Appendix E

Analytical Data Review and Validation Report Summaries

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# 21141

VOLATILES ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package 21141 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-02-12 (022405)	S21141.01	Water	02/24/2005	X				

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D was outside control limits due to a decrease in response by 2-hexanone. All sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI

Date of Report: March 10, 2005

Validation performed by: (Todd A Church)

Date of Validation: April 8, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# 21140

VOLATILES AND METALS ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package 21140 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-81-08 (022405)	S21140.01	Water	02/24/2005	X				
RFI-09-48 (022405)	S21140.02	Water	02/24/2005				X	
RFI-94-09 (022505)	S21140.03	Water	02/25/2005	X				
MW-25 (022505)	S21140.04	Water	02/25/2005				X	
RFI-84-05 (022505)	S21140.05	Water	02/25/2005	X				
RFI-84-06R (022505)	S21140.06	Water	02/25/2005				X	

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The initial calibrations %RSD were outside control limits for chloromethane and cyclohexane. All associated sample data results were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D was outside control limits due to an increase in response by acetone. All associated detected sample data results for compounds with increasing responses were qualified as estimated.

The laboratory control spike % recovery was above control limits for vinyl chloride. All associated detected sample data results were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by:	Merit Laboratories, Inc. East Lansing, MI
Date of Report:	March 10, 2005
Validation performed by:	(Todd A Church)
Date of Validation:	April 8, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# 21163

VOLATILES AND METALS ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package 21163 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
MW-26 (022805)	S21163.01	Water	02/28/2005				X	
RFI-36-17 (022805)[1]	S21163.02	Water	02/28/2005	X				
RFI-36-48 (022805)[2]	S21163.05	Water	02/28/2005	X				
Dup-01 (022805)	S21163.06	Water	02/28/2005	X				
RFI-81-03 (022805)	S21163.07	Water	02/28/2005	X				
EB-01 (022805)	S21163.08	Water	02/28/2005	X				
TB-01 (022805)	S21163.09	Water	02/28/2005	X				

1 MS/MSD performed on sample

2 Sample ID Dup-01 (022805) is the field duplicate of parent sample location RFI-36-48 (022805)

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Several compounds were detected in the associated blanks. Based on the blank content, data have been qualified as non-detect for chloroform in sample location RFI-36-17 (022805).

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D was outside control limits due to a decrease in response by 2-hexanone. All associated sample data results for compounds with decreasing responses were qualified as estimated.

The MS/MSD exhibited % recoveries below control limits for methyl acetate and trans-1,3-dichloropropene and above control limits for 1,1-dichloroethane, 1,1-dichloroethene and vinyl chloride,. All associated detected sample data results which exhibited recoveries above control limits and all associated data results which exhibited recoveries below control limits in sample location RFI-36-17 (022805) were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: March 10, 2005
Validation performed by: (Todd A Church)
Date of Validation: April 8, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21243

VOLATILE, SEMIVOLATILE,PCB AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21243 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-09-53 (0-2)	S21243.01	Soil	03/04/2005	X[1]	X[1]	X	X	
RFI-09-53 (8-10)	S21243.02	Soil	03/04/2005	X	X	X	X	
TB-1 (030405)	S21243.03	Groundwater	03/04/2005	X				

1 MS and laboratory duplicate performed on sample.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)		X	
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

Acetone, benzene and toluene were detected in the associated blanks. Associated sample results less than the blank action level were qualified as non-detect for these compounds.

Bromoform and cyclohexane exhibited an initial calibration percent relative standard deviation (%RSD) outside control limits. All associated data sample results were qualified as estimated. Toluene and m,p-xylene exhibited %RSD above control limits but less than 30%, therefore, all associated detect data sample results were qualified as estimated for toluene and m,p-xylene.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All associated non-detect data results were qualified as rejected (R).

The continuing calibrations %D were above control limits due to a decrease in response by several compounds. Data have been qualified as estimated for dichlorodifluoromethane, 2-hexanone, acetone, trans-1,3-dichloropropene, dibromochloromethane, bromoform and 1,2,4-trichlorobenzene in the associated samples based on the %D.

1,2-Dibromo-3-chloropropane exhibited a continuing calibration relative response factor (RRF) less than required control limit. All non-detect data results for 1,2-dibromo-3-chloropropane were qualified as rejected (R).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, acenaphthene, carbazole, dibenzofuran and Phenanthrene were qualified as estimated.

The MS/MSD exhibited % recoveries less than control limits for several compounds. All associated sample results (with the exception of pentachlorophenol which had a % recovery below 10%) with the deviant MS/MSD were qualified as estimated. The associated non-detect sample data result for pentachlorophenol in sample location RFI-09-53 (0-2) was qualified as rejected (R).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)	X		
	Internal standard (Response)			X
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: March 25, 2005
Validation performed by: (Joseph C. Houser)
Date of Validation: April 28, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21260

VOLATILE, SEMIVOLATILE, PCB AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21260 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-02-03R (0-2)[1]	S21260.01	Soil	03/07/2005				X	X
Duplicate 1 (030705)[2]	S21260.04	Soil	03/07/2005				X	X
RB1 (030705)	S21260.05	Groundwater	03/07/2005				X	X
RFI-84-07 (0-2)	S21260.06	Soil	03/07/2005	X	X	X	X	
RFI-84-07 (8-10)	S21260.07	Soil	03/07/2005	X	X	X	X	
RFI-84-07 (15-17)	S21260.08	Soil	03/07/2005	X	X	X	X	
TB2 (030705)	S21260.09	Groundwater	03/07/2005	X	X	X	X	

[1] MS/MSD performed on sample.

[2] Parent Sample RFI-02-03R (0-2).

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

Acetone and toluene were detected in the associated blanks. Associated sample results less than the blank action level were qualified as non-detect for these compounds.

Bromoform and cyclohexane exhibited an initial calibration percent relative standard deviation (%RSD) outside control limits. All associated data sample results were qualified as estimated. Toluene exhibited %RSD above control limits but less than 30%, therefore, all associated detect data sample results were qualified as estimated for toluene.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All associated non-detect data results were qualified as rejected (R).

The continuing calibrations %D were above control limits due to a decrease in response by several compounds. Data have been qualified as estimated for dichlorodifluoromethane, 2-hexanone, acetone, trans-1,3-dichloropropene, dibromochloromethane, bromoform and 1,2,4-trichlorobenzene in the associated samples based on the %D.

1,2-Dibromo-3-chloropropane exhibited a continuing calibration relative response factor (RRF) less than required control limit. All non-detect data results for 1,2-dibromo-3-chloropropane were qualified as rejected (R).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, acenaphthene, dibenzofuran, carbazole and phenanthrene were qualified as estimated in samples RFI-84-07 (0-2) and RFI-84-07 (15-17). All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, 1,1-biphenyl, fluorene and phenanthrene were qualified as estimated in sample RFI-84-07 (8-10).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The MS/MSD exhibited % recoveries less than control limits for soil hexavalent chromium. All associated sample results were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: March 25, 2005
Validation performed by: (Joseph C Houser)
Date of Validation: April 29, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21299

VOLATILE, SEMIVOLATILE, PCB AND INORGANIC ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21299 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-81-51 (0-2)	S21299.01	Soil	03/07/2005	X	X	X	X	X
RFI-81-51 (8-10)	S21299.02	Soil	03/07/2005	X	X	X	X	X
RFI-81-51 (11-13)	S21299.03	Soil	03/07/2005	X	X	X	X	X
RFI-02-14 (2-4)	S21299.04	Soil	03/08/2005	X	X	X	X	X
RFI-02-14 (8-10)	S21299.05	Soil	03/08/2005	X	X	X	X	X
RFI-94-11 (1.5-3.5)	S21299.06	Soil	03/08/2005	X	X	X	X	X
RFI-94-11 (8-10)	S21299.07	Soil	03/08/2005	X	X	X	X	X
RFI-94-11 (10.5-12.5)	S21299.08	Soil	03/08/2005	X	X	X	X	X
TB3 (030805)	S21260.09	Water	03/08/2005	X				

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Bromoform and cyclohexane exhibited an initial calibration percent relative standard deviation (%RSD) outside control limits. All associated data sample results were qualified as estimated. Benzene, toluene and p,m-xylene exhibited %RSD above control limits but less than 30%, therefore, all associated detect data sample results were qualified as estimated for toluene.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All associated non-detect data results were qualified as rejected (R).

The continuing calibrations %D were above control limits due to a decrease in response by several compounds. Data have been qualified as estimated for dichlorodifluoromethane, 2-hexanone, acetone, trans-1,3-dichloropropene, dibromochloromethane, bromoform and 1,2,4-trichlorobenzene in the associated samples based on the %D.

1,2-Dibromo-3-chloropropane exhibited a continuing calibration relative response factor (RRF) less than required control limit. All non-detect data results for 1,2-dibromo-3-chloropropane were qualified as rejected (R).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)		X	
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, 1,1-biphenyl, dibenzofuran, carbazole and phenanthrene were qualified as estimated. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, 1,1-biphenyl, fluorene and phenanthrene were qualified as estimated in sample RFI-02-14 (8-10).

The recovery for one of the acid surrogates (2,4,6-Tribromophenol) was less than control limits and less than 10% for associated sample RFI-02-14 (8-10). The non-detect sample data results for RFI-02-14 (8-10) were qualified as rejected (R) for compounds associated with the deviant surrogate.

The response for the internal standard Perylene-d12 were less than control limits for associated sample RFI-02-14 (8-10). The results for sample RFI-02-14 (8-10) have been qualified as estimated for compounds associated with the deviant internal standard.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)		X	
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The surrogate recoveries were less than control limits for decachlorobiphenyl for samples RFI-81-51 (0-2) and RFI-94-11 (1.5-3.5). Since the surrogate recoveries for tetrachloro-m-xylene met criteria for these samples none of the data have been qualified based on this deviation.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)		X	
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The serial dilutions exhibited %D above control limits for arsenic, barium and zinc. All associated sample data results were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: March 25, 2005
Validation performed by: (Joseph C Houser)
Date of Validation: April 29, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21335

VOLATILE, SEMIVOLATILE, PCB AND INORGANIC ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21335 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-10-32 (0-2)	S21335.01	Soil	03/08/2005	X	X	X	X	X
RFI-10-32 (8-10)	S21335.02	Soil	03/08/2005	X	X	X	X	X
RFI-10-32 (10-12)	S21335.03	Soil	03/08/2005	X	X	X	X	X
RFI-36-53 (0-2)	S21335.04	Soil	03/09/2005	X	X	X	X	X
RFI-36-53 (8-10)	S21335.05	Soil	03/09/2005	X	X	X	X	X
RFI-36-53 (12-14)[1]	S21335.06	Soil	03/09/2005	X	X	X	X	X
Duplicate 2 (030905)[2]	S21335.10	Soil	03/09/2005	X	X	X	X	X
RFI-81-50 (4-6)	S21335.11	Soil	03/09/2005	X	X	X	X	X
RB2 (030905)	S21335.12	Water	03/09/2005	X	X	X	X	X

1 MS/MSD performed on sample.
2 Parent Sample RFI-81-50 (4-6).

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

Acetone, methylene chloride and toluene were detected in the associated blanks. Associated sample results less than the blank action level were qualified as non-detect for these compounds.

Bromoform, 1,2-dibromo-3-chloropropane and cyclohexane exhibited an initial calibration percent relative standard deviation (%RSD) outside control limits. All associated soil data sample results were qualified as estimated. The compound p,m-xylene exhibited an %RSD above control limits but less than 30%, therefore, all associated detect data sample results were qualified as estimated for p,m-xylene.

Bromoform and cyclohexane exhibited an initial calibration percent relative standard deviation (%RSD) outside control limits. All associated data sample results for RB2 (030905) were qualified as estimated for these compounds. Toluene exhibited %RSD above control limits but less than 30%, therefore; the associated detect data sample result for sample RB2 (030905) was qualified as estimated for toluene.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All associated non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were above control limits due to a decrease in response by acetone and 2-hexanone. All associated soil data have been qualified as estimated for acetone and 2-hexanone based on the %D.

