

Derenzo and Associates, Inc.

Environmental Consultants

October 21, 2011

Ms. Trina Vielhauer, Bureau Chief
Bureau of Air Regulation
Department of Environmental Protection
STATE OF FLORIDA
2600 Blair Stone Road, MS 5505
Tallahassee, FL 32399-2400

RECEIVED
OCT 27 2011
**DIVISION OF AIR
RESOURCE MANAGEMENT**

Subject: Seminole Energy, LLC
DEP File No. 1170084-008-AC (PSD-FL-376A)
LFG Monitoring Sulfur and Chlorine Contents

Dear Ms. Vielhauer:

Condition 3.C. of Section III – Emission Unit(s) Specific Conditions of Air Construction Permit 1170084-008-AC (PSD-FL-376A) issued Seminole Energy, LLC (Seminole Energy) specifies that *The permittee shall comply with the following requirements to monitor the sulfur and chlorine content of the landfill gas:*

... the permittee shall sample and analyze the landfill gas for sulfur and chlorine content. The gas sample collected for the analyses shall be a composite sample and collected under normal operating conditions ... The gas sample collection and analyses for sulfur and chlorine content shall be done semi-annually ... Results shall be reported as SO₂ and HCl emission factors in terms of lb/MMscf of landfill gas.

The initial gas sample collection and analyses were completed in February 2007. Therefore, Derenzo and Associates, Inc. (Derenzo and Associates), on behalf of Seminole Energy, is submitting to the Florida Department of Environmental Protection, Division of Air Resource Management (FDEP-DARM) results of sulfur and chlorine analyses that were performed on a sample of landfill gas (LFG) obtained from the Osceola Road Solid Waste Management Facility in September 2011 (semi-annual collection and analyses). The required SO₂ and HCl emission factors (in terms of lb/MMscf of landfill gas) and supporting analytical data are provided in the attached documents.

The air permit application for Seminole Energy developed (based on USEPA AP-42 default LFG composition data) a:

1. SO₂ emission factor of 27.5 lb/MMscf of LFG; and
2. HCl emission factor of 11.95 lb/MMscf of LFG.

Derenzo and Associates, Inc.

Ms. Trina Vielhauer
FDEP-DARM

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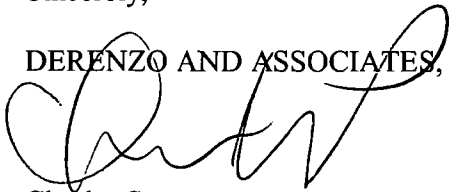
The SO₂ emission factor developed from analyses of the September 21, 2011 sample of LFG obtained from the Osceola Road Solid Waste Management Facility is 9.48 lb/MMscf of LFG (<12.20 lb/MMscf of LFG with the incorporation of all non-measured chemicals at its reporting limit).

The HCl emission factor developed from analyses of the September 21, 2011 sample of LFG obtained from the Osceola Road Solid Waste Management Facility is 0.30 lb/MMscf of LFG (<0.84 lb/MMscf of LFG with the incorporation of all non-measured chemicals at its reporting limit).

Please contact us if you have questions or require clarifications

Sincerely,

DERENZO AND ASSOCIATES, INC.



Charles Scamp
Environmental consultant

attachments

- c: Mike Laframboise, Landfill Energy Systems
- Gary Kuberski, FDEP Central District Office
- Kimberly Russell, Seminole County Solid Waste Management Division

Seminole Energy, LLC (September 21, 2011 Sample)

