 of the RFI Report (CRA, March 2005) and Section 4 of the Supplement to the RFI Report (CRA, April 2005), it was concluded that adequate

4.2 SUMMARY OF ECOLOGICAL RISKS

As discussed above in Section 3.7 and in the RFI Report (CRA, March 2005), an ecological risk assessment was prepared to develop information necessary to determine whether there is the potential for unacceptable risk of adverse ecological effects resulting from Site-related hazardous constituent concentrations in environmental media. This risk assessment included identification of AOIs with hazardous constituents, habitat and potentially complete exposure pathways; habitat characterization; and quantitative risk analysis.

Based on the results of a habitat characterization and a review of existing Site information, there is adequate information to conclude that ecological risks are negligible at the Site. Currently, only the areas east of Area 2 and in the vicinity of AOI 31 were found to provide habitat for ecological receptors. No further ecological risk assessment tasks were conducted for the Site because there are no releases of hazardous constituents associated with areas that currently provide potential habitat. In addition, these areas currently provide limited habitat and are likely to be significantly altered during the course of planned development.

in soil at AOI 5. Benzo(a)pyrene was detected in a soil sample at a concentration greater than screening criteria.

The following Interim Measure is proposed as the Final Corrective Measure for AOI 5 Soil:

AOI 5 Soil Excavation – As described in Section 3.10 and the AOI 5 Soil Remediation Completion Report (CRA; April 2005), benzo(a)pyrene-impacted soil at AOI 5 was excavated and disposed at the proper landfill facility to facilitate the potential sale and redevelopment of portions of the Site. A conservative cleanup criteria of 8 mg/kg was used to screen the verification samples. Benzo(a)pyrene was not detected at concentrations greater than 8 mg/kg in any of the verification samples. As described in the RFI Report, there are no unacceptable risks to human health or the environment related to soil at AOI 5.

5.3 AOI 27 SOIL

As described in the CCR, RFI Report, and Supplement to the RFI Report, AOI 27 incorporated the presence of a 1000-gallon diesel AST located along the north side of the Powerhouse. The AST was removed as part of the building decommissioning activities in 2000. This AOI also includes the area that the Powerhouse historically occupied. AOI 27 is located in the north central portion of the Site. RFI data indicates that significant concentrations of semi-volatile organic compounds (SVOCs) and PCBs are present in soil at AOI 27. Concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, and PCBs exceed Part 201 industrial direct contact criteria and concentrations of phenanthrene exceed Part 201 industrial volatile soil inhalation criteria (i.e. ambient air).

The estimated cumulative cancer risk and HI for routine workers are 4×10^{-4} and 1, respectively. The highest location-specific estimated cancer risk and HI for site-redevelopment workers exposed to soil at AOI 27 is 2×10^{-4} and 8, respectively. This risk is primarily due to PAHs in the soil via incidental ingestion. Currently there is no activity being conducted at AOI 27, except for RFI activities being conducted according to a Site-specific health and safety plan (HASp).

yet been estimated, however, the soil removal activities would be detailed in a separate work plan submitted to the U.S. EPA for review and approval.

5. Costs – Costs associated with the groundwater monitoring program are minimal unless contingent activities are necessary. The soil excavation activities can be completed with modest costs and will provide certainty that the portion of the Site can be redeveloped without concern for future workers at the Site. The implementation of engineering and institutional controls at the Site will also involve minimal costs.

Based on information currently available, the proposed remedy for the Site provides the best balance of Corrective Measures scenarios with respect to the evaluation criteria.

45. U.S. EPA, 2001. Office of Emergency and Remedial Response. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005. September 2001.
46. U.S. EPA, 2002. Region 9 Preliminary Remediation Goals (PRGs) 2002. November 2002.
47. U.S. EPA, 2003. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Office of Emergency and Remedial Response, Washington D.C., June 2003.

APPENDIX A

CRITERIA FOR EVALUATING GROUNDWATER MONITORING DATA

Off-Site Groundwater Monitoring Criteria GMC - 13000 Eckles Road, Livonia, Michigan			
Chem Group	Chemical	CASRN	Groundwater Monitoring Criteria (mg/L)
INORG	Silver	7440-22-4	5.0E+00
INORG	Thallium	7440-28-0	2.6E-01
INORG	Vanadium	7440-62-2	3.1E+00
INORG	Zinc	7440-66-6	1.2E+03
Notes:			
The groundwater monitoring criteria are based on the minimum of the construction worker groundwater contact criteria, residential vapor intrusion (foundation) criteria, residential vapor intrusion (sump) criteria, residential nonpotable groundwater criteria, and residential home produce groundwater criteria.			
NA -- Criterion not available due to lack of physical, chemical or toxicological information.			

APPENDIX B

BACKGROUND RFI INFORMATION

