OCTOBER 2013 SEMI-ANNUAL VOLUNTARY REMEDIATION PLAN PROGRESS REPORT

139 BRAMPTON ROAD
SAVANNAH, CHATHAM COUNTY, GEORGIA
HSI Site No. 10208

Submitted to:

Georgia Department of Natural Resources
Hazardous Waste Management Branch
Suite 1462, East Tower
2 Martin Luther King Jr. Drive SE
Atlanta, Georgia 30334

Prepared for:

Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey
c/o Dwight Feemster, Esq
Duffy and Feemster, LLC
and
Rheem Manufacturing Company
c/o Troutman Sanders LLP
Bank of America Plaza
Suite 5200
600 Peachtree Street, NE
Atlanta, Georgia

Prepared by:

AMEC Environment & Infrastructure, INC.
396 Plasters Avenue, NE
Atlanta, Georgia 30024

October 2013

October 30, 2013

Mr. Derrick Williams
Acting Program Manager
Hazardous Sites Response Program
Georgia Environmental Protection Division
2 Martin Luther King, Jr. Drive, SE
Suite 1462 East Floyd Tower
Atlanta, Georgia 30334

Subject: **October 2013 Semi-Annual Voluntary Remediation Plan Progress Report**
139 Brampton Road (former Rheem Manufacturing)
Savannah, Chatham County, Georgia
HSI Site No. 10208 Tax Parcel ID#1-0720-01-002

Dear Mr. Williams:

On behalf of Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey, and Rheem Manufacturing Company, AMEC Environment & Infrastructure, Inc. (AMEC), respectfully submits this Progress Report No.4 for the 139 Brampton Road property in Savannah, Chatham County, Georgia (HSI Site No. 10208, Tax Parcel ID#1-0720-01-002). This Progress Report is required by the Voluntary Remediation Program (VRP) statute and requested by the Georgia Environmental Protection Division (EPD) in their comment letter dated October 4, 2011.

This report is for the exclusive use of Mr. Dale Hendrix, Sr., Trustee under Trust for Benefit of Brenda Heisey and Rheem Manufacturing Company, and their attorneys, and for regulatory submittal. If you have any questions and/or comments regarding the material presented in the report, please contact Mr. Chuck Ferry (404) 817-0107 or by email at chuck.ferry@amec.com.

Sincerely,

AMEC Environment & Infrastructure, Inc.

Tyler Boyles
Project Geologist

Charles T. Ferry, P.E.
Senior Principal Engineer

cc: Mr. Dwight Feemster, Duffy & Feemster, LLC
Ms. Barbara Ann Cook, Rheem Manufacturing Company
Mr. Charles T. Steffens, Rheem Manufacturing Company
Ms. Hollister A. Hill, Troutman Sanders, LLP

Project No. 6121-09-0220

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1.0 PROJECT SUMMARY

The 139 Brampton Road property (subject property) is an approximately 11.1-acre parcel of land located in Savannah, Chatham County, Georgia. The Georgia EPD approved a Voluntary Remediation Plan Application (VRPA) with conditions and comments presented in two letters dated October 4, 2011 and accepted the 139 Brampton Road property as a "qualifying property" in the Voluntary Remediation Program (VRP).

The subject property is commercially developed with various structures which are currently leased for warehousing and office space. The subject property is zoned heavy industrial and is located in close proximity to the Georgia Port Authority – Garden City Terminal Container Port in Savannah, Georgia. The property has been utilized for commercial/industrial purposes for approximately 5 decades.

The property has been the subject of a number of environmental assessments conducted between 1985 and 2009, which revealed the presence of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs) and metals in soil and groundwater. The property was listed on the Hazardous Site Inventory (HSI) in June 1994 as site number 10208 due to the presence of lead in soil and tetrachloroethene in groundwater.

In its October 4, 2011 VRP approval letter, EPD requested that adjacent properties, owned by McDonald Ventures LLC (to the north) and Norfolk Southern Railway Company (to the east/south), be included as additional qualifying properties based on historic sampling results. Including these properties as qualifying properties would have been based on historic sampling results over 13 years old and would not be based on current information as assumed in EPD's VRP approval letter. Therefore, the Trustee and Rheem contacted representative of both McDonald Ventures and Norfolk Southern to inform them that the 139 Brampton Road property was in the VRP program, that an access agreement for testing on each of their properties was needed, and that a Uniform Environmental Covenant for their property may be needed.

The Trustee and Rheem finalized and executed an Agreement for Access with McDonald Ventures LLC dated February 1, 2013 which allowed the performance of additional assessment on the property to the north that was documented in the April 2013 (3rd) Semi-Annual Report.

This Semi-Annual Voluntary Remediation Plan Progress Report No. 4 was prepared in accordance with the Voluntary Remediation Plan (VRP) for the 139 Brampton Road Site, HSI Site No. 10208/Tax Parcel ID#1-0720-01-002.

2.0 ACTIONS TAKEN SINCE LAST SUBMITTAL

The activities that have been performed since submittal of the Semi-Annual Voluntary Remediation Plan Progress Report No. 3 dated April 30, 2013 are described in the following sections and included:

- Evaluation of the vapor risk into the McDonald Ventures warehouse building, an adjacent property, based on recent groundwater analyses; and
- Completion of negotiations for access onto the adjacent Norfolk Southern Railroad property.

2.1 VAPOR INTRUSION

The results of the subsurface investigations identified the presence of chlorinated solvents in groundwater on the subject property and to the east. As a result, an evaluation of the potential for vapor intrusion to indoor air in the three industrial buildings on the subject property was completed in 2012 in accordance with the February 22, 2004 USEPA "User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings." This was summarized in Semi-Annual Progress Report No. 2 dated October 2012.

2.1.1 Vapor Intrusion Risk Evaluation

During the current Semi-Annual Period, AMEC evaluated the potential impact of groundwater contamination on future indoor air quality for the industrial warehouse building, McDonald Ventures LLC, located on the adjacent property to north addressed at 155 Brampton Road in Savannah, Georgia. This also was completed in accordance with the February 22, 2004 USEPA "User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings."

This McDonald Ventures property is commercially developed with an approximate 200,000 square-foot office/warehouse building which appears to be currently vacant and unoccupied. The surrounding area is in close proximity to the Georgia Port Authority – Garden City Terminal Container Port and is primarily industrial/commercial. The current building is situated on slab foundations. Maximum detected groundwater concentrations were used to estimate worst-case potential exposures for current and future industrial/commercial workers that might be exposed to indoor air vapor emissions from the subsurface.