Sulfur Dioxide Emission Factor for LFG Combustion

LFG Influent Sulfur Compound	Analytical Report Concentrations ^A (ppmv)	Molecular Formula	No. Sulfur Atoms	Sulfur Content ^B as H ₂ S (ppmv)	Resulting SO ₂ Emission Rate (lb./MMcf)
Hydrogen sulfide	44.0	H ₂ S	1	44.0	7.28 *
Carbonyl sulfide	<0.80	CSO	1	<0.80	<0.13
Methyl mercaptan	6.70	CH ₄ S	1	6.70	1.11
Ethyl mercaptan	<0.80	C ₂ H ₆ S	1	<0.80	<0.13
Dimethyl sulfide	6.6	C ₂ H ₆ S	1	6.6	1.09
Carbon disulfide	<1.00	CS ₂	2	<2.00	<0.33
Isopropyl mercaptan	<0.80	C ₃ H ₆ S	1	<0.80	<0.13
tert-Butyl mercaptan	<0.80	C ₄ H ₁₀ S	1	<0.80	<0.13
n-Propyl mercaptan	<0.80	C ₃ H ₈ S	1	<0.80	<0.13
Ethyl methyl sulfide	<0.80	C ₃ H ₈ S	1	<0.80	<0.13
Thiophene	<0.80	C ₄ H ₄ S	1	<0.80	<0.13
Isobutyl mercaptan	<0.80	C ₄ H ₁₀ S	1	<0.80	<0.13
Diethyl sulfide	<0.80	CH ₃ CH ₂ SCH ₂ CH ₃	1	<0.80	<0.13
n-Butyl mercaptan	<0.80	C ₄ H ₁₀ S	1	<0.80	<0.13
3-Methyl Thiophene	<0.80	C ₅ H ₆ S	1	<0.80	<0.13
Dimethyl disulfide	<0.80	CH ₃ SSCH ₃	2	<1.60	<0.26
Tetrahydrothiophene	<0.80	C ₄ H ₈ O ₂ S	1	<0.80	<0.13
2-Ethylthiophene	<0.80	C ₆ H ₈ S	1	<0.80	<0.13
2,5-Dimethylthiophene	<0.80	C ₆ H ₈ S	1	<0.80	<0.13
Diethyl disulfide	<0.80	CH ₃ SSCH ₃	2	<1.60	<0.26
Total				<73.7	<12.20^C

Notes

A. September 22, 2011 LFG sample laboratory analytical results (see Attachment)

B. Determined by multiplying concentration by number of sulfur atoms in the molecule.

C. Calculation of SO₂ emission factor from sulfur content, as H₂S:

$$(73.7 \text{ scf H}_2\text{S/MMcf LFG}) (1 \text{ scf SO}_2\text{/scf H}_2\text{S}) (64.06 \text{ lb. SO}_2\text{/mol}) / (387 \text{ ft}^3\text{/mol}) = 12.2 \text{ lb SO}_2\text{/MMcf LFG}$$

* Sample calculation: SO₂ generation from hydrogen sulfide (H₂S):

$$(44.0 \text{ scf H}_2\text{S/MMcf LFG}) (1 \text{ scf SO}_2\text{/scf H}_2\text{S}) (64.06 \text{ lb. SO}_2\text{/mol}) / (387 \text{ ft}^3\text{/mol}) = 7.28 \text{ lb SO}_2\text{/MMcf LFG}$$

Seminole Energy, LLC (September 21, 2011 Sample)

Sulfur Dioxide Emission Factor for LFG Combustion

LFG Influent Sulfur Compound	Measured Concentrations ^A (ppmv)	Molecular Formula	No. Sulfur Atoms	Sulfur Content ^B as H ₂ S (ppmv)	Resulting SO ₂ Emission Rate (lb./MMcf)
Hydrogen sulfide	44.0	H ₂ S	1	44.0	7.28 *
Methyl mercaptan	6.70	CH ₄ S	1	6.70	1.11
Dimethyl sulfide	6.6	C ₂ H ₆ S	1	6.6	1.09
Total				57.3	9.48

Notes

A. September 22, 2011 LFG sample laboratory analytical results (see Attachment)

B. Determined by multiplying concentration by number of sulfur atoms in the molecule.

* Sample calculation: SO₂ generation from hydrogen sulfide (H₂S):
 $(44.0 \text{ scf H}_2\text{S/MMcf LFG}) (1 \text{ scf SO}_2\text{/scf H}_2\text{S}) (64.06 \text{ lb.SO}_2\text{/mol}) / (387 \text{ ft}^3\text{/mol})$
 = 7.28 lb SO₂/MMcf LFG

Seminole Energy, LLC (September 21, 2011 Sample)

