



ADDENDUM TO GREENHOUSE GAS PROJECT PLAN FOR QUANTIFICATION OF GREENHOUSE GAS EMISSION REDUCTIONS

SENECA MEADOWS LANDFILL EXPANSION WATERLOO, NY

Prepared For:

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1.0 INTRODUCTION

On behalf of Seneca Meadows, Inc. (SMI), Conestoga-Rovers & Associates, Inc. (CRA) has developed this Addendum to the June 2010 Greenhouse Gas Project (GGP) Plan for the SMI Expansion Landfill (Expansion). This Addendum addresses the corrective actions recommended by First Environment, Inc. after their review of the June 2010 GGP Plan.

2.0 ADDITIONAL MONITORING PROCEDURES

This Section discusses additional monitoring requirements to be added to the Project based on recommendations from First Environment, Inc. Table 1 presents the revision to the list of monitoring parameters presented in the GGP Plan.

2.1 ELECTRICITY USAGE IN LANDFILL GAS RECOVERY FACILITY

The Facility will record the amount of electricity consumption in the Landfill Gas Recovery Facility (LGRF). A meter reading will be taken monthly and documented on a form maintained at the Facility. The amount of electricity usage at the LGRF will be used to calculate project energy emissions as described in Section 6.2 of the GGP Plan.

2.2 FUEL USAGE IN CONSTRUCTION RELATED ACTIVITIES

The Facility will record the amount of diesel fuel, gasoline, or any other type of fuel used in the construction of the gas collection and control system (GCCS). The amount of fuel used will be documented daily on a form maintained at the Facility. The amount of fuel usage in the construction of the GCCS will be used to calculate project energy emissions as described in Section 6.2 of the GGP Plan.

2.3 FUEL USAGE FOR FLARE ASSISTANCE

The Facility will record the amount of propane or any other type of fuel used to assist the operation of the enclosed flare(s). The amount of propane used will be documented per occurrence (filling of propane tank(s)) on a form maintained at the Facility based on purchase records. The amount of propane usage for the assistance of flare operation will be used to calculate project energy emissions as described in Section 6.2 of the GGP Plan.

2.4 CHANGES TO REGULATORY REQUIREMENTS

The Facility routinely monitors changes to regulations that may affect the eligibility of the Project. The following sources of information will be checked at least semi-annually for any changes to federal, state, or local regulations that may impact the Project:

- The *Federal Register*, located at <http://www.gpoaccess.gov/fr/>

- The United States Environmental Protection Agency (USEPA) website, located at <http://www.epa.gov/>
- The New York State Department of Environmental Conservation (NYSDEC) *Environmental Notice Bulletin*, located at <http://www.dec.ny.gov/enb/enb.html>
- The NYSDEC website, located at <http://www.dec.ny.gov/>
- The Town of Seneca Falls website, located at <http://www.senecafalls.com/>

A summary of any regulatory changes that impact the Project will be presented in the annual report described in Section 9.0 of the GGP Plan.

2.5 ADDITIONAL MONITORING EQUIPMENT

The Facility currently uses a LANDTEC Gas Analyzer and Extraction Monitor (GEM), Model 2000 to provide measurements of the following parameters:

- Daily measurements of methane concentration from the gas header (near the location of the flow meter) each business day;
- Monthly measurements of landfill gas temperature at each vertical well / horizontal collector; and
- Monthly measurements of applied vacuum at each vertical well / horizontal collector.

The Facility will also employ an Envirovision gas analyzer to record the parameters described above. The manufacturer specifies an internal calibration frequency of 1 year and a periodic change of the internal filters as the maintenance procedures. Appendix A presents the manufacturer specifications for the Envirovision gas analyzer.

The calibration certificates for the Envirovision gas analyzer will be maintained at the Facility and available for review upon request.