The continuing calibrations %D were above control limits due to a decrease in response by several compounds. Associated data have been qualified as estimated for dichlorodifluoromethane, 2-hexanone, acetone, trans-1,3-dichloropropene, dibromochloromethane, bromoform and 1,2,4-trichlorobenzene in sample RB2 (030905) based on the %D.

1,2-Dibromo-3-chloropropane exhibited a continuing calibration relative response factor (RRF) less than required control limit. The associated non-detect data result for 1,2-dibromo-3-chloropropane in sample RB2 (030905) was qualified as rejected (R).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)		X	
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compounds di-n-butyl phthalate and 1,1-biphenyl were detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for di-n-butyl phthalate and1,1-biphenyl.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, 1,1-biphenyl, benzo(a)anthracene, flourene and phenanthrene were qualified as estimated.

The laboratory control sample exhibited percent recoveries less than control limits for 4-chloroaniline. All associated sample results were qualified as estimated for 4-chloroaniline.

The MS/MSD performed on sample location RFI-36-52 (12-14) exhibited percent recoveries less than control limits for several compounds. The MS/MSD concentrations were diluted below the linear analytical range therefore; no data were qualified due to this deviation.

The MS/MSD performed on sample location Duplicate2 (030905) exhibited percent recoveries less than control limits for several compounds. All associated sample results with the deviant MS/MSD were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)		X	
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The surrogate recovery was less than control limits for decachlorobiphenyl for sample RFI-10-32 (0-2). Since the surrogate recovery for tetrachloro-m-xylene met criteria for this sample none of the data have been qualified based on this deviation.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)		X	
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)		X	
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

Cadmium was detected in the associated blanks. Associated sample results less than the blank action level were qualified as non-detect for cadmium.

The serial dilutions exhibited %D above control limits for arsenic, barium and zinc. All associated sample data results were qualified as estimated.

The RPDs between original sample RFI-81-50 (4-6) and duplicate sample Duplicate 2 (030905) were above control limits for cobalt and manganese. All soil data have been qualified as estimated for the cobalt and manganese metals.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by:	Merit Laboratories, Inc. East Lansing, MI
Date of Report:	March 25, 2005
Validation performed by:	(Joseph C Houser)
Date of Validation:	May 2, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21493

VOLATILE, SEMIVOLATILE, PCB AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21493 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-2-14 UNADL	S21636.01	Soil	03/22/2005	X	X	X	X	

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The initial calibrations %RSD were outside control limits for acetone and cyclohexane. All associated data sample results were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were outside control limits due to a decrease in response by 2-butanone, 2-hexanone, acetone, bromoform and dichlorodifluoromethane. All associated sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methyl. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methyl were qualified as estimated.

The continuing calibrations %D were outside control limits due to a decrease in response by hexachlorocyclopentadiene, 2,4-dinitrophenol and 4,6-dinitro-2-methyl. All associated sample data results for compounds with decreasing responses were qualified as estimated

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)	X		
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: April 15, 2005
Validation performed by: (Todd A Church)
Date of Validation: April 26, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21511

VOLATILE, SEMIVOLATILE AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21511 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-2-19 (1.7-4)	S21511.01	Soil	03/22/2005					
RFI-2-17 (8-10)	S21511.02	Soil	03/22/2005					
RFI-2-19 (1.7-4)	S21511.03	Soil	03/22/2005	X	X	X	X	
RFI-2-19 (8-10)	S21511.04	Soil	03/22/2005	X	X	X	X	
RFI-2-18 (1.5-3.5)	S21511.05	Soil	03/22/2005					
RFI-2-18 (8-10)	S21511.06	Soil	03/22/2005					
RFI-2-20 (1.5-3.5)	S21511.07	Soil	03/23/2005	X	X	X	X	
RFI-2-20 (8-10)	S21511.08	Soil	03/23/2005	X	X	X	X	
RFI-2-21 (1.5-3.5)	S21511.09	Soil	03/23/2005	X	X	X	X	
RFI-2-21 (8-10)	S21511.10	Soil	03/23/2005	X	X	X	X	
TB2 (032205)	S21511.11	Soil	03/22/2005	X				

1 MS/MSD performed on sample.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound toluene was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for toluene in sample location RFI-2-19 (1.7-4).

The initial calibrations %RSD were outside control limits for acetone and cyclohexane. All sample data results for acetone and cyclohexane and associated data result for methyl cyclohexane in sample location RFI-2-19 (1.7-4) were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were outside control limits due to a decrease in response by acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, trans-1,3-dichloropropene, dibromochloromethane, bromoform, 1,1,2,2-tetrachloroethane, 1,3-dichlorobenzene, 1,2-dibromo-3-chloropropane and 1,2,4-trichlorobenzene. All associated sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)		X	
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compounds 2-methylnaphthalene and di-n-butyl phthalate were detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for 2-methylnaphthalene and di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, benzo(a)anthracene, fluorene and Phenanthrene were qualified as estimated.

The laboratory control sample exhibited % recovery below the control limit for 4-chloroaniline. Associated sample data results were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: April 15, 2005
Validation performed by: (Todd A Church)
Date of Validation: April 26, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
FLINT OPERATIONS SITE

FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21520

VOLATILE, SEMIVOLATILE, PCB AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21520 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-2-22 (0-3)	S21520.01	Soil	03/23/2005	X	X	X	X	
RFI-2-22 (8-10)	S21520.02	Soil	03/23/2005	X	X	X	X	
RFI-2-22 (11-13)[1]	S21520.03	Soil	03/23/2005	X	X	X	X	
Dup 1 (032305)	S21520.06	Soil	03/23/2005	X	X	X	X	
RB 1 (032305)	S21520.07	Groundwater	03/23/2005	X	X	X	X	
RFI-2-23 (1.7-3.7)	S21520.08	Soil	03/24/2005	X	X	X	X	
RFI-2-23 (8-10)	S21520.09	Soil	03/24/2005	X	X	X	X	
RFI-2-24 (1.3-3.3)	S21520.10	Soil	03/24/2005	X	X	X	X	
RFI-2-24 (8-10)	S21520.11	Soil	03/24/2005	X	X	X	X	
TB3 (032305)	S21520.12	Groundwater	03/23/2005	X				

[1] MS/MSD performed on sample.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound toluene was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for toluene.

The initial calibrations %RSD were outside control limits for acetone and cyclohexane. All sample data results for acetone and cyclohexane and associated detect data results for benzene, ethylbenzene, methyl cyclohexane, p,m-xylene and o-xylene were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were outside control limits due to a decrease in response by acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone, trans-1,3-dichloropropene, dibromochloromethane, dichlorodifluoromethane, bromoform, 1,1,2,2-tetrachloroethane, 1,3-dichlorobenzene, 1,2-dibromo-3-chloropropane and 1,2,4-trichlorobenzene. All associated sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)		X	
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)		X	
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compounds bis(2-ethylhexyl) phthalate and di-n-butyl phthalate were detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for bis(2-ethylhexyl) phthalate and di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methylphenol and associated detect data sample results for anthracene, benzo(a)anthracene, fluorene and Phenanthrene were qualified as estimated.

The internal standard perylene-D12 was below control limit for sample location RFI-2-23 (8-10), RFI-2-24 (1.3-3.3) and RFI-2-24 (8-10). All associated data results have been qualified as estimated based on internal standard deviation for sample location RFI-2-23 (8-10), RFI-2-24 (1.3-3.3) and RFI-2-24 (8-10).

The MS/MSD %RPD exhibited %RPD above control limit for 4-chloroaniline. Associated sample data result for 4-chloroaniline was qualified as estimated in sample location RFI-2-22 (11-13).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by:	Merit Laboratories, Inc. East Lansing, MI
Date of Report:	April 15, 2005
Validation performed by:	(Todd A Church)
Date of Validation:	April 26, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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TIER II
DATA VALIDATION REPORT

SDG# S21636

VOLATILE, SEMIVOLATILE AND METAL ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21636 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-10-32(040405)	S21636.01	Groundwater	04/04/2005	X				
RFI-36-53(040405)[1]	S21636.02	Groundwater	04/04/2005	X				
RFI-83/85-01(040405)[2]	S21636.05	Groundwater	04/04/2005		X			
Dupe03 (040405)	S21636.06	Groundwater	04/04/2005		X			
RFI-81-50(040405)[1, 3]	S21636.07	Groundwater	04/04/2005				X	
Dupe02(040405)	S21636.10	Groundwater	04/04/2005				X	
RFI-81-51(040405)[4]	S21636.11	Groundwater	04/04/2005	X				
Dupe01(040405)	S21636.12	Groundwater	04/04/2005	X				
RFI-02-20(040505)	S21636.13	Groundwater	04/05/2005	X				
RFI-02-21(040505)	S21636.14	Groundwater	04/05/2005	X				
RFI-02-08R(040505)	S21636.15	Groundwater	04/05/2005		X			
RFI-02-22(040505)	S21636.16	Groundwater	04/05/2005	X				
TB-1(040505)	S21636.17	Groundwater	04/05/2005	X				

1 MS/MSD performed on sample.
2 Sample ID Dupe03 is the field duplicate of parent sample location RFI-83/85-01.
3 Sample ID Dupe02 is the field duplicate of parent sample location RFI-81-50.
4 Sample ID Dupe01 is the field duplicate of parent sample location RFI-81-51.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound methylene chloride was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for methylene chloride in all sample locations.

The initial calibrations %RSD were outside control limits for 1,2-dibromo-3-choropropane, bromoform and cyclohexane. All associated data sample results were qualified as estimated. Chloroethane and toluene exhibited %RSD above control limits. All associated detect sample data results were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were outside control limits due to a decrease in response by carbon disulfide, dichlorodifluoromethane methyl cyclohexane and tert-methyl butyl ether (MTBE). All associated sample data results for compounds with decreasing responses were qualified as estimated.

The MS/MSD exhibited % recoveries above control limit for isopropylbenzene and below control limit for trans-1,3-dichloropropene. Associated detect data sample result for isopropylbenzene and associated non-detect sample data result for trans-1,3-dichloropropene were qualified as estimated in sample location RFI-36-53(040405).

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compounds bis(2-ethylhexyl) phthalate and di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for bis(2-ethylhexyl) phthalate and di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol and 4,6-dinitro-2-methyl. All associated sample data results for 2,4-dinitrophenol and 4,6-dinitro-2-methyl were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)	X		
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)	X		
	Field duplicate (RPD)	X		
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by:	Merit Laboratories, Inc. East Lansing, MI
Date of Report:	April 15, 2005
Validation performed by:	(Todd A Church)
Date of Validation:	April 25, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S21663

VOLATILE AND SEMIVOLATILE ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S21663 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
RFI-02-24 (040505)	S21663.01	Groundwater	04/05/2005	X				
RFI-84-07(040505)	S21663.02	Groundwater	04/05/2005	X				
RFI-23-02R(040605)[1]	S21663.03	Groundwater	04/06/2005		X			
RFI-23-01R (040605)	S21663.06	Groundwater	04/06/2005		X			
RFI-12-24 (040605)	S21663.07	Groundwater	04/06/2005		X			
RFI-21-04 (040605)	S21663.08	Groundwater	04/06/2005		X			
TB-2 (040605)	S21663.09	Groundwater	04/06/2005	X				
RFI-94-11 (040705)	S21663.10	Groundwater	04/07/2005	X				
RFI-09-09D (040705)	S21663.12	Groundwater	04/07/2005	X				
RFI-94-11D (040705)	S21663.13	Groundwater	04/07/2005	X				
RFI-09-08D (040705)	S21663.14	Groundwater	04/07/2005	X				
RFI-09-53 (040705)	S21663.15	Groundwater	04/07/2005	X				
RFI-09-54S (040705)	S21663.16	Groundwater	04/07/2005	X				
RFI-02-19 (040805)	S21663.17	Groundwater	04/08/2005	X				
TB-3 (040805)	S21663.18	Groundwater	04/08/2005	X				
RFI-09-55D (040805)	S21663.19	Groundwater	04/08/2005	X				
RFI-09-545D (040805)	S21663.20	Groundwater	04/08/2005	X				
EB-01 (040805)	S21663.21	Groundwater	04/08/2005	X	X			
RFI-09-555 (040805)	S21663.22	Groundwater	04/08/2005	X				

1 MS/MSD performed on sample.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

The initial calibrations %RSD were outside control limits for 1,2-dibromo-3-chloropropene, bromoform, cyclohexane, p,m-xylene and toluene. All associated data results for 1,2-dibromo-3-chloropropene, bromoform and cyclohexane and all associated detect sample data results for p,m-xylene and toluene were qualified as estimated.