LFG Combustion Hydrogen Chloride Emission Factor

LFG Influent Chlorine Coumpounds	Analytical Report		No. Chlorine Atoms	HCl Emission Factor (lb./MMcf)
	Concentration ¹ (ppm)	Molecular Formula		
Freon 12 (Dichlorodifluoromethane)	0.160	CCl ₂ F ₂	2	0.030 *
Freon 114 (Dichlorotetrafluoroethane)	<0.050	C ₂ Cl ₂ F ₄	2	<0.009
Chloromethane	0.510	CH ₃ Cl	1	0.048
Vinyl Chloride	<0.050	C ₂ HCl	1	<0.005
Chloroethane	<0.200	C ₂ H ₅ Cl	1	<0.019
Freon 11 (Fluorotrchloromethane)	<0.050	CFCl ₃	3	<0.014
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	<0.050	C ₂ Cl ₂ F ₃	2	<0.009
3-Chloropropene	<0.200	C ₃ H ₅ Cl	1	<0.019
Methylene Chloride (Dichloromethane)	0.086	CH ₂ Cl ₂	2	0.016
1,2-Dichloroethene (as cis-1,2-Dichloroethene)	0.150	C ₂ H ₂ Cl ₂	2	0.028
1,2-Dichloroethene (as trans-1,2-Dichloroethene)	<0.050	C ₂ H ₂ Cl ₂	2	<0.009
1,1-Dichloroethane	<0.050	C ₂ H ₄ Cl ₂	2	<0.009
1,1-Dichloroethene	<0.069	C ₂ H ₂ Cl ₂	2	<0.013
Chloroform	<0.050	CHCl ₃	3	<0.014
1,1,1-Trichloroethane	<0.050	C ₂ H ₃ Cl ₃	3	<0.014
Carbon Tetrachloride	<0.050	CCl ₄	4	<0.019
1,2-Dichloroethane	0.078	C ₂ H ₄ Cl ₂	2	0.015
Trichloroethene	0.075	C ₂ HCl ₃	3	0.021
1,2-dichloropropane	<0.050	C ₃ H ₆ Cl ₂	2	<0.009
Bromodichloromethane	<0.050	CBrCl ₂	2	<0.009
1,3-Dichloropropene (as cis-1,3-Dichloropropene)	<0.050	C ₃ H ₄ Cl ₂	2	<0.009
1,3-Dichloropropene (as trans-1,3-Dichloropropene)	<0.050	C ₃ H ₄ Cl ₂	2	<0.009
1,1,2-Trichloroethane	<0.050	C ₂ H ₃ Cl ₃	3	<0.014
Tetrachloroethene (Perchloroethene)	0.150	C ₂ Cl ₄	4	0.057
Dibromochloromethane	<0.050	CHBr ₂ Cl	1	<0.005
Chlorobenzene	0.120	C ₆ H ₅ Cl	1	0.011
1,1,2,2-Tetrachloroethane	<0.050	C ₂ H ₂ Cl ₄	4	<0.019
1,3-Dichlorobenzene	0.190	C ₆ H ₄ Cl ₂	2	0.036
1,4-Dichlorobenzene	0.200	C ₆ H ₄ Cl ₂	2	0.038
alpha-Chlorotoluene	<0.500	C ₇ H ₇ Cl	1	<0.047
1,2-Dichlorobenzene	<0.500	C ₆ H ₄ Cl ₂	2	<0.094
1,2,4-Trichlorobenzene	<0.200	C ₆ H ₃ Cl ₃	3	<0.057
Hexachlorobutadiene	<0.200	C ₄ Cl ₆	6	<0.113
Total hydrogen chloride emission factor (lb./MMcf)				<0.84

Notes

1. September 23, 2011 LFG sample laboratory analytical results.

* Example calculation for Freon 12 that assumes complete conversion of chloride to HCl

$$(0.160 \text{ ft}^3 \text{ Freon 12/MMcf LFG}) (2 \text{ mol HCl/mol Freon 12}) (36.46 \text{ lb. HCl/mol}) / (387 \text{ ft}^3/\text{mol})$$

$$= 0.030 \text{ lb. HCl/MMcf LFG}$$

Seminole Energy, LLC (September 21, 2011 Sample)

LFG Combustion Hydrogen Chloride Emission Factor

LFG Influent Chlorine Compounds ¹	Measured Concentration (ppm)	Molecular Formula	No. Chlorine Atoms	HCl Emission Factor (lb./MMcf)
Freon 12 (Dichlorodifluoromethane)	0.160	CCl ₂ F ₂	2	0.030*
Chloromethane	0.510	CH ₃ Cl	1	0.048
Methylene Chloride (Dichloromethane)	0.086	CH ₂ Cl ₂	2	0.016
1,2-Dichloroethene (as cis-1,2-Dichloroethene)	0.150	C ₂ H ₂ Cl ₂	2	0.028
1,2-Dichloroethane	0.078	C ₂ H ₄ Cl ₂	2	0.015
Trichloroethene	0.075	C ₂ HCl ₃	3	0.021
Tetrachloroethene (Perchloroethene)	0.150	C ₂ Cl ₄	4	0.057
Chlorobenzene	0.120	C ₆ H ₅ Cl	1	0.011
1,3-Dichlorobenzene	0.190	C ₆ H ₄ Cl ₂	2	0.036
1,4-Dichlorobenzene	0.200	C ₆ H ₄ Cl ₂	2	0.038
Total hydrogen chloride emission factor (lb./MMcf)				0.30

Notes

1. September 23, 2011 LFG sample laboratory analytical results.

* Example calculation for Freon 12 that assumes complete conversion of chloride to HCl

$$(0.160 \text{ ft}^3 \text{ Freon 12/MMcf LFG}) (2 \text{ mol HCl/mol Freon 12}) (36.46 \text{ lb. HCl/mol}) / (387 \text{ ft}^3/\text{mol}) = 0.030 \text{ lb. HCl/MMcf LFG}$$

**LABORATORY NARRATIVE
ASTM D-5504
Derenzo & Associates
Workorder# 1109413A**

Two 1 Liter Tedlar Bag samples were received on September 22, 2011. The laboratory performed the analysis of sulfur compounds via ASTM D-5504 using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 2.0 mL sampling loop. See the data sheets for the reporting limits for each compound.