3.0 EX ANTE ESTIMATED GHG EMISSIONS REDUCTIONS

Greenhouse gas emissions reductions were estimated for each stage of the Expansion, and are provided as Appendix B. The following assumptions were utilized in the analysis:

- Waste placement numbers are based on the projected design capacity of each stage of the Expansion
- Putrescible waste is assumed to comprise 78.85% of total waste (based on an analysis of waste types accepted at the Facility)
- Landfill gas is assumed to be composed of 50% methane by volume
- The density of methane at 60°F and 1 atm equals 0.0423 pounds per cubic foot
- Methane has a global warming potential of 21 times that of carbon dioxide

The lower boundary limit of GHG credits generated (in metric tons of carbon dioxide equivalents) was estimated based on landfill gas generation rates utilizing the USEPA LandGEM model with AP-42 parameters ($L_0 = 100 \text{ m}^3/\text{Mg}$, $k = 0.04 \text{ yr}^{-1}$) and a 75% collection efficiency. The upper boundary limit of GHG credits generated (in metric tons of carbon dioxide equivalents) was estimated based on landfill gas generation rates utilizing the USEPA LandGEM model with the modeling parameters $L_0 = 170 \text{ m}^3/\text{Mg}$ and $k = 0.1 \text{ yr}^{-1}$ with a 90% collection efficiency.

The following table presents the estimated ex ante projection of GHG emission reductions for the Project:

<i>Stage</i>	<i>Approximate Range of GHG Emission Reductions</i>
	<i>(metric tons CO₂ equivalents)</i>
1	178,130 – 812,682
2	263,198 – 1,245,740
3	302,743 – 1,395,370
4	157,787 – 734,072
5	302,136 – 1,427,227
6	263,395 – 1,215,711
7	342,842 – 1,622,307
8	202,582 – 941,703
9	246,605 – 1,166,615
<i>Totals</i>	<i>2,259,419 – 10,561,427</i>

4.0 OTHER PROJECT INFORMATION / CONSIDERATIONS

This Section provides a description of other miscellaneous project information.

4.1 IDENTIFICATION OF PROJECT RISKS

The generation of landfill gas from municipal solid waste (MSW) disposal and the subsequent collection and control is a proven technology. Therefore, no significant risks are identified with this process. The greatest potential risk with the project is a change in regulation that would affect credit eligibility.

4.2 ROLES, RESPONSIBILITIES AND CONTACT INFORMATION

The primary contact for all information related to this project is the Environmental, Engineering and Compliance (EEC) Manager for Seneca Meadows, Inc. The EEC Manager or designee will coordinate the services of the Environmental Specialist, LFG Control System Specialist, Environmental Engineer, outside consultants or other parties, as needed, to gather information and respond to any questions or other information. There are no other entities that hold title to the Seneca Meadows Landfill property. The New York State Department of Environmental Conservation (NYSDEC) is the regulatory agency responsible for issuing permits associated with landfill gas generation and collection. NYSDEC also has delegated authority for most applicable Federal rules.

A copy of a contact list with names and phone numbers has been included as Appendix C.

4.3 RELEVANT OUTCOMES FROM STAKEHOLDER CONSULTATIONS

There have been no relevant stake holder conversations to date. As detailed above, any communications would be handled by the Environmental, Engineering and Compliance Manager and communicated to relevant parties as needed.

4.4 OTHER GHG EMISSIONS TRADING SYSTEMS

To date, the Project has not applied for GHG emission reductions or removal credits through any GHG emissions trading system.

4.5 ESTIMATING MISSING DATA

Section 5.1 of the GGP Plan addresses procedures for estimating missing data. The Section states that "the values for these points with respect to methane concentration and landfill gas flow will constitute the arithmetic average of the data points that fall directly before and after the missing data." This methodology was referenced from the USEPA Greenhouse Gas Reporting Rule under 40 CFR Part 98 since a methodology for estimating missing data was not provided under the ACR Standard (Version 2.0, February 2010).

For flow measurements with the Magnetrol flow meter, the data set will be required to be complete to a level of 90%. Since flow measurements are taken each minute, the total amount of missing data points on an annual basis shall not exceed 52,560 (52,704 data points for leap years). The data substitution procedures discussed in Section 5.1 of the GGP Plan can be utilized as long as the data set is 90% complete. If the data set is less than 90% complete, then these missing time periods must be excluded from the calculations.

For methane concentration measurements from the Landtec GEM or the Envision gas analyzer, the data set must also be 90% complete on an annual basis. Since methane concentration measurements are taken each business day, the total amount of missing data points on an annual basis shall not exceed 26. The data substitution procedures discussed in Section 5.1 of the GGP Plan can be utilized as long as the data set is 90% complete. If the data set is less than 90% complete, then these missing time periods must be excluded from the calculations.