Bromomethane exhibited an initial calibration relative response factor (RRF) less than required control limit. All non-detect data results for bromomethane were qualified as rejected (R).

The continuing calibrations %D were outside control limits due to a decrease in response by acetone and tert-methyl butyl ether (MTBE). All associated sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)	X		
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)	X		
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compounds bis(2-ethylhexyl) phthalate and di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for bis(2-ethylhexyl) phthalate and di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, caprolactam and hexachlorocyclopentadiene. All associated sample data results for 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, caprolactam and hexachlorocyclopentadiene were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: April 15, 2005
Validation performed by: (Todd A Church)
Date of Validation: April 25, 2005

GENERAL MOTORS CORPORATION
NORTH AMERICAN OPERATIONS
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FLINT, MICHIGAN

TIER II
DATA VALIDATION REPORT

SDG# S22025

VOLATILE AND SEMIVOLATILE ANALYSES

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary

The following is an assessment of data package S22025 for sampling in support of the RCRA Facility Investigation at the GM-NAO Flint Operations Site in Flint, Michigan. Included in this assessment are checklists used in the review of the samples and a summary of non-conformances and their impact on the reported data. Analyses were performed on the following samples:

Sample ID	Laboratory ID	Matrix	Sample Date	Analyses				
				VOC	SVOC	PCB	TAL	MISC
Outfall 005 (042805)[1]	S22025.01	Sludge	04/28/2005	X	X	X	X	X
Outfall 011(042805)	S22025.02	Sludge	04/28/2005	X	X	X	X	X
Outfall 013(042805)	S22025.03	Sludge	04/28/2005	X	X	X	X	X

[1] MS/MSD performed on sample for method 8270 only.

Sample Analysis: Volatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound methylene chloride was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for methylene chloride in all sample locations.

The initial calibrations %RSD were outside control limits for cyclohexane. All associated data results for cyclohexane were qualified as estimated.

The continuing calibrations %D were outside control limits due to a decrease in response by 1,2,4-trichlorobenzene, 1,2-dibromo-3-chloropropene and bromoform. All associated sample data results for compounds with decreasing responses were qualified as estimated.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Semivolatiles

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)		X	
	Continuing calibration (%D, RF)		X	
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)		X	
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	Internal standard (Response, RT)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)		X	
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples		X	

Notes

The compound di-n-butyl phthalate was detected in the associated blanks. Sample results less than the blank action level were qualified as non-detect for di-n-butyl phthalate.

The initial calibrations %RSD were above control limits for 2,4-dinitrophenol, 4-chloroaniline, benzo(ghi)perylene, dibenzo(ah)anthracene, hexachlorocyclopentadiene and indeno(1,2,3-cd)pyrene. All associated sample data results were qualified as estimated.

The continuing calibrations %D were outside control limits due to a decrease in response by 4-chloroaniline. All associated sample results for compounds with decreasing responses were qualified as estimated.

The MS/MSD RPD was above control limits for 2,4-dinitrophenol. The associated sample result was qualified as estimated in sample location Outfall 005 (042805).

The MS/MSD recoveries were below control limits in sample location Outfall 005 (042805) for 2,4-dinitrophenol, hexachloroethane and hexachlorocyclopentadiene all associated sample results were qualified as estimated with the exception of hexachlorocyclopentadiene, which exhibited a MS/MSD recovery of less than 10%; therefore, the associated non-detect sample result was qualified as rejected.

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: PCBs

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%RSD, R2, RF)	X		
	Continuing calibration (%D, RF)	X		
	Surrogate (%Recovery)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

All data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Sample Analysis: Metals

Quality Control Checks

		YES	NO	NA
1.	Field Chain-of-Custody complete	X		
2.	Proper methods for analysis used	X		
3.	All documentation supplied	X		
4.	Samples analyzed within specified holding times	X		
5.	The minimum number of field and laboratory QC samples analyzed	X		
6.	Accuracy maintained within established ranges for the following:			
	Initial calibration (%R, R2)	X		
	Continuing calibration (%D)	X		
	Matrix spike (%Recovery)			X
	Blank spike (%Recovery)			X
	Control sample (%Recovery)	X		
	CRDL standard (%R)			X
	Serial dilution (%D)			X
	Internal standard (Response)	X		
7.	Precision maintained within established ranges for the following:			
	Matrix spike (RPD)			X
	Laboratory duplicate (RPD)			X
	Field duplicate (RPD)			X
8.	Target analyte concentrations below detection limit in all blank samples	X		

Notes

Other than for the deviations noted in this review, all data quality parameters were within method-specified limits and the data is acceptable for use as reported by the laboratory.

Analyses performed by: Merit Laboratories, Inc. East Lansing, MI
Date of Report: May 23, 2005
Validation performed by: (Todd A Church)
Date of Validation: June 2, 2005

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MEMORANDUM

TO:	Lisa Coffey	REF. NO.:	17307-195004
FROM:	Paul McMahon/cs/2 Pm	DATE:	July 7, 2005
			E-Mail and U.S. Mail
C.C.:	JoAnn Robertson		
RE:	**Data Quality Assessment and Validation Site Investigation General Motors – NAO Flint Operations Flint, Michigan**		

The following details a quality assessment and validation of the analytical data resulting from the collection of 21 water, two trip blank, two equipment blank, and two field duplicate samples from the General Motors Site (Site) in Flint, Michigan in June 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodology presented in Table 2. The QC criteria used to assess the data were established by the method and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999; and

ii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time period is presented in the analytical method. All samples were prepared and analyzed within the method-required holding time. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and all data showed acceptable sensitivity and linearity.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all Relative Response Factors (RRFs) values must be greater than or equal to 0.05; and

ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and all results met the above criteria for instrument sensitivity. Some VOCs exhibited variability in instrument response. Associated sample data for these compounds were qualified as estimated (see Table 3).

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. The blank results were non-detect for the analytes of interest , demonstrating that laboratory contamination was not a factor for this program.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the method employed, all samples, blanks, and QA/QC standards analyzed for VOCs were spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against laboratory control limits. All sample surrogate recoveries were within the laboratory specified control limits, demonstrating acceptable analytical accuracy.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all VOCs. The LCS recoveries were within the laboratory specified control limits for all analytes of interest except some high VOC recoveries. Associated non-detect VOC results were not impacted by the indicated high bias in the LCS. One detected VOC sample result was associated with a high LCS recovery, and was qualified as estimated (see Table 4).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

MS/MSD samples are prepared and analyzed with each sample batch. The recoveries of spike analyses are used to assess the analytical accuracy achieved on individual sample matrices. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as shown in Table 1. Most MS/MSD recoveries were within laboratory control limits demonstrating acceptable overall analytical accuracy and precision. High recoveries were reported for some VOCs. The non-detect results associated with high MS/MSD recoveries were not impacted, and no qualification was performed.

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and

ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All sample IS results met the above criteria and all were correctly used to calculate sample results.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

Trip Blanks - VOCs

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. Trip blanks were collected at the proper frequency, and all results were non-detect for the analytes of interest.

Field Duplicates

Two samples were collected in duplicate as summarized in Table 1 and submitted to the laboratory for analysis. All sample results showed acceptable sampling and analytical precision.

Equipment Blanks

To assess contamination from field equipment cleaning activities, two equipment blanks were collected as identified in Table 1. Most sample results were non-detect for the analytes of interest. Chloroform was detected in the blanks. All associated sample results were either non-detect or significantly greater than the contamination present, and no qualification of the data was performed.

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used as reported.

TABLE 1
SAMPLE COLLECTION AND ANALYSIS SUMMARY
SITE INVESTIGATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE 2005

				Parameter	
Sample ID	*Location ID*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*TCL VOCs*	*Comments*
RFI-84-05(060805)	RFI-84-05	6/8/2005	14:34	X	
RFI-36-18(060805)	RFI-36-18	6/8/2005	16:36	X	
RFI-09-04R(060805)	RFI-09-04R	6/8/2005	13:20	X	
RFI-36-44(060805)	RFI-36-44	6/8/2005	16:31	X	
84-7(060805)	84-7	6/8/2005	15:09	X	
RFI-09-53(060805)	RFI-09-53	6/8/2005	13:28	X	
TB-01(060805)	-	6/8/2005	-	X	Trip Blank
36-FP1(060905)	36-FP1	6/9/2005	16:25	X	
RFI-36-46(060905)	RFI-36-46	6/9/2005	15:31	X	
RFI-36-03(060905)	RFI-36-03	6/9/2005	14:25	X	
84-6RZ(060905)	84-6RZ	6/9/2005	12:38	X	MS/MSD
RFI-17-02(060905)	RFI-17-02	6/9/2005	11:08	X	
RFI-10-32(060905)	RFI-10-32	6/9/2005	9:50	X	
Dupe-01(060905)	RFI-10-32	6/9/2005	-	X	Duplicate of RFI-10-32(060905)
EB-01(060905)	-	6/9/2005	16:49	X	Equipment Blank
TB-02(060905)	-	6/9/2005	-	X	Trip Blank
36-100(061005)	36-100	06/10/05	14:35	X	
RFI-36-48(061005)	RFI-36-48	06/10/05	10:00	X	
RFI-36-47(061005)	RFI-36-47	06/10/05	12:35	X	
RFI-36-17(061005)	RFI-36-17	06/10/05	11:20	X	
RFI-36-51(061005)	RFI-36-51	06/10/05	3:15	X	
EB-02(061005)	-	06/10/05	15:45	X	Equipment Blank
RFI-36-05(061005)	RFI-36-05	06/10/05	13:50	X	
RFI-36-45(061005)	RFI-36-45	06/10/05	12:20	X	
Dupe-02(061005)	RFI-36-45	06/10/05	-	X	Duplicate of RFI-36-45(061005)
RFI-36-37(061005)	RFI-36-37	06/10/05	11:25	X	MS/MSD
RFI-36-53(061005)	RFI-36-53	06/10/05	9:44	X	

Notes:

TCL	Target Compound List.
VOCs	Volatile Organic Compounds.
MS/MSD	Matrix Spike/Matrix Spike Duplicate.

TABLE 2

SUMMARY OF ANALYTICAL METHODOLOGIES
SITE INVESTIGATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE 2005

Parameter	*Method*
TCL VOCs	SW-846 8260[1]

Notes:

1	"Test Methods for Solid Waste Physical/Cehmical Methods", SW-846, 3rd Edition, September 1986 (with subsequent revisions).
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS

SITE INVESTIGATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Volatiles	06/12/05	Dichlorodifluoromethane(CFC-12)	29	RFI-36-03(060905)	1 U	ug/L	UJ
	06/13/05	Chloroethane	31	RFI-36-45(061005)	5	ug/L	J
				RFI-36-37(061005)	5	ug/L	J
				Dupe-02(061005)	4	ug/L	J
				36-FP1(060905)	69	ug/L	J
				RFI-36-53(061005)	7	ug/L	J
				RFI-10-32(060905)	110	ug/L	J

Notes:

J	Estimated.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
% D	Percent Difference.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY CONTROL SAMPLE RESULTS

SITE INVESTIGATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE 2005

Parameter	*Compound*	*Percent Recovery*	*Control Limits (percent)*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Volatiles	Trichlorofluoromethane (CFC-11)	125	79-121	RFI-09-04R(060805)	5	ug/L	J

Notes:
J Estimated.