Two groundwater monitoring wells (EW-3 and GW-9) located near the McDonald Ventures warehouse were sampled in March 2013 for volatile organic compounds (VOCs). A summary of the March 2013 groundwater testing results is presented on Figure 1. Previous groundwater sampling events occurred on

the adjacent Former Rheem Manufacturing site beginning in 1987 through 2012, but these data were previously included in the risk evaluation for the Former Rheem Manufacturing Site and are side-gradient to the McDonald Ventures site. These data are not considered representative of current groundwater conditions at the McDonald Ventures site. No VOCs were detected in the sample from EW-3. Five VOCs were detected in the GW-9 groundwater sample, and these data are further considered in the indoor air risk evaluation. The maximum detected groundwater VOC concentrations are listed on Table 1.

2.1.2 Exposure Assessment

In order to identify groundwater constituents of potential concern (COPCs) for the vapor intrusion pathway, the maximum detected groundwater concentrations were compared to target groundwater concentrations from USEPA's Vapor Intrusion Screening Level (VISL) Calculator Version 3.1 (June 2013). These screening levels are presented in Table 1 and are based on a conservative residential exposure scenario with target carcinogenic risk of 10^{-6} and target hazard index of 1. As a result of this screening step, one constituent was identified as groundwater COPCs and carried through the vapor intrusion risk evaluation, trichloroethene (TCE).

TCE in groundwater was evaluated as a potential source of volatile emissions into a current/future commercial use building located on the property. AMEC utilized the USEPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (USEPA, 2002) as a primary guidance document. In accordance with the guidance, AMEC estimated future indoor air concentrations at the Site, using USEPA's Johnson and Ettinger Model for Subsurface Vapor Intrusion into Buildings (GW-ADV, Version 3.1) (the J&E Model) (USEPA, 2004). The maximum detected concentration was conservatively used as the groundwater exposure point concentration in the J&E Model run.

Default and site-specific modeling parameters were used for estimating indoor air concentrations (Table 2). Based on the March 2013 depth to groundwater in monitoring well GW-9, the depth to groundwater is assumed to be 1.54 feet. The soil type is primarily sandy clay with some silty sand. Soils were classified as SC (sandy clay) for the purposes of modeling. The warehouse is approximately 800 feet by 250 feet with a 35.5-foot ceiling height. An air exchange rate of 2 exchanges per hour was used based on site-specific information. Commercial/industrial workers were assumed to be exposed for 8 hours per day, for 250 days per year for 25 years (USEPA, 1991).

2.1.3 Toxicity Assessment

Toxicity values [Inhalation Reference Concentrations (RfCs) and Unit Risk Factors (URFs)] used in this evaluation were obtained from the USEPA Integrated Risk Information System (IRIS, 2013). The toxicity values used in this assessment are listed on Table 3. The RfC is used to estimate non-carcinogenic inhalation hazards. The RfC is an estimate of the daily exposure to the human population (including sensitive subgroups such as children and the elderly) that is likely to be without an appreciable risk of deleterious effects. The estimated hazard is compared to a target hazard index (HI) of one. Cumulative hazards less than one are not likely to be associated with systemic or non-carcinogenic health risks.

Using the chemical-specific URF, the cumulative carcinogenic risk for the indoor vapor intrusion pathway was calculated and compared to a target risk of 10^{-5}. If the cumulative carcinogenic risk for site workers is less than or equal to 10^{-5}, risk is considered to be in the acceptable range under the Hazardous Site Response Act (HSRA). The URF is characterized as an upper-bound estimate designed to be protective of the majority of the human population.

2.1.4 Risk Characterization – Vapor Intrusion Modeling

The J&E Model was used to estimate indoor air concentrations with groundwater concentrations used as the input values. These estimated indoor air concentrations were then used to assess potential indoor air exposures and calculate cumulative incremental risks and hazards related to potential vapor intrusion into the site building (Table 3). The J&E Model output for TCE is included in Appendix A. The J&E Model incorporates both convective and diffusive mechanisms for estimating the transport of contaminant vapors emanating from the subsurface into indoor spaces located directly above the source of contamination. The model is a one-dimensional analytical solution to vapor transport into indoor spaces, relating the vapor concentration in the building to the chemical concentration at the subsurface source area.

The J&E Model assumes the structure is located above the subsurface impacts and volatile emissions will enter through the concrete floor slab. This model does not incorporate dispersion, dilution, or bioattenuation. However, in actuality, the concentrations of volatile compounds may naturally attenuate over time. The model also assumes an infinite subsurface contamination source, while the distribution under the building is not homogeneous. In general, the assumptions used in the J&E modeling would tend to overestimate indoor air concentrations.

Table 3 summarizes the results of the risk calculations for commercial land use. The estimated incremental risk from vapor intrusion in indoor air is 9×10^{-6}. The estimated hazard index (HI) for vapor intrusion to indoor air from the COPCs in groundwater is 3×10^{-11}. The HI is less than one and the incremental risks are less than $1x10^{-5}$. Based on these results, the vapor intrusion pathway would not pose an unacceptable hazard or risk to occupational receptors working in the on-site building, and would not be of concern to human health in the future.

2.1.5 Parameters of Analysis

This assessment assumes uniform exposure across the site although groundwater concentrations vary by location. The assessment also assumes site workers will be exposed over a 25-year period for 250 days per year (USEPA, 1991). These assumptions would tend to overestimate risks because commercial/warehouse workers do not typically remain in the same job and location for 25 years. In addition, the detected constituents are potentially biodegradable.

Whether volatile constituents are present under this building is not defined. Monitoring wells EW-1 south of the building and EW-3 north of the building are non-detect for VOCs. Monitoring wells GW-9 is west of the building and may exhibit VOCs coming from the southeast without passing underneath the McDonald Ventures building. This risk evaluation may overestimate site-related risks from indoor air exposures for these reasons.

2.1.6 Summary and Conclusions

Risk calculations were completed using the March 2013 maximum detected groundwater concentrations in the J&E Model in order to estimate the indoor air concentrations for COPCs. Risk and hazard associated with estimated indoor air exposures were then calculated by estimating indoor air exposure concentrations and comparing these concentrations to inhalation toxicity benchmarks. The resulting estimated cumulative hazards and risks indicate no unacceptable risk or hazards for occupational receptors potentially exposed via indoor air vapor emissions based on maintaining the current hard cover and current building parameters.