Receiving Notes

Sample SE2 were placed on hold per the client's request.

The Chain of Custody (COC) was not relinquished properly. A signature and date were not provided by the field sampler.

Analytical Notes

Sample SE1 was analyzed past the method specified 24 hour hold time.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:

- B - Compound present in laboratory blank greater than reporting limit.
- J - Estimated value.
- E - Exceeds instrument calibration range.
- S - Saturated peak.
- Q - Exceeds quality control limits.
- U - Compound analyzed for but not detected above the detection limit.
- M - Reported value may be biased due to apparent matrix interferences.

File extensions may have been used on the data analysis sheets and indicates as follows:

- a-File was requantified
- b-File was quantified by a second column and detector
- r1-File was requantified for the purpose of reissue

Summary of Detected Compounds
SULFUR GASES BY ASTM D-5504 GC/SCD

Client Sample ID: SE1

Lab ID#: 1109413A-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	44000
Methyl Mercaptan	800	6700
Dimethyl Sulfide	800	6600



Client Sample ID: SE1

Lab ID#: 1109413A-01A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	1092221	Date of Collection: 9/21/11 1:30:00 PM
Dil. Factor:	200	Date of Analysis: 9/22/11 02:30 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	44000
Carbonyl Sulfide	800	Not Detected
Methyl Mercaptan	800	6700
Ethyl Mercaptan	800	Not Detected
Dimethyl Sulfide	800	6600
Carbon Disulfide	1000	Not Detected
Isopropyl Mercaptan	800	Not Detected
tert-Butyl Mercaptan	800	Not Detected
n-Propyl Mercaptan	800	Not Detected
Ethyl Methyl Sulfide	800	Not Detected
Thiophene	800	Not Detected
Isobutyl Mercaptan	800	Not Detected
Diethyl Sulfide	800	Not Detected
n-Butyl Mercaptan	800	Not Detected
Dimethyl Disulfide	800	Not Detected
3-Methylthiophene	800	Not Detected
Tetrahydrothiophene	800	Not Detected
2-Ethylthiophene	800	Not Detected
2,5-Dimethylthiophene	800	Not Detected
Diethyl Disulfide	800	Not Detected

Container Type: 1 Liter Tedlar Bag



Client Sample ID: Lab Blank

Lab ID#: 1109413A-03A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	1092204	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/21/11 07:10 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4.0	Not Detected
Carbonyl Sulfide	4.0	Not Detected
Methyl Mercaptan	4.0	Not Detected
Ethyl Mercaptan	4.0	Not Detected
Dimethyl Sulfide	4.0	Not Detected
Carbon Disulfide	5.0	Not Detected
Isopropyl Mercaptan	4.0	Not Detected
tert-Butyl Mercaptan	4.0	Not Detected
n-Propyl Mercaptan	4.0	Not Detected
Ethyl Methyl Sulfide	4.0	Not Detected
Thiophene	4.0	Not Detected
Isobutyl Mercaptan	4.0	Not Detected
Diethyl Sulfide	4.0	Not Detected
n-Butyl Mercaptan	4.0	Not Detected
Dimethyl Disulfide	4.0	Not Detected
3-Methylthiophene	4.0	Not Detected
Tetrahydrothiophene	4.0	Not Detected
2-Ethylthiophene	4.0	Not Detected
2,5-Dimethylthiophene	4.0	Not Detected
Diethyl Disulfide	4.0	Not Detected

Container Type: NA - Not Applicable



Client Sample ID: LCS

Lab ID#: 1109413A-04A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	1092202	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/21/11 06:24 PM

Compound	%Recovery
Hydrogen Sulfide	80
Carbonyl Sulfide	106
Methyl Mercaptan	103
Ethyl Mercaptan	107
Dimethyl Sulfide	107
Carbon Disulfide	103
Isopropyl Mercaptan	100
tert-Butyl Mercaptan	100
n-Propyl Mercaptan	103
Ethyl Methyl Sulfide	105
Thiophene	104
Isobutyl Mercaptan	102
Diethyl Sulfide	105
n-Butyl Mercaptan	98
Dimethyl Disulfide	107
3-Methylthiophene	110
Tetrahydrothiophene	112
2-Ethylthiophene	113
2,5-Dimethylthiophene	111
Diethyl Disulfide	112