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MEMORANDUM

TO: Lisa Coffey

FROM: Angela Bown/js/9 AB/gf

C.C.: JoAnn Robertson, Paul McMahon

RE: **Data Quality Assessment and Validation**
Monitoring Well Installation
General Motors – NAO Flint Operations
Flint, Michigan

REF. NO.: 17307-195006

DATE: August 24, 2005

E-Mail and U.S. Mail

PREVIOUSLY TRANSMITTED BY E-MAIL

The following details a quality assessment and validation of the analytical data resulting from the collection of 29 soil, two trip blank, one rinse blank, and two field duplicate samples from the General Motors Site (Site) in Flint, Michigan, from June 28 to July 15, 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodologies presented in Table 2. The QC criteria used to assess the data were established by the methods and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999;

ii) "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review", EPA 540/R-94-013, February 1994; and

iii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time periods are presented in the analytical methods. All samples were prepared and analyzed within the method-required holding times. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) and semi-volatile organic compound decafluorotriphenylphosphine (DFTPP), respectively. The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC and SVOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and the data showed acceptable sensitivity and linearity with the exception of the data presented in Table 3 with qualifiers.

Initial Calibration - Organics, GC

To quantify compounds of interest, calibration of the GC over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve is analyzed for Aroclors 1254, 1016, and 1260, while the other Aroclors are calibrated using one point.

Linearity of the calibration curves are acceptable if %RSD values are less than or equal to 20 percent or if the correlation coefficient is greater than 0.995. Retention time windows are also calculated from the initial calibration analyses. These windows are then used to identify all compounds of interest in subsequent analyses.

Initial calibration standards were analyzed at the required frequencies. All retention time and linearity criteria were satisfied.

Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) - Mass Calibration and Resolution Checks - Metal Analyses

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each ICP/MS instrument used for metals analyses was checked prior to calibration before initiating an analysis sequence through the analysis of a tuning solution. The results of the tuning solution analysis were reviewed against the following criteria:

i) analyze tuning solution a minimum of four times with a %RSD of less than or equal to five for the analytes contained in the tuning solution; and

ii) the mass resolution must be within 0.1 atomic mass unit (amu) of the true value over the analytical range.

Instrument performance check data were reviewed. The tuning solution was analyzed at the required frequency throughout the analyses. The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration – Inorganic Analyses

To calibrate the ICP/MS, a calibration blank and at least one standard must be analyzed to establish the analytical curve. For mercury analyses, a calibration blank and a minimum of five standards must be analyzed to establish the analytical curve. Resulting correlation coefficients for mercury curves must be at least 0.995.

After calibration, an initial calibration verification (ICV) standard must be analyzed to verify the analytical accuracy of the calibration curves within a method-specific percent recovery of the accepted or true value.

A review of the data showed that all calibration curves and ICVs were analyzed at the proper frequencies and were within the acceptance criteria.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all RRF values must be greater than or equal to 0.05; and

ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and most results met the above criteria for instrument sensitivity and linearity of response. Some VOCs and SVOCs exhibited variability in instrument response. Associated sample data for these compounds were qualified as estimated (see Table 4).

Continuing Calibration - Organics, GC

To ensure that the calibration of the instrument is valid throughout the sample analysis period, continuing calibration standards are analyzed and evaluated on a regular basis. To evaluate the continued linearity of the calibration, %D values are calculated for each compound in all continuing standards and assessed against an acceptance criterion of 15 percent.

To ensure that compound retention times do not vary over the analysis period, all retention times must fall within the established retention time windows.

Continuing calibration standards were analyzed at the required frequency and all method criteria were met for analyte linearity with the exception of the data presented in Table 4 with qualifiers.

Continuing Calibration - Inorganics

Continuing calibration criteria for inorganic analyses were the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. The blank results were non-detect for the analytes of interest, with the exception of the sample data presented in Table 5 with qualifiers.

Laboratory Blank Samples - Inorganic Analyses

Metals analyses include the analysis of initial calibration blanks (ICB) and continuing calibration blanks (CCB) to assess the presence and the magnitude of sample contamination introduced during sample analysis. The CCBs are analyzed at a minimum frequency of one every 10 samples and target analytes should be non-detect.

Several ICB and CCBs were reported with detectable concentrations of target analytes. The samples presented in Table 6 should be qualified due to ICB and CCB contamination above the laboratory method detection limits (MDL). The remaining ICB and CCBs were reported to be free from detectable levels of target analytes, indicating no additional laboratory-attributable contamination occurred.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the methods employed, all samples, blanks, and standards analyzed for VOCs, SVOCs, and polychlorinated biphenyls (PCBs) were spiked with surrogate compounds prior to sample extraction and/or analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against laboratory control limits. For the SVOC method, it is acceptable for one surrogate recovery per fraction (base neutral or acid phenolic) to fall outside of these limits, provided it is greater than 10 percent. All surrogate recoveries were within the laboratory specified control limits for VOCs and SVOCs, demonstrating acceptable analytical accuracy. The surrogate, decachlorobiphenyl (DCB) recovered outside of acceptable limits for some samples for PCB analysis. Table 7 presents the sample data that should be qualified due to surrogate failure.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all parameters. The LCS recoveries were within the laboratory specified control limits for all analytes of interest except for certain VOC and SVOC compounds. Table 8 presents the data that are qualified due to LCS failures.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

MS/MSD samples are prepared for each parameter and analyzed with each sample batch for the organic parameters. MS/MSD samples are prepared and analyzed with the samples for each metal. The recoveries of spike analyses are used to assess the analytical accuracy achieved on individual sample matrices. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as shown in Table 1. The laboratory performed additional analyses internally. Most MS/MSD recoveries were within laboratory control limits demonstrating acceptable overall analytical accuracy and precision. Outlying recoveries were reported for VOCs and SVOCs. Non-detect results associated with outlying RPDs or high MS/MSD recoveries were not impacted, and no qualification was performed. No qualification was performed when only the MS or MSD was slightly outside of control limits. Some low VOC, SVOC, and PCB MS/MSD recoveries were associated with non-detected and detected sample results, and the results were qualified as estimated (see Table 9 and Table 10).

Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) Interference Check Sample (ICS) Analysis

To verify that proper inter-element and background correction factors have been established by the laboratory, ICSs are analyzed. These samples contain high concentrations of aluminum, calcium, magnesium, and iron and are analyzed at the end of each sample analysis period.

ICS analysis results were evaluated for all samples. All ICS recoveries were within the established control limits of 80 to 120 percent.

Serial Dilution - Inorganic Analyses

The serial dilution determines whether significant physical or chemical interferences exist due to sample matrix. A minimum of one per 20 investigative samples is analyzed at a five-fold dilution. For samples with sufficient analyte concentrations (>50 times the MDL), the serial dilution results must agree within 10 percent of the original results.

Serial dilution analyses were performed and the results were acceptable.

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC and SVOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and

ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All sample IS results met the above criteria and all were correctly used to calculate sample results.

Internal Standard Summaries - Inorganic Analyses

To correct for variability in the ICP/MS response and sensitivity, IS are added to all samples. Overall instrument stability and performance for metals analyses was monitored using the IS intensity data which are evaluated against the following criteria:

i) the IS intensities in samples must recover between 30 and 120 percent of the true value; and
ii) the IS intensities in instrument calibration checks (CCVs and CCBs) must recover between 80 and 120 percent of the true value.

A review of the ICP/MS metals IS data showed that the IS intensities were within the acceptance criteria.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

Trip Blanks - VOCs

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. Trip blanks were collected at the proper frequency, and all results were non-detect for the analytes of interest.

Field Duplicates

Two samples were collected in duplicate as summarized in Table 1 and submitted to the laboratory for analysis. Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample sets. The RPDs associated with these duplicate samples must be less than 50 and 100 percent for water and soil samples, respectively. If the reported concentration in either the investigative sample or its duplicate is less than five times the RL, the evaluation criteria is one or two times the RL value for water and soil samples, respectively.

Table 11 presents the RPDs of detected analytes in duplicate sample sets with qualifiers.

Rinse Blanks

To assess contamination from field equipment cleaning activities, a rinse blank was collected as identified in Table 1. Most sample results were non-detect for the analytes of interest. VOCs and SVOCs were detected in the rinse blank. Most associated sample results were either non-detect or were significantly greater in concentration, and were not impacted. Associated sample results with comparable concentrations were qualified as non-detect (see Table 12).

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision based on the provided information and may be used with the qualifications noted.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Sample ID	*Location ID*	*Start Depth (ft bgs)*	*End Depth (ft bgs)*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*Analysis/Parameters*				*Comments*
						TCL VOCs	*TCL SVOCs*	*PCBs*	*Site Metals/Cyanide*	
RFI-10-35(0-2)	RFI-10-35	0	2	06/28/05	8:10	X	X	X	X	
RF1-10-35(8-10)	RF1-10-35	8	10	06/28/05	9:25	X	X	X	X	
RFI-10-36(0-2)	RFI-10-36	0	2	06/28/05	10:02	X	X	X	X	
RF1-10-36(8-10)	RF1-10-36	8	10	06/28/05	10:19	X	X	X	X	
RFI-10-34(0-2)	RFI-10-34	0	2	06/28/05	11:22	X	X	X	X	
RF1-10-34(8-10)	RF1-10-34	8	10	06/28/05	11:44	X	X	X	X	
RFI-10-33(0-2)	RFI-10-33	0	2	06/28/05	13:48	X	X	X	X	
RF1-10-33(8-10)	RF1-10-33	8	10	06/28/05	14:10	X	X	X	X	
RFI-84-8(2-3)	RFI-84-8	2	3	06/28/05	16:24	X	X	X	X	
RFI-84-8(8-10)	RFI-84-8	8	10	06/28/05	16:39	X	X	X	X	
RFI-84-8(28-30)	RFI-84-8	28	30	06/29/05	16:24	X	X	X	X	
RFI-84-7(2-4)	RFI-84-7	2	4	06/30/05	8:02	X	X	X	X	
RFI-84-7(14-16)	RFI-84-7	14	16	06/30/05	8:38	X	X	X	X	
RFI-09-56(0-2)	RFI-09-56	0	2	06/30/05	14:25	X	X	X	X	
RFI-09-56(2-4)	RFI-09-56	2	4	06/30/05	14:30	X	X	X	X	
RFI-84-7(8-10)	RFI-84-7	8	10	06/30/05	4:24	X	X	X	X	
RFI-09-57(0-2)	RFI-09-57	0	2	07/01/05	12:05	X	X	X	X	MS/MSD
RF1-09-57(4-6)	RF1-09-57	4	6	07/01/05	12:14	X	X	X	X	
Duplicate 1	RF1-09-57	-	-	07/01/05	-	X	X	X	X	Duplicate of RF1-09-57(4-6)
RFI-36-55(0-2)	RFI-36-55	0	2	07/01/05	9:10	X	X	X	X	
RFI-36-55(8-10)	RFI-36-55	8	10	07/01/05	9:45	X	X	X	X	
Rinse Blank 1(7/1/05)	Rinse Blank	-	-	07/01/05	12:00	X	X	X	X	Rinse Blank
Trip Blank	Trip Blank	-	-	07/01/05	-	X				Trip Blank
RFI-09-58(0-2')	RFI-09-58	0	2	07/13/05	10:05	X	X	X	X	
RFI-09-58(8-10')	RFI-09-58	8	10	07/13/05	10:25	X	X	X	X	
RFI-36-56(0-2')	RFI-36-56	0	2	07/13/05	15:35	X	X	X	X	
RFI-36-56(6-8')	RFI-36-56	6	8	07/13/05	15:45	X	X	X	X	
RFI-36-54(0-2')	RFI-36-54	0	2	07/14/05	9:55	X	X	X	X	MS/MSD
RFI-36-54(8-10')	RFI-36-54	8	10	07/14/05	10:35	X	X	X	X	
RFI-36-54(14-16')	RFI-36-54	14	16	07/14/05	10:50	X	X	X	X	
DUP-1	RFI-36-54	14	16	07/14/05	-	X	X	X	X	Duplicate of RFI-36-54(14-16')
TB-071505	Trip Blank	-	-	07/15/05	-	X				Trip Blank

Notes:

-	Not applicable.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
PCB	Polychlorinated Biphenyls.
SVOC	Semi-Volatile Organic Compound.
TCL	Target Compound List.
VOC	Volatile Organic Compound.