2.2 ACCESS TO ADJACENT NORFOLK SOUTHERN PROPERTY

During the third semi-annual period the Trustee, Rheem, AMEC and their attorneys have completed negotiations of an Environmental Right of Entry Agreement with Norfolk Southern Railway Company dated October 29, 2013. This will allow the performance of additional soil and groundwater sampling

and analysis on the Norfolk Southern property to the southeast and west of the subject property during the next semi-annual period.

3.0 SCHEDULE AND FUTURE SUBMITTALS

As required by EPD, semi-annual progress reports must be submitted to EPD every April 30th and October 30th throughout the duration of this project. An updated milestone schedule is included as Table 4 which describes the activities yet to be performed. A breakdown of professional service hours with a description of the services provided is included in Appendix C.

4.0 PROFESSIONAL ENGINEER CERTIFICATION STATEMENT

"I certify under penalty of law that this report and all attachments were prepared by me or under my direct supervision in accordance with the Voluntary Remediation Program Act (O.C.G.A. Section 12-8-101, et seq.). I am a professional engineer who is registered with the Georgia State Board of Registration for Professional Engineers and Land Surveyors and I have the necessary experience and am in charge of the investigation and remediation of this release of regulated substances.

Furthermore, to document my direct oversight of the Voluntary Remediation Plan development, implementation of corrective action, and long term monitoring, I have attached a monthly summary of hours invoiced and description of services provided by me to the Voluntary Remediation Program participant since the previous submittal to the Georgia Environmental Protection Division.

The information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Mr. Charles T. Ferry, P.E.
Georgia Registration No. 10957

REFERENCES

IRIS, 2013. Integrated Risk Information System, www.epa.gov/iris.

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance, OSWER Directive 9285.6-03, March 1991.

USEPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, EPA530-D-02-004, November 2002.

USEPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings, Office of Emergency and Remedial Response, February 2004.

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TABLES

Table 1
Summary of Groundwater Concentrations - 2013
McDonald Ventures
155 Brampton Road, Savannah, GA

Parameter	2013 Maximum Detected Groundwater Concentration, ug/L (a)	Target Groundwater Concentration Protective of Indoor Air, ug/L (b)	Indoor Air COPC? (c)
Volatile Organic Compounds			
1,1-Dichloroethane	6.14	6.6	No
1,1-Dichloroethene	15	200	No
Benzene	1.22	1.4	No
Tetrachloroethene	5.51	13	No
Trichloroethene	1.65	1.1	**Yes**

(a) Maximum detected concentrations for GW-9, sampled in March 2013.
(b) Calculated using OSWER Vapor Intrusion Screening Level (VISL) Calculator Version 1.0, June 2013 RSLs for TCR = 0.000001 and THQ = 1
(c) Compound selected as a COPC if maxiumum detected concentration is greater than target groundwater concentration protective of indoor air.
ug/L micrograms per liter

PREPARED/DATE: LWC 10/14/13
CHECKED/DATE: LMS 10/17/13

Table 2
Occupational Assumptions Used in Johnson & Ettinger Model (GW-ADV)
McDonalds Ventures
155 Brampton Road, Savannah, GA

Parameter	Value	Justification
Average Water Temp.	18.3 °C	Area average (65° F)
Depth Below Grade to Enclosed Space Floor	15 cm	Slab on grade foundation - assumption
Depth Below Grade to Groundwater /Thickness of Soil Stratum	46.94 cm	Site-specific (1.54 ft); based on 2013 monitoring well data (GW-9)
Stratum A Soil Vapor Permeability	SC	Sandy Clay; site-specific
SCS Soil Type	SC	Sandy Clay; site-specific
Soil Dry Bulk Density	1.63 g/cm^3	Sandy Clay – Model value
Soil Total Porosity	0.385 unitless	Sandy Clay – Model value
Soil Water-filled Porosity	0.197 cm^3/cm^3	Sandy Clay – Model value
Enclosed Space Floor Thickness	20.32 cm	Site-specific (8 inches)
Soil-Building Pressure Differential	40 $g/cm\text{-}s^2$	Model default
Enclosed Space Floor Length	24,384 cm	Site-specific for warehouse (800 ft)
Enclosed Space Floor Width	7,620 cm	Site-specific for warehouse (250 ft)
Enclosed Space Height	1,082 cm	Height for Warehouse (35.5 ft); site-specific.
Floor-Wall Seam Crack Width	0.1 cm	Model default
Indoor Air Exchange Rate	2/hr	Site-specific for warehouse
Averaging Time, Carcinogens	70 years	Model default
Averaging Time, Noncarcinogens	25 years	Default for occupational
Exposure Duration	25 years	Default for occupational
Exposure Frequency	250 days/year	Default for occupational
Target Risk for Carcinogens	1×10^{-6} unitless	Target Risk
Target Hazard for Noncarcinogens	1 unitless	Target Hazard

Prepared by: LWC 10/14/13
Checked by: LMS 10/17/13

Table 3
Calculations of Risk to Indoor Air Concentrations
Site Worker - Future
Inhalation of Indoor Air
McDonald Ventures
155 Brampton Road, Savannah, GA

Parameter	Concentration in Air (ug/m^3)	Value Type [1]	Exposure Concentration (ug/m^3) [2]		Toxicity Values: Inhalation RfC (mg/m^3)	Toxicity Values: Inhalation Unit Risk $(ug/m^3)^{-1}$	Source	Hazard Quotient [3] (Unitless)	Excess Cancer Risk [4] (Unitless)
			Noncarcinogen	Carcinogen					
Volatile Organic Compounds									
Trichloroethene	7.96E-05	Modeled	1.82E-05	6.49E-06	2.0E-03	4.0E-06	IRIS	9.1E-06	2.6E-11
						Total:		9E-06	3E-11

m^3 = cubic meters
mg = milligram
RfC = Reference Concentration
ug = micrograms
IRIS - Integrated Risk Information System; Cal EPA - California Environmental Protection Agency.

PREPARED/DATE: LWC 10/14/13
CHECKED/DATE: LMS 10/17/13

[1] Infinite source concentration from the Johnson and Ettinger Model (version GW-ADV 3.1, 02/04). Maximum detected groundwater concentration used as the exposure point concentration (Table 1).