Container Type: NA - Not Applicable



Client Sample ID: LCSD

Lab ID#: 1109413A-04AA

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	1092203	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/21/11 06:46 PM

Compound	%Recovery
Hydrogen Sulfide	79
Carbonyl Sulfide	106
Methyl Mercaptan	102
Ethyl Mercaptan	107
Dimethyl Sulfide	106
Carbon Disulfide	102
Isopropyl Mercaptan	99
tert-Butyl Mercaptan	98
n-Propyl Mercaptan	100
Ethyl Methyl Sulfide	105
Thiophene	101
Isobutyl Mercaptan	99
Diethyl Sulfide	104
n-Butyl Mercaptan	97
Dimethyl Disulfide	104
3-Methylthiophene	106
Tetrahydrothiophene	110
2-Ethylthiophene	111
2,5-Dimethylthiophene	104
Diethyl Disulfide	110

Container Type: NA - Not Applicable

**LABORATORY NARRATIVE
EPA Method TO-15
Derenzo & Associates
Workorder# 1109413B**

Two 1 Liter Tedlar Bag samples were received on September 22, 2011. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

Sample SE2 were placed on hold per the client's request.

The Chain of Custody (COC) was not relinquished properly. A signature and date were not provided by the field sampler.

Analytical Notes

All Quality Control Limit exceedences and affected sample results are noted by flags. Each flag is defined at the bottom of this Case Narrative and on each Sample Result Summary page. Target compound non-detects in the samples that are associated with high bias in QC analyses have not been flagged.

Dilution was performed on sample SE1 due to the presence of high level target species.

Method TO-15 is validated for samples collected in specially treated canisters. As such, the use of Tedlar bags for sample collection is outside the scope of the method and not recommended for ambient or indoor air samples. It is the responsibility of the data user to determine the usability of TO-15 results generated from Tedlar bags.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates

as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

**Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN**

Client Sample ID: SE1

Lab ID#: 1109413B-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	50	160	250	780
Chloromethane	200	510	410	1000
Ethanol	200	55000 E	380	100000 E
Acetone	200	16000	480	38000
2-Propanol	200	7600	490	19000
Carbon Disulfide	200	330	620	1000
Methylene Chloride	50	86	170	300
Hexane	50	460	180	1600
2-Butanone (Methyl Ethyl Ketone)	200	14000	590	42000
cis-1,2-Dichloroethene	50	150	200	610
Tetrahydrofuran	50	1700	150	5100
Cyclohexane	50	260	170	880
2,2,4-Trimethylpentane	50	250	230	1200
Benzene	50	4800	160	15000
1,2-Dichloroethane	50	78	200	320
Heptane	50	620	200	2500
Trichloroethene	50	75	270	400
4-Methyl-2-pentanone	50	960	200	3900
Toluene	50	6100	190	23000
Tetrachloroethene	50	150	340	1000
Chlorobenzene	50	120	230	570
Ethyl Benzene	50	4900	220	21000
m,p-Xylene	50	5400	220	23000
o-Xylene	50	1700	220	7400
Styrene	50	800	210	3400
Cumene	50	810	240	4000
Propylbenzene	50	380	240	1900
4-Ethyltoluene	50	900	240	4400
1,3,5-Trimethylbenzene	50	520	240	2600
1,2,4-Trimethylbenzene	50	1100	240	5500
1,3-Dichlorobenzene	50	190	300	1100
1,4-Dichlorobenzene	50	200	300	1200