TABLE 2

SUMMARY OF ANALYTICAL METHODS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Method*[1]
TCL VOC	SW-846-8260B
TCL SVOCs	SW-846-8270C
PCBs	SW-846-8082
Select Metals	SW-846-6020/7471A/9012

Notes:

1	"Test Methods for Solid Waste/Physical Chemical Methods", SW-846, 3rd Edition, September 1986 (with all subsequent revisions).
PCB	Polychlorinated Biphenyls.
SVOC	Semi-Volatile Organic Compound.
TCL	Target Compound List.
VOC	Volatile Organic Compound.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING INITIAL CALIBRATION RESULTS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Compound*	*Calibration Date*	*%RSD*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Semi-volatiles	4-Chloroaniline	06/20/05	35	RFI-10-33(0-2)	670 U	µg/Kg	UJ
				RFI-10-33(8-10)	670 U	µg/Kg	UJ
				RFI-10-34(0-2)	670 U	µg/Kg	UJ
				RFI-10-34(8-10)	670 U	µg/Kg	UJ
				RFI-10-35(0-2)	670 U	µg/Kg	UJ
				RFI-10-35(8-10)	670 U	µg/Kg	UJ
				RFI-10-36(0-2)	670 U	µg/Kg	UJ
				RFI-10-36(8-10)	670 U	µg/Kg	UJ
				RFI-84-8(2-3)	670 U	µg/Kg	UJ
				RFI-84-8(8-10)	670 U	µg/Kg	UJ
				RFI-84-8(28-30)	670 U	µg/Kg	UJ
				RFI-09-56(0-2)	670 U	µg/Kg	UJ
				RFI-09-56(2-4)	670 U	µg/Kg	UJ
				RFI-36-55(0-2)	670 U	µg/Kg	UJ
				RFI-36-55(8-10)	670 U	µg/Kg	UJ
				RFI-84-7(14-16)	670 U	µg/Kg	UJ
				RFI-84-7(2-4)	600 U	µg/Kg	UJ
				RFI-84-7(8-10)	670 U	µg/Kg	UJ
				RFI-09-57(0-2)	670 U	µg/Kg	UJ
				RFI-09-57(4-6)	670 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	670 U	µg/Kg	UJ

Notes:

%RSD	Percent Relative Standard Deviation.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Semi-volatiles	07/14/05	Benzo(k)fluoranthene	32.9	RFI-10-33(0-2)	50 J	µg/Kg	J
				RFI-10-34(0-2)	70 J	µg/Kg	J
				RFI-84-8(8-10)	200 J	µg/Kg	J
Volatiles	07/13/05	Dichlorodifluoromethane	34.9	RFI-36-55(0-2)	50 U	µg/Kg	UJ
				RFI-36-55(8-10)	60 U	µg/Kg	UJ
				RFI-84-7(2-4)	60 U	µg/Kg	UJ
Volatiles	07/26/05	Dichlorodifluoromethane	37.3	RFI-09-58(0-2)	50 U	µg/Kg	UJ
				RFI-09-58(8-10)	60 U	µg/Kg	UJ
				RFI-36-54(0-2)	50 U	µg/Kg	UJ
				RFI-36-54(14-16)	50 U	µg/Kg	UJ
				RFI-36-54(8-10)	60 U	µg/Kg	UJ
				RFI-36-56(0-2)	60 U	µg/Kg	UJ
				RFI-36-56(6-8)	50 U	µg/Kg	UJ
				RFI-36-54(14-16) DUP	50 U	µg/Kg	UJ
PCBs	07/11/05	Aroclor-1016	16.2	RFI-09-56(0-2)	330 U	µg/Kg	UJ
				RFI-09-56(2-4)	330 U	µg/Kg	UJ
				RFI-36-55(0-2)	330 U	µg/Kg	UJ
				RFI-36-55(8-10)	330 U	µg/Kg	UJ
				RFI-84-7(14-16)	330 U	µg/Kg	UJ
				RFI-84-7(2-4)	330 U	µg/Kg	UJ
				RFI-84-7(8-10)	330 U	µg/Kg	UJ
				RFI-09-57(4-6)	330 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	330 U	µg/Kg	UJ
PCBs	07/11/05	Aroclor-1221	16.2	RFI-09-56(0-2)	330 U	µg/Kg	UJ
				RFI-09-56(2-4)	330 U	µg/Kg	UJ
				RFI-36-55(0-2)	330 U	µg/Kg	UJ
				RFI-36-55(8-10)	330 U	µg/Kg	UJ
				RFI-84-7(14-16)	330 U	µg/Kg	UJ
				RFI-84-7(2-4)	330 U	µg/Kg	UJ
				RFI-84-7(8-10)	330 U	µg/Kg	UJ
				RFI-09-57(4-6)	330 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	330 U	µg/Kg	UJ
PCBs	07/11/05	Aroclor-1232	16.2	RFI-09-56(0-2)	330 U	µg/Kg	UJ
				RFI-09-56(2-4)	330 U	µg/Kg	UJ
				RFI-36-55(0-2)	330 U	µg/Kg	UJ
				RFI-36-55(8-10)	330 U	µg/Kg	UJ
				RFI-84-7(14-16)	330 U	µg/Kg	UJ
				RFI-84-7(2-4)	330 U	µg/Kg	UJ
				RFI-84-7(8-10)	330 U	µg/Kg	UJ
				RFI-09-57(4-6)	330 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	330 U	µg/Kg	UJ
PCBs	07/11/05	Aroclor-1242	16.2	RFI-09-56(0-2)	330 U	µg/Kg	UJ
				RFI-09-56(2-4)	330 U	µg/Kg	UJ
				RFI-36-55(0-2)	330 U	µg/Kg	UJ
				RFI-36-55(8-10)	330 U	µg/Kg	UJ
				RFI-84-7(14-16)	330 U	µg/Kg	UJ
				RFI-84-7(2-4)	330 U	µg/Kg	UJ
				RFI-84-7(8-10)	330 U	µg/Kg	UJ
				RFI-09-57(4-6)	330 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	330 U	µg/Kg	UJ

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
PCBs	07/11/05	Aroclor-1248	16.2	RFI-09-56(0-2)	330 U	µg/Kg	UJ
				RFI-09-56(2-4)	330 U	µg/Kg	UJ
				RFI-36-55(0-2)	330 U	µg/Kg	UJ
				RFI-36-55(8-10)	330 U	µg/Kg	UJ
				RFI-84-7(14-16)	330 U	µg/Kg	UJ
				RFI-84-7(2-4)	330 U	µg/Kg	UJ
				RFI-84-7(8-10)	330 U	µg/Kg	UJ
				RFI-09-57(4-6)	330 U	µg/Kg	UJ
				Dup-RFI-09-57(4-6)	330 U	µg/Kg	UJ
PCBs	07/12/05	Aroclor-1016	16.6	RFI-09-57(0-2)	330 U	µg/Kg	UJ
PCBs	07/12/05	Aroclor-1221	16.6	RFI-09-57(0-2)	330 U	µg/Kg	UJ
PCBs	07/12/05	Aroclor-1232	16.6	RFI-09-57(0-2)	330 U	µg/Kg	UJ
PCBs	07/12/05	Aroclor-1242	16.6	RFI-09-57(0-2)	330 U	µg/Kg	UJ
PCBs	07/12/05	Aroclor-1248	16.6	RFI-09-57(0-2)	330 U	µg/Kg	UJ

Notes:

%D	Percent Difference.
J	Estimated.
PCBs	Polychlorinated Biphenyls.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE METHOD BLANKS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Analysis Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Result*
Semi-volatiles	07/14/05	bis(2-Ethylhexyl)phthalate	0.31	RFI-10-33(0-2)	50 J	330U
				RFI-10-34(0-2)	30 J	330U
Semi-volatiles	07/14/05	Di-n-butylphthalate	0.34	RFI-10-33(0-2)	40 J	330U
				RFI-10-34(0-2)	30 J	330U
				RFI-10-35(0-2)	30 J	330U
				RFI-10-36(8-10)	20 J	330U
				RFI-84-8(2-3)	20 J	330U
Semi-volatiles	07/14/05	Di-n-butylphthalate	0.26	RFI-09-56(0-2)	30 J	330U
				RFI-09-56(2-4)	40 J	330U
				RFI-36-55(0-2)	30 J	330U
				RFI-36-55(8-10)	20 J	330U
				RFI-84-7(2-4)	20 J	330U
				RFI-84-7(8-10)	30 J	330U
Semi-volatiles	07/14/05	Di-n-butylphthalate	0.21	Dup-RFI-09-57(4-6)	30 J	330U
Semi-volatiles	07/25/05	Di-n-butylphthalate	0.17	RFI-09-58(0-2)	50 J	330U
				RFI-36-54(0-2)	80 J	330U

Notes:

U	Non-detect at associated value.
J	Estimated.

TABLE 6

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN INSTRUMENT BLANKS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Analysis Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Result*	*Units*
Metals	07/12/05	Arsenic	0.7	RFI-10-34(8-10)	0.64	0.64 U	mg/Kg
				RFI-84-8(2-3)	0.68	0.68 U	mg/Kg
				RFI-09-57(4-6)	0.58	0.58 U	mg/Kg
				Dup-RFI-09-57(4-6)	0.46	0.46 U	mg/Kg
Metals	07/12/05	Selenium	2.8	RFI-10-33(0-2)	0.29	0.29 U	mg/Kg
				RFI-10-34(0-2)	0.30	0.30 U	mg/Kg
				RFI-10-35(0-2)	0.21	0.21 U	mg/Kg
				RFI-10-36(0-2)	0.23	0.23 U	mg/Kg
				RFI-84-8(2-3)	0.15 J	0.20 U	mg/Kg
				RFI-84-8(28-30)	0.82	0.82 U	mg/Kg
				RFI-84-8(8-10)	0.58	0.58 U	mg/Kg
				RFI-09-56(0-2)	0.18 J	0.20 U	mg/Kg
				RFI-09-56(2-4)	0.40	0.40 U	mg/Kg
				RFI-36-55(0-2)	0.22	0.22 U	mg/Kg
				RFI-36-55(8-10)	0.36	0.36 U	mg/Kg
				RFI-84-7(14-16)	0.92	0.92 U	mg/Kg
				RFI-84-7(2-4)	0.87	0.87 U	mg/Kg
				RFI-84-7(8-10)	0.64	0.64 U	mg/Kg
				RFI-09-57(0-2)	0.40	0.40 U	mg/Kg
				RFI-09-57(4-6)	0.17 J	0.20 U	mg/Kg
				Dup-RFI-09-57(4-6)	0.19 J	0.20 U	mg/Kg
Metals	07/20/05	Selenium	1.8	RFI-09-58(0-2)	0.35	0.35 U	mg/Kg
				RFI-09-58(8-10)	0.37	0.37 U	mg/Kg
				RFI-36-54(0-2)	0.11 J	0.20 U	mg/Kg
				RFI-36-54(14-16)	0.28	0.28 U	mg/Kg
				RFI-36-54(8-10)	0.14 J	0.20 U	mg/Kg
				RFI-36-56(0-2)	0.15 J	0.20 U	mg/Kg
				RFI-36-54(14-16) DUP	0.23	0.23 U	mg/Kg
Metals	07/12/05	Silver	0.09	RFI-10-33(0-2)	0.09 J	0.10 U	mg/Kg
				RFI-10-35(0-2)	0.02 J	0.10 U	mg/Kg
				RFI-10-36(0-2)	0.09 J	0.10 U	mg/Kg
				RFI-84-8(2-3)	0.02 J	0.10 U	mg/Kg
				RFI-84-8(28-30)	0.03 J	0.10 U	mg/Kg
				RFI-84-8(8-10)	0.02 J	0.10 U	mg/Kg
				RFI-09-56(0-2)	0.02 J	0.10 U	mg/Kg
				RFI-84-7(2-4)	0.02 J	0.10 U	mg/Kg
				RFI-36-55(0-2)	0.07 J	0.10 U	mg/Kg
				RFI-84-7(14-16)	0.05 J	0.10 U	mg/Kg
				RFI-09-57(0-2)	0.05 J	0.10 U	mg/Kg
Metals	07/12/05	Thallium	0.15	RFI-10-33(8-10)	0.02 J	0.50 U	mg/Kg
				RFI-10-34(0-2)	0.13 J	0.50 U	mg/Kg
				RFI-10-34(8-10)	0.02 J	0.50 U	mg/Kg
				RFI-10-35(0-2)	0.04 J	0.50 U	mg/Kg
				RFI-10-35(8-10)	0.02 J	0.50 U	mg/Kg
				RFI-10-36(0-2)	0.07 J	0.50 U	mg/Kg
				RFI-84-8(28-30)	0.09 J	0.50 U	mg/Kg
				RFI-09-56(0-2)	0.03 J	0.50 U	mg/Kg
				RFI-36-55(0-2)	0.12 J	0.50 U	mg/Kg
				RFI-84-7(14-16)	0.12 J	0.50 U	mg/Kg
				RFI-84-7(2-4)	0.05 J	0.50 U	mg/Kg
				RFI-84-7(8-10)	0.02 J	0.50 U	mg/Kg
				RFI-09-57(0-2)	0.09 J	0.50 U	mg/Kg
				RFI-09-57(4-6)	0.02 J	0.50 U	mg/Kg
				Dup-RFI-09-57(4-6)	0.02 J	0.50 U	mg/Kg