[2] Exposure Concentration = See Equations below

[3] Hazard Quotient (Noncarcinogens) = Noncarcinogen Exposure Concentration/RfC x 1000 ug/mg

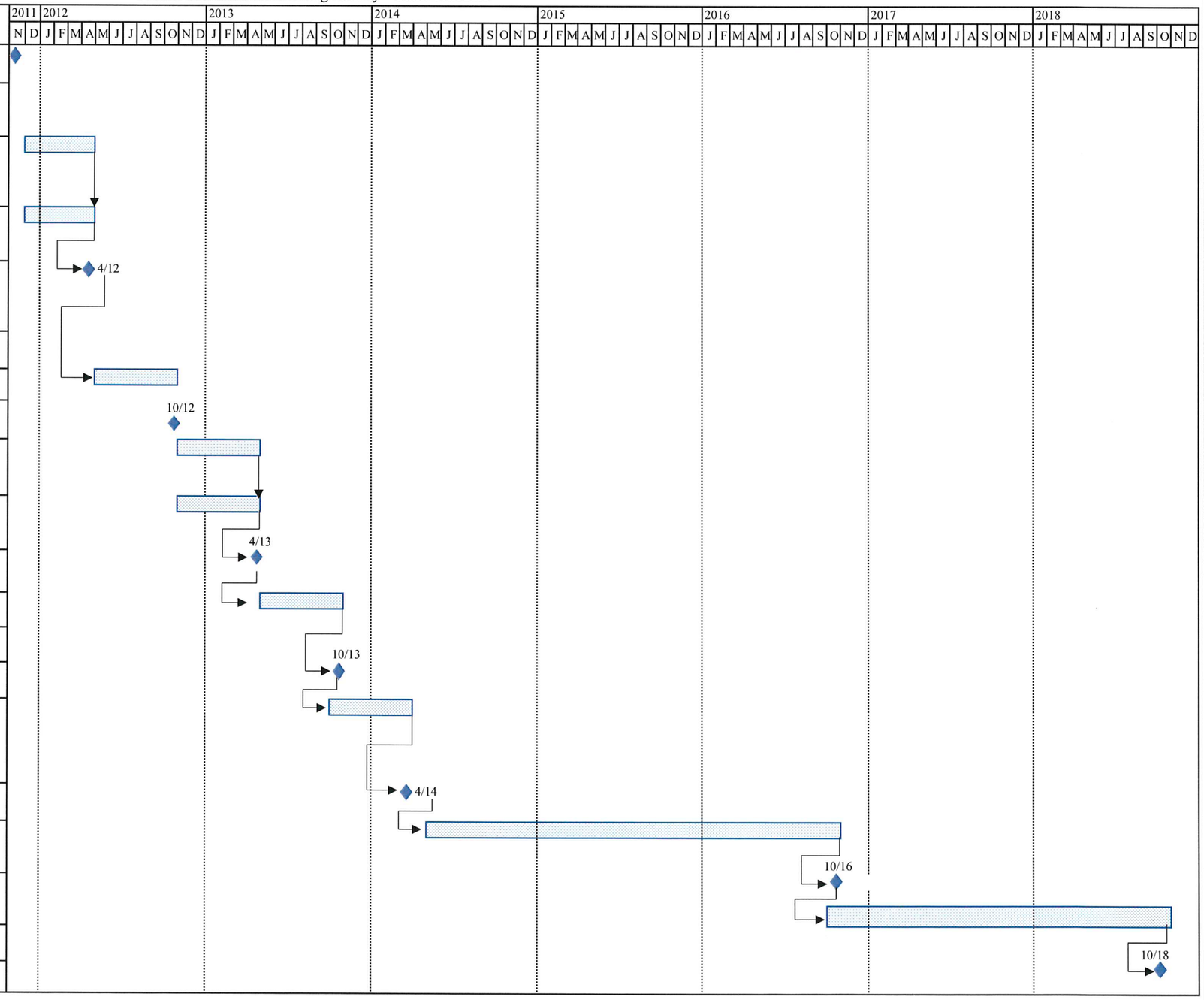
[4] Excess Cancer Risk (Carcinogens) = Carcinogen Exposure Concentration x Inhalation Unit Risk

Carcinogen Exposure Concentration = $CA \times ET \times EF \times ED / AT_c$ where Noncarcinogen Exposure Concentration = $CA \times ET \times EF \times ED / AT_{nc}$ where:

CA = Constituent Concentration in Air (estimated)	See above	AT_{nc} = Averaging Time (Noncarcinogen, hours)	219,000
ET = Exposure Time (hours per day)	8	AT_c = Averaging Time (Carcinogenic, hours)	613,200
EF = Exposure Frequency (days per year)	250		
ED = Exposure Duration (years)	25		

Former Rheem Manufacturing Facility - Gantt Schedule

Item	Task Name	Duration	Start	Finish
1	Prepare milestone schedule and cost estimate for financial assurance	Complete		12/8/2011
2	Execute access agreement with adjacent properties to the north, south and east and include additional qualifying parcels to the VRPA	Started		
	Perform initial groundwater assessment program which will consist of sampling existing on-site wells (3 known), installation and sampling additional on-site wells and hydraulic conductivity tests.	Complete		4/30/2012
	Perform additional soil characterization to further delineate known lead impacts and check for impacts of regulated substances listed in Table 3 of the VRPA.	Complete		4/30/2012
	Prepare First Progress Report which will include fate and transport model, status of existing monitoring well network, revised RRS for all constituents, updated Conceptual Site Model (CSM) and milestone schedule.	Complete		4/30/2012
3	Continue negotiating access agreements with adjacent properties to the north, south and east			
	Perform Vapor Intrusion Risk Evaluation	Complete		10/30/2012
	Prepare Second Progress Report with vapor intrusion into on-site building modeling, updated CSM and milestone schedule.	Complete		10/30/2012
4	Begin off-site groundwater delineation on property to the north which consisted of sampling one existing off-site well, installation and sampling of one additional off-site well.	Complete		4/30/2013
	Begin off-site soil characterization on property to the north to delineate impacts of regulated substances. Complete horizontal delineation of on-site soil impacts.	Complete		4/30/2013
	Prepare Third Progress Report with updated CSM and milestone schedule.	Complete		4/30/2013
5	Continue negotiating access agreements with adjacent properties to the south and east			
	Perform Vapor Intrusion Risk Evaluation on McDonald's Ventures property located at 155 Brampton Road	Complete		10/30/2013
	Prepare Fourth Progress Report with updated CSM and milestone schedule	Complete		10/30/2013
6	Begin off-site soil and groundwater characterization on property to the east and south to delineate impacts of regulated substances. Complete vertical delineation of soil and groundwater, update CSM, finalize VRP and provide preliminary cost estimate for soil remediation activities using soil averaging.	6 months	10/30/2013	4/30/2014
	Prepare Fifth Progress Report with updated CSM and milestone schedule		4/30/2014	4/30/2014
7	Complete soil remediation activities using soil averaging, complete all assessment and modeling efforts, prepare sixth through ninth Progress Reports.	30 Months	4/30/2014	10/30/2016
8	Submit Compliance Status Report to certify soil and vapor compliance and demonstrate no risk of exposure for groundwater impacts		10/30/2016	10/30/2016
9	Assume two years of semi-annual groundwater monitoring and reporting	24 months	10/30/2016	10/30/2018
	Submit Delisting request			10/30/2018