Client Sample ID: SE1

Lab ID#: 1109413B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092324	Date of Collection:	9/21/11 1:30:00 PM
Dil. Factor:	100	Date of Analysis:	9/23/11 09:52 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	50	160	250	780
Freon 114	50	Not Detected	350	Not Detected
Chloromethane	200	510	410	1000
Vinyl Chloride	50	Not Detected	130	Not Detected
1,3-Butadiene	50	Not Detected	110	Not Detected
Bromomethane	50	Not Detected	190	Not Detected
Chloroethane	200	Not Detected	530	Not Detected
Freon 11	50	Not Detected	280	Not Detected
Ethanol	200	55000 E	380	100000 E
Freon 113	50	Not Detected	380	Not Detected
1,1-Dichloroethene	50	Not Detected	200	Not Detected
Acetone	200	16000	480	38000
2-Propanol	200	7600	490	19000
Carbon Disulfide	200	330	620	1000
3-Chloropropene	200	Not Detected	630	Not Detected
Methylene Chloride	50	86	170	300
Methyl tert-butyl ether	50	Not Detected	180	Not Detected
trans-1,2-Dichloroethene	50	Not Detected	200	Not Detected
Hexane	50	460	180	1600
1,1-Dichloroethane	50	Not Detected	200	Not Detected
2-Butanone (Methyl Ethyl Ketone)	200	14000	590	42000
cis-1,2-Dichloroethene	50	150	200	610
Tetrahydrofuran	50	1700	150	5100
Chloroform	50	Not Detected	240	Not Detected
1,1,1-Trichloroethane	50	Not Detected	270	Not Detected
Cyclohexane	50	260	170	880
Carbon Tetrachloride	50	Not Detected	310	Not Detected
2,2,4-Trimethylpentane	50	250	230	1200
Benzene	50	4800	160	15000
1,2-Dichloroethane	50	78	200	320
Heptane	50	620	200	2500
Trichloroethene	50	75	270	400
1,2-Dichloropropane	50	Not Detected	230	Not Detected
1,4-Dioxane	200	Not Detected	720	Not Detected
Bromodichloromethane	50	Not Detected	340	Not Detected
cis-1,3-Dichloropropene	50	Not Detected	230	Not Detected
4-Methyl-2-pentanone	50	960	200	3900
Toluene	50	6100	190	23000
trans-1,3-Dichloropropene	50	Not Detected	230	Not Detected
1,1,2-Trichloroethane	50	Not Detected	270	Not Detected
Tetrachloroethene	50	150	340	1000



Client Sample ID: SE1

Lab ID#: 1109413B-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092324	Date of Collection:	9/21/11 1:30:00 PM
Dil. Factor:	100	Date of Analysis:	9/23/11 09:52 PM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	200	Not Detected	820	Not Detected
Dibromochloromethane	50	Not Detected	420	Not Detected
1,2-Dibromoethane (EDB)	50	Not Detected	380	Not Detected
Chlorobenzene	50	120	230	570
Ethyl Benzene	50	4900	220	21000
m,p-Xylene	50	5400	220	23000
o-Xylene	50	1700	220	7400
Styrene	50	800	210	3400
Bromoform	50	Not Detected	520	Not Detected
Cumene	50	810	240	4000
1,1,2,2-Tetrachloroethane	50	Not Detected	340	Not Detected
Propylbenzene	50	380	240	1900
4-Ethyltoluene	50	900	240	4400
1,3,5-Trimethylbenzene	50	520	240	2600
1,2,4-Trimethylbenzene	50	1100	240	5500
1,3-Dichlorobenzene	50	190	300	1100
1,4-Dichlorobenzene	50	200	300	1200
alpha-Chlorotoluene	50	Not Detected	260	Not Detected
1,2-Dichlorobenzene	50	Not Detected	300	Not Detected
1,2,4-Trichlorobenzene	200	Not Detected UJ	1500	Not Detected UJ
Hexachlorobutadiene	200	Not Detected	2100	Not Detected

E = Exceeds instrument calibration range.

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: 1 Liter Tedlar Bag

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	109	70-130

Client Sample ID: Lab Blank

Lab ID#: 1109413B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092308	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 10:04 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	2.0	Not Detected	4.1	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
1,3-Butadiene	0.50	Not Detected	1.1	Not Detected
Bromomethane	0.50	Not Detected	1.9	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
Ethanol	2.0	Not Detected	3.8	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Acetone	2.0	Not Detected	4.8	Not Detected
2-Propanol	2.0	Not Detected	4.9	Not Detected
Carbon Disulfide	2.0	Not Detected	6.2	Not Detected
3-Chloropropene	2.0	Not Detected	6.3	Not Detected
Methylene Chloride	0.50	Not Detected	1.7	Not Detected
Methyl tert-butyl ether	0.50	Not Detected	1.8	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Hexane	0.50	Not Detected	1.8	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
2-Butanone (Methyl Ethyl Ketone)	2.0	Not Detected	5.9	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Tetrahydrofuran	0.50	Not Detected	1.5	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Cyclohexane	0.50	Not Detected	1.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
2,2,4-Trimethylpentane	0.50	Not Detected	2.3	Not Detected
Benzene	0.50	Not Detected	1.6	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Heptane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
1,4-Dioxane	2.0	Not Detected	7.2	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
4-Methyl-2-pentanone	0.50	Not Detected	2.0	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected

Client Sample ID: Lab Blank

Lab ID#: 1109413B-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092308	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 10:04 AM

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
2-Hexanone	2.0	Not Detected	8.2	Not Detected
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
1,2-Dibromoethane (EDB)	0.50	Not Detected	3.8	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
Styrene	0.50	Not Detected	2.1	Not Detected
Bromoform	0.50	Not Detected	5.2	Not Detected
Cumene	0.50	Not Detected	2.4	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
Propylbenzene	0.50	Not Detected	2.4	Not Detected
4-Ethyltoluene	0.50	Not Detected	2.4	Not Detected
1,3,5-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,2,4-Trimethylbenzene	0.50	Not Detected	2.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected UJ	15	Not Detected UJ
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected

UJ = Non-detected compound associated with low bias in the CCV and/or LCS.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	103.	70-130
4-Bromofluorobenzene	90	70-130



Client Sample ID: CCV

Lab ID#: 1109413B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092303	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 07:13 AM

Compound	%Recovery
Freon 12	83
Freon 114	88
Chloromethane	88
Vinyl Chloride	94
1,3-Butadiene	91
Bromomethane	92
Chloroethane	95
Freon 11	82
Ethanol	95
Freon 113	93
1,1-Dichloroethene	94
Acetone	90
2-Propanol	95
Carbon Disulfide	105
3-Chloropropene	113
Methylene Chloride	86
Methyl tert-butyl ether	93
trans-1,2-Dichloroethene	92
Hexane	96
1,1-Dichloroethane	91
2-Butanone (Methyl Ethyl Ketone)	97
cis-1,2-Dichloroethene	92
Tetrahydrofuran	95
Chloroform	91
1,1,1-Trichloroethane	93
Cyclohexane	96
Carbon Tetrachloride	95
2,2,4-Trimethylpentane	90
Benzene	89
1,2-Dichloroethane	89
Heptane	95
Trichloroethene	92
1,2-Dichloropropane	91
1,4-Dioxane	100
Bromodichloromethane	97
cis-1,3-Dichloropropene	103
4-Methyl-2-pentanone	104
Toluene	88
trans-1,3-Dichloropropene	108
1,1,2-Trichloroethane	90
Tetrachloroethene	90

Client Sample ID: CCV

Lab ID#: 1109413B-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092303	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 07:13 AM

Compound	%Recovery
2-Hexanone	104
Dibromochloromethane	102
1,2-Dibromoethane (EDB)	93
Chlorobenzene	89
Ethyl Benzene	97
m,p-Xylene	99
o-Xylene	105
Styrene	103
Bromoform	108
Cumene	105
1,1,2,2-Tetrachloroethane	91
Propylbenzene	104
4-Ethyltoluene	111
1,3,5-Trimethylbenzene	102
1,2,4-Trimethylbenzene	97
1,3-Dichlorobenzene	93
1,4-Dichlorobenzene	91
alpha-Chlorotoluene	118
1,2-Dichlorobenzene	93
1,2,4-Trichlorobenzene	68 Q
Hexachlorobutadiene	92

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	101	70-130
4-Bromofluorobenzene	106	70-130



Client Sample ID: LCS

Lab ID#: 1109413B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092304	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 07:41 AM

Compound	%Recovery
Freon 12	88
Freon 114	77
Chloromethane	92
Vinyl Chloride	94
1,3-Butadiene	82
Bromomethane	90
Chloroethane	78
Freon 11	82
Ethanol	86
Freon 113	83
1,1-Dichloroethene	88
Acetone	85
2-Propanol	63
Carbon Disulfide	112
3-Chloropropene	112
Methylene Chloride	79
Methyl tert-butyl ether	95
trans-1,2-Dichloroethene	96
Hexane	98
1,1-Dichloroethane	83
2-Butanone (Methyl Ethyl Ketone)	88
cis-1,2-Dichloroethene	88
Tetrahydrofuran	86
Chloroform	85
1,1,1-Trichloroethane	92
Cyclohexane	98
Carbon Tetrachloride	93
2,2,4-Trimethylpentane	92
Benzene	85
1,2-Dichloroethane	75
Heptane	90
Trichloroethene	87
1,2-Dichloropropane	84
1,4-Dioxane	79
Bromodichloromethane	86
cis-1,3-Dichloropropene	97
4-Methyl-2-pentanone	91
Toluene	82
trans-1,3-Dichloropropene	103
1,1,2-Trichloroethane	83
Tetrachloroethene	86



Client Sample ID: LCS

Lab ID#: 1109413B-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092304	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 07:41 AM