TABLE 6

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN INSTRUMENT BLANKS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Analysis Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Result*	*Units*
Metals	07/20/05	Thallium	0.11	RFI-09-58(8-10)	0.02 J	0.50 U	mg/Kg
				RFI-36-54(14-16)	0.08 J	0.50 U	mg/Kg
				RFI-36-56(0-2)	0.11 J	0.50 U	mg/Kg
				RFI-36-54(14-16) DUP	0.08 J	0.50 U	mg/Kg
Metals	07/12/05	Antimony	0.6	RFI-36-55(0-2)	0.07 J	0.30 U	mg/Kg
				RFI-84-7(8-10)	0.47	0.47 U	mg/Kg
	07/12/05	Antimony	0.86	RFI-09-57(0-2)	0.58	0.58 U	mg/Kg
				Dup-RFI-09-57(4-6)	0.07 J	0.30 U	mg/Kg
Metals	07/20/05	Antimony	1.5	RFI-09-58(0-2)	0.76	0.76 U	mg/Kg
				RFI-36-54(0-2)	1.07	1.07 U	mg/Kg
				RFI-36-54(14-16)	0.17 J	0.30 U	mg/Kg
				RFI-36-54(8-10)	0.63	0.63 U	mg/Kg
				RFI-36-56(0-2)	0.10 J	0.30 U	mg/Kg
				RFI-36-54(14-16) DUP	0.16 J	0.30 U	mg/Kg
Metals	07/20/05	Arsenic	0.71	RFI-36-56(6-8)	0.45	0.45 U	mg/Kg

Notes:

J	Estimated.
U	Non-detect at associated value.

TABLE 7

QUALIFIED SAMPLE DATA DUE TO OUTLYING SURROGATE RECOVERIES
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Surrogate*	*Surrogate Recovery (percent)*	*Control Limits (percent)*	*Sample ID*	*Analytes*	*Sample Results*	*Units*	*Qualifier*
PCBs	DCB	11	30-137	RFI-36-55(0-2')	Aroclor-1260 (PCB-1260)	70 J	µg/Kg	J
					Aroclor-1254 (PCB-1254)	330 U	µg/Kg	UJ
					Aroclor-1221 (PCB-1221)	330 U	µg/Kg	UJ
					Aroclor-1232 (PCB-1232)	330 U	µg/Kg	UJ
					Aroclor-1248 (PCB-1248)	330 U	µg/Kg	UJ
					Aroclor-1016 (PCB-1016)	330 U	µg/Kg	UJ
					Aroclor-1242 (PCB-1242)	330 U	µg/Kg	UJ
PCBs	DCB	20	30-137	RFI-09-57(0-2')	Aroclor-1260 (PCB-1260)	330 U	µg/Kg	UJ
					Aroclor-1254 (PCB-1254)	330 U	µg/Kg	UJ
					Aroclor-1221 (PCB-1221)	330 U	µg/Kg	UJ
					Aroclor-1232 (PCB-1232)	330 U	µg/Kg	UJ
					Aroclor-1248 (PCB-1248)	330 U	µg/Kg	UJ
					Aroclor-1016 (PCB-1016)	330 U	µg/Kg	UJ
					Aroclor-1242 (PCB-1242)	330 U	µg/Kg	UJ
PCBs	DCB	15.3	30-137	RFI-36-56(0-2')	Aroclor-1260 (PCB-1260)	330 U	µg/Kg	UJ
					Aroclor-1254 (PCB-1254)	330 U	µg/Kg	UJ
					Aroclor-1221 (PCB-1221)	330 U	µg/Kg	UJ
					Aroclor-1232 (PCB-1232)	330 U	µg/Kg	UJ
					Aroclor-1248 (PCB-1248)	330 U	µg/Kg	UJ
					Aroclor-1016 (PCB-1016)	330 U	µg/Kg	UJ
					Aroclor-1242 (PCB-1242)	330 U	µg/Kg	UJ

Notes:

DCB	Decachlorobiphenyl.
J	Estimated.
PCBs	Polychlorinated Biphenyls.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 8

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY CONTROL SAMPLE RESULTS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Compound*	*Percent Recovery*	*Control Limits (percent)*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
Semi-volatiles	Benzo(b)fluoranthene	199	29-152.7	RFI-10-33(0-2)	60 J	µg/Kg	J
				RFI-10-34(0-2)	90 J	µg/Kg	J
				RFI-84-8(8-10)	100 J	µg/Kg	J
Semi-volatiles	Benzo(k)fluoranthene	221	29.8-136	RFI-10-33(0-2)	50 J	µg/Kg	J
				RFI-10-34(0-2)	70 J	µg/Kg	J
				RFI-84-8(8-10)	200 J	µg/Kg	J
Volatiles	Cyclohexane	39.7	67.8-137.4	RFI-09-58(0-2)	210	µg/Kg	J
				RFI-09-58(8-10)	60 U	µg/Kg	UJ
				RFI-36-54(0-2)	50 U	µg/Kg	UJ
				RFI-36-54(14-16)	50 U	µg/Kg	UJ
				RFI-36-54(8-10)	60 U	µg/Kg	UJ
				RFI-36-56(0-2)	60 U	µg/Kg	UJ
				RFI-36-56(6-8)	50 U	µg/Kg	UJ
				RFI-36-54(14-16) DUP	50 U	µg/Kg	UJ

Notes:

J	Estimated.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 9

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Associated Sample ID*	*Analyte*	*MS Recovery (percent)*	*MSD Recovery (percent)*	*RPD*	*Control Limits*		*Sample Result*	*Units*	*Qualifier*
						Recovery (percent)	*RPD (percent)*			
Semi-volatiles	RFI-36-55(0-2)	2,4-Dimethylphenol	29.8	36.7	20.6	37.1-120	35	330 U	µg/Kg	UJ
Volatiles	RFI-36-54(0-2)	Bromomethane	29.7	26.8	10.2	30.5-120	20	300 U	µg/Kg	UJ
		Cyclohexane	42	42.4	0.9	67.8-137.4	20	50 U	µg/Kg	UJ

Notes:

MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
RPD	Relative Percent Difference.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 10

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING MATRIX SPIKE RECOVERIES
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Associated Samples*	*Spike ID*	*MS Recovery (percent)*	*Control Limits (percent)*	*Analytes*	*Sample Results*	*Units*	*Qualifier*
PCBs	RFI-36-55(0-2)	RFI-36-55(0-2)	19.2	52.9-123.4	Aroclor-1260 (PCB-1260)	70 J	µg/Kg	J
					Aroclor-1254 (PCB-1254)	330 U	µg/Kg	UJ
					Aroclor-1221 (PCB-1221)	330 U	µg/Kg	UJ
					Aroclor-1232 (PCB-1232)	330 U	µg/Kg	UJ
					Aroclor-1248 (PCB-1248)	330 U	µg/Kg	UJ
					Aroclor-1016 (PCB-1016)	330 U	µg/Kg	UJ
					Aroclor-1242 (PCB-1242)	330 U	µg/Kg	UJ

Notes:

J	Estimated concentration.
MS	Matrix Spike.
PCBs	Polychlorinated Biphenyls.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.

TABLE 11

QUALIFIED SAMPLE RESULTS DUE TO VARIABILITY IN FIELD DUPLICATE RESULTS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Analyte*	*Original Sample ID*	*Original Result*	*Duplicate Sample ID*	*Duplicate Result*	*2xRL*	*Units*	*Qualifier* (1)
Semi-volalites	Fluoranthene	RFI-36-54(14-16')	300	RFI-36-54(14-16')DUP	1000	660	µg/Kg	J
	Phenanthrene	RFI-36-54(14-16')	620	RFI-36-54(14-16')DUP	2100	660	µg/Kg	J
	Pyrene	RFI-36-54(14-16')	300	RFI-36-54(14-16')DUP	970	660	µg/Kg	J

Notes:

(1) Qualifier is associated witih both the original and duplicate sample.

J Estimated.

TABLE 12

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE RINSE BLANKS
MONITORING WELL INSTALLATION
GENERAL MOTORS - NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Rinse Blank Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Sample Result*	*Units*
Volatiles	07/01/05	Chloroform	0.9	RFI-09-56(2-4)	10J	50 U	µg/Kg
Semi-volatiles	07/01/05	Diethyl phthalate	0.2	RFI-36-55(0-2)	30J	330 U	ug/Kg

Notes:

J	Estimated.
U	Non-detect at associated value.

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MEMORANDUM

TO: Lisa Coffey

FROM: Paul McMahon/js/8 Pm

C.C.: JoAnn Robertson

RE: **Data Quality Assessment and Validation**
Soil Sampling
General Motors – NAO Flint Operations
Flint, Michigan

REF. NO.: 17307-195007

DATE: August 12, 2005

E-Mail and U.S. Mail

PREVIOUSLY TRANSMITTED BY E-MAIL

The following details a quality assessment and validation of the analytical data resulting from the collection of six soil, one field duplicate, and one trip blank sample from the General Motors Site (Site) in Flint, Michigan, in July 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodology presented in Table 2. The QC criteria used to assess the data were established by the method and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999; and

ii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time period is presented in the analytical method. All samples were prepared and analyzed within the method-required holding time. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and all data showed acceptable sensitivity and linearity.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all Relative Response Factors (RRFs) values must be greater than or equal to 0.05; and

ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and all results met the above criteria for instrument sensitivity. One compound exhibited variability in instrument response. Associated sample results for this compound were qualified as estimated (see Table 3).

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. All blank results were non-detect for the analytes of interest.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the method employed, all samples, blanks, and QA/QC standards analyzed for VOCs were spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against

laboratory control limits. All sample surrogate recoveries were within the laboratory specified control limits, demonstrating acceptable analytical accuracy.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all VOCs. Most LCS recoveries were within the laboratory specified control limits for the analytes of interest. A low cyclohexane LCS recovery was reported, and all associated sample results were qualified as estimated (see Table 4).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

MS/MSD samples are prepared and analyzed with each sample batch. The recoveries of spike analyses are used to assess the analytical accuracy achieved on individual sample matrices. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as shown in Table 1. Most MS/MSD recoveries were within laboratory control limits demonstrating acceptable overall analytical accuracy and precision. Low cyclohexane MS/MSD recoveries were reported for sample. The associated sample result was already qualified as estimated based on the low LCS recoveries, and no further qualification was necessary. Low bromomethane MS/MSD recoveries were reported, and the associated sample result was qualified as estimated (see Table 5).

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and

ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All reported sample IS results met the above criteria and all were correctly used to calculate sample results.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

Trip Blanks - VOCs

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. One trip blank was collected, and all results were non-detect for the analytes of interest.

Field Duplicates

One sample was collected in duplicate as summarized in Table 1 and submitted to the laboratory for analysis. All sample results showed acceptable sampling and analytical precision.