Project: Former Rheem Manufacturing Facility
Date: 10/30/2013
MACTEC Project No. 6121-09-0220

Task

Milestone

FIGURES

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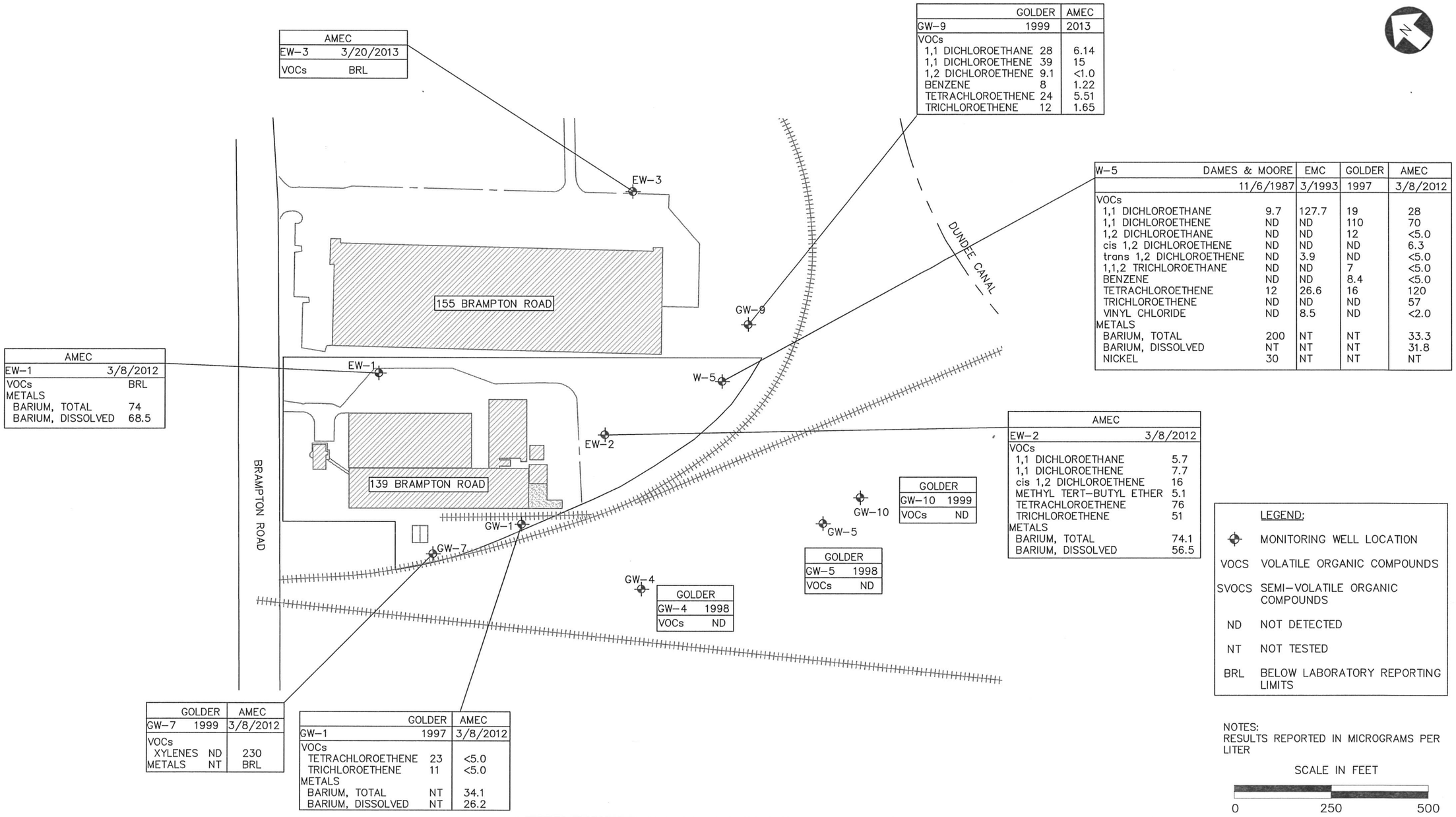

AMEC	
EW–3	3/20/2013
VOCs	BRL

AMEC	
EW–1	3/8/2012
VOCs	BRL
METALS	
BARIUM, TOTAL	74
BARIUM, DISSOLVED	68.5

	GOLDER	AMEC
GW–7	1999	3/8/2012
VOCs		
XYLENES	ND	230
METALS	NT	BRL

	GOLDER	AMEC
GW–1	1997	3/8/2012
VOCs		
TETRACHLOROETHENE	23	<5.0
TRICHLOROETHENE	11	<5.0
METALS		
BARIUM, TOTAL	NT	34.1
BARIUM, DISSOLVED	NT	26.2

	GOLDER	AMEC
GW–9	1999	2013
VOCs		
1,1 DICHLOROETHANE	28	6.14
1,1 DICHLOROETHENE	39	15
1,2 DICHLOROETHENE	9.1	<1.0
BENZENE	8	1.22
TETRACHLOROETHENE	24	5.51
TRICHLOROETHENE	12	1.65

W–5	DAMES & MOORE	EMC	GOLDER	AMEC
	11/6/1987	3/1993	1997	3/8/2012
VOCs				
1,1 DICHLOROETHANE	9.7	127.7	19	28
1,1 DICHLOROETHENE	ND	ND	110	70
1,2 DICHLOROETHANE	ND	ND	12	<5.0
cis 1,2 DICHLOROETHENE	ND	ND	ND	6.3
trans 1,2 DICHLOROETHENE	ND	3.9	ND	<5.0
1,1,2 TRICHLOROETHANE	ND	ND	7	<5.0
BENZENE	ND	ND	8.4	<5.0
TETRACHLOROETHENE	12	26.6	16	120
TRICHLOROETHENE	ND	ND	ND	57
VINYL CHLORIDE	ND	8.5	ND	<2.0
METALS				
BARIUM, TOTAL	200	NT	NT	33.3
BARIUM, DISSOLVED	NT	NT	NT	31.8
NICKEL	30	NT	NT	NT