Compound	%Recovery
2-Hexanone	93
Dibromochloromethane	92
1,2-Dibromoethane (EDB)	88
Chlorobenzene	85
Ethyl Benzene	88
m,p-Xylene	90
o-Xylene	92
Styrene	93
Bromoform	97
Cumene	92
1,1,2,2-Tetrachloroethane	87
Propylbenzene	90
4-Ethyltoluene	90
1,3,5-Trimethylbenzene	86
1,2,4-Trimethylbenzene	78
1,3-Dichlorobenzene	80
1,4-Dichlorobenzene	77
alpha-Chlorotoluene	106
1,2-Dichlorobenzene	81
1,2,4-Trichlorobenzene	65 Q
Hexachlorobutadiene	75

Q = Exceeds Quality Control limits.

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	98	70-130
4-Bromofluorobenzene	98	70-130



Client Sample ID: LCSD

Lab ID#: 1109413B-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092305	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 08:12 AM

Compound	%Recovery
Freon 12	82
Freon 114	82
Chloromethane	89
Vinyl Chloride	92
1,3-Butadiene	89
Bromomethane	89
Chloroethane	96
Freon 11	85
Ethanol	104
Freon 113	89
1,1-Dichloroethene	106
Acetone	96
2-Propanol	103
Carbon Disulfide	120
3-Chloropropene	121
Methylene Chloride	91
Methyl tert-butyl ether	93
trans-1,2-Dichloroethene	100
Hexane	89
1,1-Dichloroethane	87
2-Butanone (Methyl Ethyl Ketone)	91
cis-1,2-Dichloroethene	89
Tetrahydrofuran	88
Chloroform	87
1,1,1-Trichloroethane	88
Cyclohexane	92
Carbon Tetrachloride	88
2,2,4-Trimethylpentane	85
Benzene	86
1,2-Dichloroethane	83
Heptane	90
Trichloroethene	88
1,2-Dichloropropane	86
1,4-Dioxane	92
Bromodichloromethane	91
cis-1,3-Dichloropropene	99
4-Methyl-2-pentanone	93
Toluene	83
trans-1,3-Dichloropropene	104
1,1,2-Trichloroethane	85
Tetrachloroethene	85



Client Sample ID: LCSD

Lab ID#: 1109413B-05AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	2092305	Date of Collection: NA
Dil. Factor:	1.00	Date of Analysis: 9/23/11 08:12 AM

Compound	%Recovery
2-Hexanone	98
Dibromochloromethane	94
1,2-Dibromoethane (EDB)	90
Chlorobenzene	86
Ethyl Benzene	94
m,p-Xylene	98
o-Xylene	102
Styrene	102
Bromoform	97
Cumene	101
1,1,2,2-Tetrachloroethane	87
Propylbenzene	102
4-Ethyltoluene	105
1,3,5-Trimethylbenzene	100
1,2,4-Trimethylbenzene	92
1,3-Dichlorobenzene	92
1,4-Dichlorobenzene	90
alpha-Chlorotoluene	113
1,2-Dichlorobenzene	93
1,2,4-Trichlorobenzene	74
Hexachlorobutadiene	88

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	97	70-130
4-Bromofluorobenzene	106	70-130



CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice

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180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Page ___ of ___

Project Manager David Derenzo
 Collected by: (Print and Sign) Kevin Nichols *Ken Nichols*
 Company Derenzo + Associates Email dderenzo@derenzo.com
 Address 39345 Schoolcraft City Livonia State MI Zip 48150
 Phone 734-464-3880 Fax 734-464-4368

Project Info:	Turn Around Time:	<i>Lab Use Only</i>
P.O. # <u>1437</u>	<input checked="" type="checkbox"/> Normal	Pressurized by: _____
Project # <u>1101021B</u>	<input type="checkbox"/> Rush	Date: _____
Project Name <u>Seminole Energy</u>	<i>specify</i>	Pressurization Gas: _____
		N ₂ He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum			
						Initial	Final	Receipt	Final (psf)
<u>01A</u>	<u>SE 1</u>		<u>9/21/11</u>	<u>13:30</u>	<u>1101021B (D-5504)</u>				
<u>02A</u>	<u>SE 2</u>		<u>9/21/11</u>	<u>13:30</u>	<u>1101021B (D-5504)</u>				
					<u>EPA TO-15</u>				

Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time	Notes: 2 samples are provided, analyze only one. Second sample is provided in case 1 of 2 is damaged.
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time	
Relinquished by: (signature) Date/Time	Received by: (signature) Date/Time	

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	<u>FED EX</u>		<u>NA</u>	<u>SEALED</u>	Yes No <u>None</u>	<u>1109413</u>