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used as reported.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
SOIL SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Sample ID	*Location ID*	*Collection Date (mm/dd/yy)*	*Collection Time (hr:min)*	*Parameters* TCL VOCs	*Comments*
RFI-84-09S(0.5-2.5)	RFI-84-09	07/16/05	10:35	X	MS/MSD
RFI-84-09S(8-10)	RFI-84-09	07/16/05	12:15	X	
RFI-84-10S(0.7-2.7)	RFI-84-10	07/16/05	14:30	X	
RFI-84-10S(2.7-4.7)	RFI-84-10	07/16/05	14:35	X	
RFI-84-11(0.5-2.5)	RFI-84-11	07/16/05	14:40	X	
Dup-1(071605)	RFI-84-11	07/16/05	-	X	Duplicate of RFI-84-11(0.5-2.5)
RFI-84-11(3.5-5.5)	RFI-84-11	07/16/05	14:45	X	
TB-1(071605)	Trip Blank	07/16/05	-	X	Trip Blank

Notes:

-	Not applicable.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 2

SUMMARY OF ANALYTICAL METHODOLOGIES
SOIL SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Method*
TCL VOCs	SW-846 8260[1]

Notes:

1	"Test Methods for Solid Waste Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with subsequent revisions).
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
SOIL SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/26/05	Dichlorodifluoromethane (CFC-12)	37	RFI-84-09S(0.5-2.5)	50 U	µg/kg	UJ
				RFI-84-09S(8-10)	70 U	µg/kg	UJ
				RFI-84-10S(0.7-2.7)	50 U	µg/kg	UJ
				RFI-84-10S(2.7-4.7)	60 U	µg/kg	UJ
				RFI-84-11(0.5-2.5)	60 U	µg/kg	UJ
				RFI-84-11(3.5-5.5)	50 U	µg/kg	UJ
				Dup-1(071605)	60 U	µg/kg	UJ

Notes:

%D	Percent Difference.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY CONTROL SAMPLE RESULTS
SOIL SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Preparation Date*	*Compound*	*Percent Recovery*	*Control Limits (percent)*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/24/05	Cyclohexane	40	68-137	RFI-84-09S(0.5-2.5)	50 U	µg/kg	UJ
					RFI-84-09S(8-10)	70 U	µg/kg	UJ
					RFI-84-10S(0.7-2.7)	50 U	µg/kg	UJ
					RFI-84-10S(2.7-4.7)	60 U	µg/kg	UJ
					RFI-84-11(0.5-2.5)	60 U	µg/kg	UJ
					RFI-84-11(3.5-5.5)	50 U	µg/kg	UJ
					Dup-1(071605)	60 U	µg/kg	UJ

Notes:

U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

TABLE 5

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERIES
SOIL SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Associated Sample ID*	*Analyte*	*MS Recovery (percent)*	*MSD Recovery (percent)*	*RPD*	*Control Limits*		*Sample Result*	*Units*	*Qualifier*
						Recovery (percent)	*RPD (percent)*			
VOCs	RFI-84-09S(0.5-2.5)	Bromomethane	27	30	10	31-120	20	300 U	µg/Kg	UJ

Notes:

MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
RPD	Relative Percent Difference.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

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MEMORANDUM

TO: Lisa Coffey

FROM: Paul McMahon/js/7 PM

C.C.: JoAnn Robertson

REF. NO.: 17307-195007

DATE: August 10, 2005

E-Mail and U.S. Mail

RE: **Data Quality Assessment and Validation**
Groundwater Sampling
General Motors – NAO Flint Operations
Flint, Michigan

The following details a quality assessment and validation of the analytical data resulting from the collection of 16 water, two trip blank, and two field duplicate samples from the General Motors Site (Site) in Flint, Michigan, in July 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodology presented in Table 2. The QC criteria used to assess the data were established by the method and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999; and

ii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time period is presented in the analytical method. All samples were prepared and analyzed within the method-required holding time. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and all data showed acceptable sensitivity and linearity.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all RRFs values must be greater than or equal to 0.05; and

ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and all results met the above criteria.

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. All blank results were non-detect for the analytes of interest.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the method employed, all samples, blanks, and QA/QC standards analyzed for VOCs were spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against

laboratory control limits. All sample surrogate recoveries were within the laboratory specified control limits, demonstrating acceptable analytical accuracy.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all VOCs. Most LCS recoveries were within the laboratory specified control limits for all analytes of interest. A high acetone LCS recovery was reported, and the associated detected sample result was qualified as estimated (see Table 3). Some low LCS recoveries were reported, and all associated sample results were qualified as estimated (see Table 3).

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

MS/MSD samples are prepared and analyzed with each sample batch. The recoveries of spike analyses are used to assess the analytical accuracy achieved on individual sample matrices. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as shown in Table 1. Most MS/MSD recoveries were within laboratory control limits demonstrating acceptable overall analytical accuracy and precision. Low cyclohexane recoveries were reported for both MS/MSD samples. The associated sample results were already qualified as estimated based on the low LCS recoveries, and no further qualification was necessary. One high MSD recovery was reported, but the associated sample result was non-detect and was not impacted by the indicated high bias.

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and
ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All sample IS results met the above criteria and all were correctly used to calculate sample results.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

Trip Blanks - VOCs

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. Trip blanks were collected at the proper frequency, and most results were non-detect for the analytes of interest. Benzene and 1,1-dichloroethane were detected in one trip blank. All associated 1,1-dichloroethane sample results were either non-detect or greater than five times the contamination present and no qualification of the data was necessary. Associated detected benzene results were qualified as non-detect (see Table 4).

Field Duplicates

Two samples were collected in duplicate as summarized in Table 1 and submitted to the laboratory for analysis. All sample results showed acceptable sampling and analytical precision.

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used as reported.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Sample ID	*Location ID*	*Collection Date*	*Collection Time*	*Parameters*	*Comments*
				TCL VOCs	
RFI-36-56(072105)	RFI-36-56	07/21/05	10:35	X	
RFI-84-10D(072105)	RFI-84-10D	07/21/05	13:00	X	
RFI-84-06RD(072105)	RFI-84-06RD	07/21/05	12:15	X	
RFI-84-09D(072205)	RFI-84-09D	07/22/05	13:10	X	
RFI-09-58(072205)	RFI-09-58	07/22/05	11:00	X	
Dupe-1(072205)	RFI-09-58	07/22/05	-	X	Duplicate of RFI-09-58(072205)
RFI-84-8S(072205)	RFI-84-8S	07/22/05	11:35	X	
RFI-84-06R(072205)	RFI-84-06R	07/22/05	13:20	X	
RFI-84-09S(072205)	RFI-84-09S	07/22/05	13:31	X	
RFI-84-10S(072205)	RFI-84-10S	07/22/05	11:30	X	MS/MSD
TB-01(072105)	Trip Blank	07/21/05	-	X	Trip Blank
RFI-84-04D(072805)	RFI-84-04D	07/28/05	14:20	X	
RFI-84-04S(072805)	RFI-84-04S	07/28/05	16:05	X	
TB-1(072805)	Trip Blank	07/28/05	-	X	Trip Blank
84-6R2D(072905)	84-6R2D	07/29/05	10:25	X	
RFI-17-02D(072905)	RFI-17-02D	07/29/05	8:40	X	MS/MSD
RFI-84-03S(072905)	RFI-84-03S	07/29/05	10:45	X	
Dupe-01(072905)	RFI-84-03S	07/29/05	-	X	Duplicate of RFI-84-03S(072905)
RFI-84-03I(072905)	RFI-84-03I	07/29/05	9:55	X	
RFI-84-03D(072905)	RFI-84-03D	07/29/05	9:00	X	

Notes:

-	Not applicable.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 2

SUMMARY OF ANALYTICAL METHODOLOGIES
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Method*
TCL VOCs	SW-846 8260[1]

Notes:

[1]	"Test Methods for Solid Waste Physical/Chemical Methods", SW-846, 3rd Edition, September 1986 (with subsequent revisions).
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY CONTROL SAMPLE RESULTS
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Preparation Date*	*Compound*	*Percent Recovery*	*Control Limits (percent)*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/24/05	Cyclohexane	44	78-146	RFI-84-06RD(072105)	1 U	µg/L	UJ
					RFI-84-10d(072105)	1 U	µg/L	UJ
					RFI-84-09S(072205)	1 U	µg/L	UJ
					RFI-84-06R(072205)	1 U	µg/L	UJ
					RFI-84-09D(072205)	1 U	µg/L	UJ
					RFI-84-8S(072205)	1 U	µg/L	UJ
					Dupe-1(072205)	1 U	µg/L	UJ
					RFI-36-56(072105)	1 U	µg/L	UJ
					RFI-84-10S(072205)	1 U	µg/L	UJ
					RFI-09-58(072205)	1 U	µg/L	UJ
VOCs	07/29/05	Methyl Tert Butyl Ether	74	75-136	RFI-17-02D(072905)	3 J	µg/L	J
					RFI-84-03I(072905)	1 J	µg/L	J
					Dupe-01(072905)	5 U	µg/L	UJ
					RFI-84-03D(072905)	0.5 J	µg/L	J
					RFI-84-04S(072805)	5 U	µg/L	UJ
					RFI-84-04D(072805)	2 J	µg/L	J
					RFI-84-03S(072905)	5 U	µg/L	UJ
VOCs	07/29/05	Cyclohexane	35	78-146	RFI-84-04D(072805)	1 U	µg/L	UJ
					RFI-84-03S(072905)	1 U	µg/L	UJ
					RFI-84-04S(072805)	1 U	µg/L	UJ
					RFI-84-03D(072905)	1 U	µg/L	UJ
					RFI-17-02D(072905)	1 U	µg/L	UJ
					RFI-84-03I(072905)	1 U	µg/L	UJ
					Dupe-01(072905)	1 U	µg/L	UJ
VOCs	07/31/05	Acetone	123	28-122	84-6R2D(072905)	100 J	µg/L	J
VOCs	07/31/05	Methyl acetate	76	77-126	84-6R2D(072905)	100 U	µg/L	UJ
VOCs	07/31/05	Cyclohexane	37	78-146	84-6R2D(072905)	10 U	µg/L	UJ
VOCs	07/31/05	4-Methyl-2-Pentanone	79	80-120	84-6R2D(072905)	10 U	µg/L	UJ

Notes:

J	Estimated.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE TRIP BLANK
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Blank Date*	*Analyte*	*Blank Result*	*Associated Sample ID*	*Sample Result*	*Qualified Result*	*Units*
VOCs	07/22/05	Benzene	0.3 J	RFI-09-58(072205)	0.3 J	1 U	µg/L
				Dupe-1(072205)	0.3 J	1 U	µg/L

Notes:

J	Estimated.
U	Non-detect at associated value.
VOCs	Volatile Organic Compounds.

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MEMORANDUM

TO: Lisa Coffey

REF. NO.: 17307-195008

FROM: Paul McMahon/js/6 Pm

DATE: August 9, 2005

E-Mail and U.S. Mail

C.C.: JoAnn Robertson

RE: **Data Quality Assessment and Validation**
Groundwater Sampling
General Motors - NAO Flint Operations
Flint, Michigan

PREVIOUSLY TRANSMITTED BY E-MAIL

The following details a quality assessment and validation of the analytical data resulting from the collection of three water samples from the General Motors Site (Site) in Flint, Michigan, in July 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodology presented in Table 2. The QC criteria used to assess the data were established by the method and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999; and

ii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time period is presented in the analytical method. All samples were prepared and analyzed within the method-required holding time. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and
ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and all data showed acceptable sensitivity and linearity.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all Relative Response Factors (RRFs) values must be greater than or equal to 0.05; and
ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and all results met the above criteria for instrument sensitivity. One compound exhibited variability in instrument response. Associated sample results for this compound were qualified as estimated (see Table 3).

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. All blank results were non-detect for the analytes of interest.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the method employed, all samples, blanks, and QA/QC standards analyzed for VOCs were spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against

laboratory control limits. All sample surrogate recoveries were within the laboratory specified control limits, demonstrating acceptable analytical accuracy.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all VOCs. Most LCS recoveries were within the laboratory specified control limits for the analytes of interest. A high acetone LCS recovery was reported, and the associated detected sample result was qualified as estimated (see Table 4). Some low LCS recoveries were reported, and all associated sample results were qualified as estimated (see Table 4).