AMEC	
EW–2	3/8/2012
VOCs	
1,1 DICHLOROETHANE	5.7
1,1 DICHLOROETHENE	7.7
cis 1,2 DICHLOROETHENE	16
METHYL TERT–BUTYL ETHER	5.1
TETRACHLOROETHENE	76
TRICHLOROETHENE	51
METALS	
BARIUM, TOTAL	74.1
BARIUM, DISSOLVED	56.5

GOLDER	
GW–10	1999
VOCs	ND

GOLDER	
GW–5	1998
VOCs	ND

GOLDER	
GW–4	1998
VOCs	ND

LEGEND:

- ⌖ MONITORING WELL LOCATION
- VOCS VOLATILE ORGANIC COMPOUNDS
- SVOCS SEMI–VOLATILE ORGANIC COMPOUNDS
- ND NOT DETECTED
- NT NOT TESTED
- BRL BELOW LABORATORY REPORTING LIMITS

NOTES:
RESULTS REPORTED IN MICROGRAMS PER LITER

SCALE IN FEET

0 250 500

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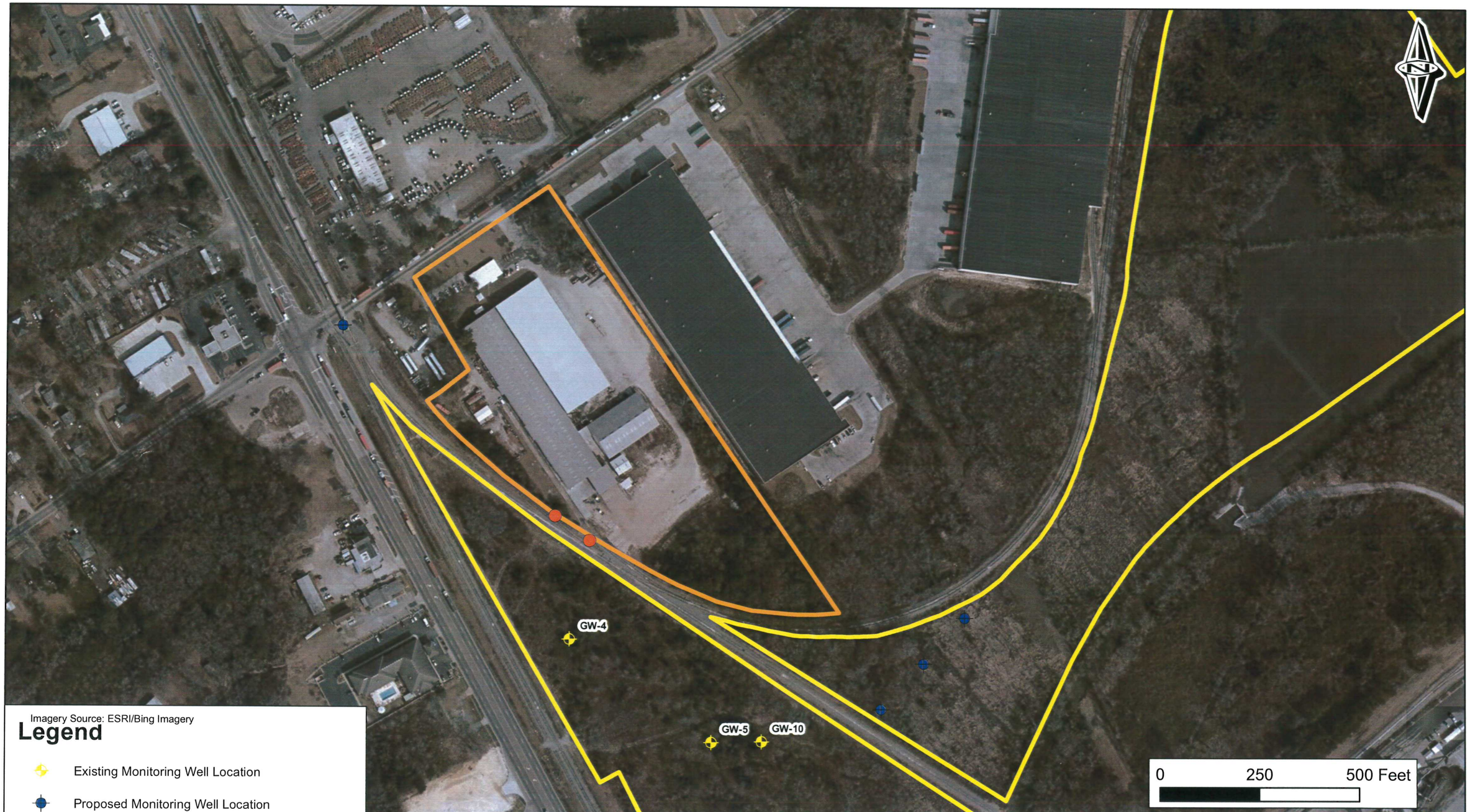
139 BRAMPTON ROAD
SAVANNAH, GEORGIA

GROUNDWATER TEST RESULTS FOR 155 BRAMPTON ROAD VAPOR INTRUSION EVALUATION

Job Number	Task	Date	Scale	Drawn By	Reviewed By	Figure
6121–09–0220	01	OCT 2013	AS SHWON	RLA	TJB	1



Imagery Source: ESRI/Bing Imagery

Legend

- Existing Monitoring Well Location
- Proposed Monitoring Well Location
- Proposed Shallow Soil Boring Location
- Approximate Norfolk Southern Property Boundary
- Approximate Property Boundary

Map Document: (G:\Rheem\mxd\2005_Aerial.mxd)
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amec

139 Brampton Road
Savannah, Georgia

Norfolk Southern Property
Propsed Locations
For Soil Borings &
Groundwater Sampling

Job Number:	Task:	Date:	Scale:	Prepared By:	Reviewed By:	Figure:
6121-09-0220	01	March 2013	1:2,750	CLS	TJB	2

APPENDIX A
J&E MODEL OUTPUT

OSWER VAPOR INTRUSION ASSESSMENT

Vapor Intrusion Screening Level (VISL) Calculator Version 3.1, June 2013 RSLs

Parameter	Symbol	Value	Instructions
Exposure Scenario	Scenario	Residential	Select residential or commercial scenario from pull down list
Target Risk for Carcinogens	TCR	1.00E-06	Enter target risk for carcinogens
Target Hazard Quotient for Non-Carcinogens	THQ	1	Enter target hazard quotient for non-carcinogens
Average Groundwater Temperature (°C)	Tgw	25	Enter average of the stabilized groundwater temperature to correct Henry's Law Constant for groundwater target concentrations

	CAS	Chemical Name	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Soil Source? Cvp > Cia,target?	Is Chemical Sufficiently Volatile and Toxic to Pose Inhalation Risk Via Vapor Intrusion from Groundwater Source? Chc > Cia,target?	Target Indoor Air Conc. @ TCR = 1E-06 or THQ = 1 MIN(Cia,c;Cia,nc)	Toxicity Basis	Target Sub-Slab and Exterior Soil Gas Conc. @ TCR = 1E-06 or THQ = 1 Csg	Target Ground Water Conc. @ TCR = 1E-06 or THQ = 1 Cgw	Is Target Ground Water Conc. < MCL? Cgw<MCL?	Pure Phase Vapor Conc. @ 25°C Cvp	Groundwater Vapor Conc. Chc	Temperature for Groundwater Vapor Conc. Tgw or 25	Lower Explosive Limit** LEL	LEL Source	Inhalation Unit Risk IUR	IUR Source*	Reference Concentration RfC	RfC Source*	Mutagenic Indicator	Target Indoor Air Conc. for Carcinogens @ TCR = 1E-06 Cia,c	Target Indoor Air Conc. for Non-Carcinogens @ THQ = 1 Cia,nc
			Yes/No	Yes/No	(ug/m^3)	C/NC	(ug/m^3)	(ug/L)	Yes/No (MCL ug/L)	(ug/m^3)	(ug/m^3)	C	(% by vol)		(ug/m^3)$^{-1}$		(mg/m^3)			(ug/m^3)	(ug/m^3)
x	71-43-2	Benzene	Yes	Yes	3.1E-01	C	3.1E+00	1.4E+00	Yes (5)	3.98E+08	4.06E+08	25	1.2	N	7.80E-06	I	3.00E-02	I		3.1E-01	3.1E+01
x	75-34-3	Dichloroethane, 1,1-	Yes	Yes	1.5E+00	C	1.5E+01	6.6E+00	--	1.45E+09	1.16E+09	25	5.4	N	1.60E-06	CA				1.5E+00	
x	75-35-4	Dichloroethylene, 1,1-	Yes	Yes	2.1E+02	NC	2.1E+03	2.0E+02	No (7)	3.31E+09	2.58E+09	25	6.5	N			2.00E-01	I			2.1E+02
x	127-18-4	Tetrachloroethylene	Yes	Yes	9.4E+00	C	9.4E+01	1.3E+01	No (5)	1.65E+08	1.49E+08	25			2.60E-07	I	4.00E-02	I		9.4E+00	4.2E+01
x	79-01-6	Trichloroethylene	Yes	Yes	4.3E-01	C	4.3E+00	1.1E+00	Yes (5)	4.88E+08	5.15E+08	25	8	N	see note	I	2.00E-03	I	TCE	4.3E-01	2.1E+00

Notes:

(1) **Inhalation Pathway Exposure Parameters (RME):**

Exposure Scenario	Units	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario in cell E5) Symbol	Selected Value
Averaging time for carcinogens	(yrs)	ATc_R	70	ATc_C	70	ATc	70
Averaging time for non-carcinogens	(yrs)	ATnc_R	30	ATnc_C	25	ATnc	30
Exposure duration	(yrs)	ED_R	30	ED_C	25	ED	30
Exposure frequency	(days/yr)	EF_R	350	EF_C	250	EF	350
Exposure time	(hr/day)	ET_R	24	ET_C	8	ET	24

(2) **Generic Attenuation Factors:**

Source Medium of Vapors		Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario in cell E5) Symbol	Selected Value
Groundwater	(-)	AFgw_R	0.001	AFgw_C	0.001	AFgw	0.001
Sub-Slab and Exterior Soil Gas	(-)	AFss_R	0.1	AFss_C	0.1	AFss	0.1

(3) **Formulas**

Cia, target = MIN(Cia,c; Cia,nc)

Cia,c (ug/m3) = TCR x ATc x (365 days/yr) x (24 hrs/day) / (ED x EF x ET x IUR)

Cia,nc (ug/m3) = THQ x ATnc x (365 days/yr) x (24 hrs/day) x RfC x (1000 ug/mg) / (ED x EF x ET)

(4) **Special Case Chemicals**

Trichloroethylene

	Residential Symbol	Residential Value	Commercial Symbol	Commercial Value	Selected (based on scenario in cell E5) Symbol	Selected Value
	mIURTCE_R	1.00E-06	mIURTCE_C	0.00E+00	mIURTCE	1.00E-06
	IURTCE_R	3.10E-06	IURTCE_C	4.10E-06	IURTCE	3.10E-06

Mutagenic Chemicals — The exposure durations and age-dependent adjustment factors for mutagenic-mode-of-action are listed in the table below:

Note: This section applies to trichloroethylene and other mutagenic chemicals, but not to vinyl chloride.

Age Cohort	Exposure Duration (years)	Age-dependent adjustment factor
0 - 2 years	2	10
2 - 6 years	4	3
6 - 16 years	10	3
16 - 30 years	14	1

Mutagenic-mode-of-action (MMOA) adjustment factor 76 — This factor is used in the equations for mutagenic chemicals.

Vinyl Chloride — See the Navigation Guide equation for Cia,c for vinyl chloride.