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and
ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All reported sample IS results met the above criteria and all were correctly used to calculate sample results.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used as reported.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Sample ID	*Location ID*	*Collection Date*	*Collection Time*	***Parameters*** TCL VOCs
84-7d(072805)	84-7d	07/28/05	15:03	X
RFI-84-07d(072805)	RFI-84-07d	07/28/05	13:25	X
RFI-84-11s(072805)	RFI-84-11s	07/28/05	11:25	X

Notes:

TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 2

SUMMARY OF ANALYTICAL METHODOLOGIES
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Method*
TCL VOCs	SW-846 8260[1]

Notes:

[1]	"Test Methods for Solid Waste Physical/Cehmical Methods", SW-846, 3rd Edition, September 1986 (with subsequent revisions).
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/31/05	Acetone	34	RFI-84-11s(072805)	30 U	µg/L	UJ
				RFI-84-07d(072805)	200 J	µg/L	J

Notes:

%D	Percent Difference.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING LABORATORY CONTROL SAMPLE RESULTS
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JULY 2005

Parameter	*Preparation Date*	*Compound*	*Percent Recovery*	*Control Limits (percent)*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/29/05	Methyl Tert Butyl Ether	74	75-136	84-7d(072805)	5 U	µg/L	UJ
VOCs	07/29/05	Cyclohexane	35	78-146	84-7d(072805)	1 U	µg/L	UJ
VOCs	07/31/05	Cyclohexane	37	78-146	RFI-84-07d(072805) RFI-84-11s(072805)	70 1 U	µg/L µg/L	J UJ
VOCs	07/31/05	4-Methyl-2-Pentanone	79	80-120	RFI-84-07d(072805) RFI-84-11s(072805)	10 U 1 U	µg/L µg/L	UJ UJ
VOCs	07/31/05	Methyl Acetate	76	77-126	RFI-84-07d(072805) RFI-84-11s(072805)	100 U 10 U	µg/L µg/L	UJ UJ
VOCs	07/31/05	Acetone	123	28-122	RFI-84-07d(072805)	200 J	µg/L	J

Notes:

J	Estimated.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

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MEMORANDUM

TO:	Lisa Coffey	REF. NO.:	17307-195006
FROM:	Paul McMahon/js/4 PM	DATE:	July 15, 2005
		E-Mail and U.S. Mail	
C.C.:	JoAnn Robertson		

RE: **Data Quality Assessment and Validation**
Groundwater Sampling
General Motors - NAO Flint Operations
Flint, Michigan

PREVIOUSLY TRANSMITTED BY E-MAIL

The following details a quality assessment and validation of the analytical data resulting from the collection of 10 water, three trip blank, one equipment blank, and one field duplicate sample from the General Motors Site (Site) in Flint, Michigan, in June and July 2005. The sample summary detailing sample identification, sample location, quality control (QC) samples, and analytical parameters is presented in Table 1. Sample analysis was completed at Merit Laboratories, Inc. in East Lansing, Michigan, in accordance with the methodology presented in Table 2. The QC criteria used to assess the data were established by the method and following documents:

i) "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", USEPA 540/R-99/008, October 1999; and

ii) "Innovative Approaches to Data Validation", USEPA Region III, June 1995.

Full Contract Laboratory Program (CLP)-equivalent raw data deliverables were provided by the laboratory. The data quality assessment and validation presented in the following subsections were performed based on the sample results and supporting quality assurance/quality control (QA/QC) provided.

Holding Time Period and Sample Analysis

The holding time period is presented in the analytical method. All samples were prepared and analyzed within the method-required holding time. All samples were properly cooled after collection and upon receipt at the laboratory.

Gas Chromatography/Mass Spectrometer (GC/MS) Mass Calibration

Prior to analysis, GC/MS instrumentation is tuned to ensure optimization over the mass range of interest. To evaluate instrument tuning, the volatile organic compound (VOC) method requires the analysis of the specific tuning compound bromofluorobenzene (BFB). The resulting spectra must meet the criteria cited in the method before analysis is initiated. Analysis of the tuning compound must then be repeated every 12 hours throughout sample analysis to ensure the continued optimization of the instrument.

Instrument tuning data were reviewed. Tuning compounds were analyzed at the required frequency throughout the VOC analysis periods. All tuning criteria were met for the analyses, indicating proper optimization of the instrumentation.

Initial Calibration - Organic Analyses, GC/MS

To quantify compounds of interest in samples, calibration of the GC/MS over a specific concentration range must be performed. Initially, a minimum of a five-point calibration curve containing all compounds of interest is analyzed to characterize instrument response for each analyte over a specific concentration range.

Calibration data were reviewed for all samples. Linearity of the calibration curve and instrument sensitivity were evaluated against the following criteria:

i) all relative response factors (RRFs) must be greater than or equal to 0.05; and

ii) percent relative standard deviation (%RSD) values must not exceed 30 percent or if quadratic/linear regression is used, the correlation coefficient (R^2) value must be at least 0.990.

Initial calibration standards were analyzed as required and all data showed acceptable sensitivity and linearity.

Continuing Calibration - Organics, GC/MS

To ensure that instrument calibration is acceptable throughout the sample analysis period, continuing calibration standards must be analyzed and compared to the initial calibration curve every 12 hours.

The following criteria were employed to evaluate continuing calibration data:

i) all Relative Response Factors (RRFs) values must be greater than or equal to 0.05; and

ii) percent difference (%D) values must not exceed 25 percent.

Calibration standards were analyzed at the required frequency and all results met the above criteria for instrument sensitivity. One compound exhibited variability in instrument response. Associated sample results for this compound were qualified as estimated (see Table 3).

Method Blank Samples

Method blanks are prepared and analyzed with investigative samples to determine the existence and magnitude of sample contamination introduced during the procedures.

For this study, method blanks were analyzed at a minimum frequency of one per analytical batch. Most blank results were non-detect for the analytes of interest. Methylene chloride was detected in one method blank, and the associated sample results were qualified as non-detect (see Table 4).

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

In accordance with the method employed, all samples, blanks, and QA/QC standards analyzed for VOCs were spiked with surrogate compounds prior to sample analysis. Surrogate recoveries provide a means to evaluate the effects of individual sample matrices on analytical efficiency and are assessed against laboratory control limits. All sample surrogate recoveries were within the laboratory specified control limits, demonstrating acceptable analytical accuracy.

Laboratory Control Sample (LCS) Analysis

The LCS serves as a measure of overall analytical performance. LCSs are prepared with all analytes of interest and analyzed with each sample batch.

LCSs were prepared and analyzed for all VOCs. The LCS recoveries were within the laboratory specified control limits for all analytes of interest.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

MS/MSD samples are prepared and analyzed with each sample batch. The recoveries of spike analyses are used to assess the analytical accuracy achieved on individual sample matrices. If the original sample concentration is significantly greater than the spike concentration, the recovery is not assessed. The RPD between the MS and MSD is used to assess analytical precision.

MS/MSD analyses were performed as shown in Table 1. All MS/MSD recoveries were within laboratory control limits demonstrating acceptable overall analytical accuracy and precision.

Internal Standard (IS) Summaries

To correct for changes in GC/MS response and sensitivity, IS compounds are added to investigative samples and QC samples prior to VOC analyses. All results are calculated as a ratio of the IS response. The criteria by which the IS results are assessed are as follows:

i) IS area counts must not vary by more than a factor of two (-50 percent to +100 percent) from the associated calibration standard; and

ii) the retention time of the IS must not vary more than ±30 seconds from the associated calibration standard.

All sample IS results met the above criteria and all were correctly used to calculate sample results.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The samples identified in Table 1 were reviewed. The organics reported adhered to the specified identification criteria.

Trip Blanks - VOCs

Trip blanks are transported, stored, and analyzed with the investigative samples to identify potential cross-contamination of VOCs. Trip blanks were collected at the proper frequency, and most results were non-detect for the analytes of interest. Chloroform and styrene were detected in the blanks. All associated sample results were non-detect, and no qualification of the data was necessary.

Field Duplicates

One sample was collected in duplicate as summarized in Table 1 and submitted to the laboratory for analysis. All sample results showed acceptable sampling and analytical precision.

Equipment Blanks

To assess contamination from field equipment cleaning activities, one equipment blank was collected as identified in Table 1. Most sample results were non-detect for the analytes of interest. Chloroform was detected in the blank. All associated sample results were non-detect, and no qualification of the data was necessary.

System Performance

System performance between various QC checks was evaluated to monitor for changes that may have caused the degradation of data quality. The samples identified in Table 1 were reviewed. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used as reported.

TABLE 1

SAMPLE COLLECTION AND ANALYSIS SUMMARY
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE - JULY 2005

Sample ID	*Location ID*	*Collection Date*	*Collection Time*	*Parameters* TCL VOCs	*Comments*
RFI-10-35(062905)	RFI-10-35	06/29/05	10:45	X	
RFI-10-36(062905)	RFI-10-36	06/29/05	11:45	X	
RFI-10-34(062905)	RFI-10-34	06/29/05	13:05	X	MS/MSD
RFI-10-33(62905)	RF1-10-33	06/29/05	14:15	X	
TB-1(062905)	-	06/29/05	-	X	Trip Blank
RFI-10-29(063005)	RFI-10-29	06/30/05	11:30	X	
RFI-84-7(070105)	RFI-84-7	07/01/05	9:30	X	
TB-1(070105)	-	07/01/05	-	X	Trip Blank
EB-1(070105)	-	07/01/05	17:00	X	Equipment Blank
RFI-36-55(070605)	RFI-36-55	07/06/05	9:10	X	
RFI-84-8(070605)	RFI-84-8	07/06/05	11:20	X	
Dupe-1(070605)	RFI-84-8	07/06/05	-	X	Duplicate of RFI-84-8(070605)
RFI-09-56(070605)	RFI-09-56	07/06/05	13:50	X	
RFI-09-57(070605)	RFI-09-57	07/06/05	14:55	X	
TB(070605)	-	07/06/05	-	X	Trip Blank

Notes:

-	Not applicable.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 2

SUMMARY OF ANALYTICAL METHODOLOGIES
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE - JULY 2005

Parameter	*Method*
TCL VOCs	SW-846 8260[1]

Notes:

1	"Test Methods for Solid Waste Physical/Cehmical Methods", SW-846, 3rd Edition, September 1986 (with subsequent revisions).
TCL	Target Compound List.
VOCs	Volatile Organic Compounds.

TABLE 3

QUALIFIED SAMPLE RESULTS DUE TO OUTLYING CONTINUING CALIBRATION RESULTS
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE - JULY 2005

Parameter	*Calibration Date*	*Compound*	*%D*	*Associated Sample ID*	*Sample Results*	*Units*	*Qualifier*
VOCs	07/06/05	Dichlorodifluoromethane (CFC-12)	34	RFI-10-33(062905)	1 U	µg/L	UJ
				RFI-10-36(062905)	1 U	µg/L	UJ
				RFI-10-34(062905)	1 U	µg/L	UJ
				RFI-10-29(063005)	1 U	µg/L	UJ
				RFI-10-35(062905)	1 U	µg/L	UJ
				RFI-84-7(070105)	1 U	µg/L	UJ

Notes:

%D	Percent Difference.
U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.

TABLE 4

QUALIFIED SAMPLE RESULTS DUE TO ANALYTE CONCENTRATIONS IN THE LABORATORY BLANKS
GROUNDWATER SAMPLING
GENERAL MOTORS NAO FLINT OPERATIONS
FLINT, MICHIGAN
JUNE - JULY 2005

Parameter	*Analysis Date*	*Analyte*	*Blank Result*	*Sample ID*	*Sample Result*	*Qualified Result*	*Units*
VOCs	07/06/05	Methylene Chloride	1.04	RFI-10-35(062905)	0.5 J	5 U	µg/L
				RFI-10-36(062905)	0.3 J	5 U	µg/L
				RFI-10-34(062905)	0.3 J	5 U	µg/L

Note:

U	Non-detect at associated value.
UJ	The analyte was not detected above the sample quantitation limit. The reported quantitation limit is an estimated quantity.
VOCs	Volatile Organic Compounds.