Notation:

NVT = Not sufficiently volatile and/or toxic to pose inhalation risk in selected exposure scenario for the indicated medium

C = Carcinogenic

NC = Non-carcinogenic

I = IRIS; EPA Integrated Risk Information System (IRIS). Available online at: http://www.epa.gov/iris/subst/index.html

P = PPRTV. EPA Provisional Peer Reviewed Toxicity Values (PPRTVs). Available online at: http://hhppdtv.ornl.gov/pprtv.shtml

A = Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (MRLs). Available online at: http://www.atsdr.cdc.gov/mrls/index.html

CA = California Environmental Protection Agency/Office of Environmental Health Hazard Assessment assessments. Available online at: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

H = HEAST. EPA Superfund Health Effects Assessment Summary Tables (HEAST) database. Available online at: http://epa-heast.ornl.gov/heast.shtml

S = See RSL User Guide, Section 5

X = PPRTV Appendix

E = The Engineering ToolBox. Available online at http://www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html

N = Centers for Disease Control and Prevention (CDC) National Institute for Occupational Safety and Health (NIOSH). Pocket Guide to Chemical Hazards. Available online at: http://www.cdc.gov/niosh/npg/default.html http://www.cdc.gov/niosh/npg/default.html

M = Chemical-specific MSDS

Mut = Chemical acts according to the mutagenic-mode-of-action, special exposure parameters apply (see footnote (4) above).

VC = Special exposure equation for vinyl chloride applies (see Navigation Guide for equation).

TCE = Special mutagenic and non-mutagenic IURs for trichloroethylene apply (see footnote (4) above).

Yellow highlighting indicates site-specific parameters that may be edited by the user.

Blue highlighting indicates exposure factors that are based on Risk Assessment Guidance for Superfund (RAGS) or EPA vapor intrusion guidance, which generally should not be changed.

**Lower explosive limit is the minimum concentration of the compound in air (% by volume) that is needed for the gas to ignite and explode.

GW-ADV
Version 3.1; 02/04

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.65E+00	Trichloroethylene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
18.3	15	46.94	46.94			A	SC	SC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-fillec porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil Parameters				Lookup Soil Parameters				Lookup Soil Parameters			
SC	1.63	0.385	0.197	SC	1.63	0.385	0.197	SC	1.63	0.385	0.197

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
20.32	40	24384	7620	1082	0.1	2	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	250	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

APPENDIX B

PROPOSED OFF-SITE SCOPE OF WORK FOR NORFOLK SOUTHERN PROPERY

September 16, 2013

Subject: **Heisey Trust Property (former Rheem Manufacturing Company facility)**
139 Brampton Road
Savannah, Georgia 31408

Voluntary Remediation Program Services
2013 Fourth Progress Report Period – October 2013
AMEC Project No. 6121-09-0220

FIFTH SEMI-ANNUAL REPORTING PERIOD
PROPOSED OFF-SITE WORK PLAN ON NORFOLK SOUTHERN PROPERTY

Off-Site Access

In its October 4, 2011 VRP Approval Letter, GA EPD requested that the adjacent property to the east and south belonging to Norfolk Southern Corporation be included as an additional qualifying property. This was based on historic test results which may not reflect current conditions, so current sampling data is needed. To assist Rheem and Trustee in arranging for off-site access for current sampling, this proposed Work Plan describes the scope of sampling and testing to be performed on the Norfolk Southern property during the second semi-annual reporting period.

Further Soil Characterization on Norfolk Southern Property

In order to assess off-site soil conditions, we plan to install soil borings in the middle of the Norfolk Southern property located south of the 139 Brampton Road site property boundary. Two soil borings will be installed using a hand auger to a depth of approximately 4 feet. Soil samples will be collected at regular intervals and classified visually in the field. Two soil samples from each boring will be collected and transported to the laboratory. The shallow sample will be analyzed for lead. Based on the laboratory results, testing of deeper soil samples may be warranted. AMEC has prepared the attached figure with the location of our recommended placement of the additional soil borings.

The soil samples will be collected in laboratory-supplied containers and maintained on ice and under chain-of-custody control from the time they are collected until they are released to the laboratory. The samples will be submitted to Analytical Environmental Services, Inc. in Atlanta, Georgia and tested for the presence of lead (EPA Method 8270C).

Further Groundwater Characterization on Norfolk Southern Property

In order to further assess off-site groundwater conditions, AMEC plans to install additional monitoring wells at selected locations on the Norfolk Southern property during the fifth reporting period. The locations of the wells have been determined utilizing the data collected during the initial groundwater characterization effort. We plan to install three additional monitoring wells on the eastern portion of the Norfolk Southern property using a hand auger and one monitoring well on the western portion of the property using a geo-probe drill rig, if possible, or a hand auger. AMEC has prepared the attached figure with the recommended placement for the additional wells.

In addition, the existing monitoring wells GW-4, GW-5 and GW-10 on the Norfolk Southern property will be sampled during this field event. If we are unable to locate some or all of these existing monitoring wells, then we propose to drill and install up to two new groundwater wells in the area of those previous wells on the Norfolk Southern property in order to collect current groundwater samples.

The groundwater samples will be collected in laboratory-supplied containers and maintained on ice and under chain-of-custody control from the time they are collected until they are released to the laboratory. The samples will be submitted to Analytical Environmental Services, Inc. in Atlanta, Georgia and tested for the presence of volatile organic compounds (VOCs via EPA Method 8260B).

In order to obtain the data necessary for the future calculations associated with a groundwater model, AMEC will also collect water samples from the wells which will be analyzed for parameters relevant to the fate and transport of groundwater contamination. Field parameters will be measured which include temperature, pH, specific conductance, dissolved oxygen and oxidation-reduction potential. Laboratory analyses will be performed which include total organic carbon, alkalinity, chloride, ethene, ethane, ferrous iron, methane, nitrate, nitrite, sulfate and sulfide.

Miscellaneous

AMEC's activities will be performed in accordance with a site specific job hazard analysis and safety plan.

AMEC will call in a public utility clearance as required by law, and we will also have a private subcontractor clear each boring location prior to drilling.

Soil cuttings, well development water and other wastes will be drummed and the drums will be removed from the Norfolk Southern property upon completion of the field work.

Schedule

We anticipate that this field work will be conducted prior to March 2014 over a one week time period. AMEC will notify Norfolk Southern in advance of our specific schedule for property access.

APPENDIX C

SUMMARY OF PROFESSIONAL ENGINEER'S SERVICES

Charles T. Ferry, P.E.
Summary of Hours and Services During the 4th Semi-Annual Progress Period
139 Brampton Road
Savannah, Georgia
HSI Site No. 10832

Summary of Hours for Voluntary Remediation Program Activities

(1) Project oversight, assistance in access negotiations, consult on vapor intrusion and review calculations
4.5 hours invoiced between 7/19/13 and 8/29/13

(2) Review preparation of October 2013 Semi-Annual VRP Progress Report and future scope of work documents
4 hours invoiced between 10/11/13 and 10/30/13