4.6 ASSESSMENT OF UNCERTAINTY

Uncertainty has been considered throughout the selection of monitoring equipment, frequency, calculation and reporting methodologies. Methane measuring devices selected have a measurement accuracy of + or - 3%, and flow meters are accurate + or - 1%, plus 3% of the calibrated flow scale. In addition, data is collected more frequently than required; methane concentrations are measured each business day as opposed to monthly and flow is measured and recorded each minute as opposed to every 15 minutes. Section 4.5 above was also included in order to provide data accuracy and calculation transparency should there be any missing data. Further, all equipment is maintained and calibrated in accordance with manufacturer's requirements (at a

minimum). Therefore, no additional statistical analysis is proposed, nor is any reduction of calculated emissions reduction/removal proposed, providing equipment is operated and maintained within the requirements specified in the GGP Plan.

Should required maintenance or calibration fail to occur, if technical issues arise that call into question the accuracy of the data collected, or if the quantity of missing data is outside of the parameters listed in Section 4.5, additional statistical analysis will be conducted. If the emissions reductions are then determined to be more than + or - 10% of the mean at 90% confidence, then the reportable amount of GHG reductions will be the mean minus the lower bound of the 90% confidence interval.

TABLE

TABLE 1

**DESCRIPTION OF MONITORING PARAMETERS
ADDENDUM TO GREENHOUSE GAS PROJECT PLAN
SENECA MEADOWS, INC.**

<i>Parameter Monitored</i>	<i>Monitoring Device</i>	<i>Units of Measurement</i>	<i>Monitoring Frequency</i>	<i>Data Recording Device</i>	<i>Notes</i>
Flow of Landfill Gas	Magnetrol ThermoTel Model TA2 Flow Meter	SCFM	Continuous	SCADA System	Correction factor of (520°R / 540°R) applied to flow measurements for applicable flow meter
Methane Concentration of Landfill Gas	LANDTEC GEM 2000; Envision Gas Analyzer	% of total volume, wet basis	Each Business Day (M-F)	PC / eDat software	Measurement taken at flow meter location
Methane Concentration of Landfill Gas	Analysis of LFG sample for CH ₄ using USEPA RM 3C	% of total volume, wet basis	Semi-annual	Laboratory Report	Measurement taken at flow meter location
Combustion Temperature of Enclosed Flares	Thermocouple	°F	Continuous	SCADA System	---
Kilowatt Output of Engines	Meter	KW	Continuous	Monthly Operating Reports	---
Temperature of Landfill Gas at Well / Collector	LANDTEC GEM 2000; Envision Gas Analyzer	°F	Monthly	PC / eDat software	Measurement taken at each horizontal collector / well
Applied Vacuum on Well / Collector	LANDTEC GEM 2000; Envision Gas Analyzer	H ₂ O (inches water column)	Monthly	PC / eDat software	Measurement taken at each horizontal collector / well
Electricity Consumption of LGRF	Meter	KW	Continuous	Manual reading logged on form	Meter reading taken at the end of each month
Fuel Consumption - GCCS Construction Activities	None	gallons	Daily	Fuel usage amount logged on form	Amount of fuel usage logged on form daily
Fuel Consumption - Flare Operation Assistance	None	gallons	Daily	Fuel usage amount logged on form	Amount of fuel usage logged on form daily
Regulatory Changes Affecting Project	None	NA	Semi-annually	NA	The Facility will check information sources for possible changes to regulations affecting the Project

APPENDIX A

ENVISION GAS ANALYZER MANUFACTURER SPECIFICATIONS

Technical Specifications



Operation Range

Unit	Minimum	Maximum	Comments
Envision	-22° F	140° F	Heater unit option for low temperatures

Gas Sensors

Gas Sensors	Range	Comments
CH4	0 - 100%	Infra-red cell
CO2	0 - 100%	Infra-red cell
O2	0 - 22%	Electrochemical w/ 1,000,000 O2% hours = Approximate life 5.4 years

Gas Sensor Accuracy

Range	CH4	CO2	O2
0-5%	±0.3%	±0.3%	±0.25%
5-30%	±1.0%	±1.0%	±<1% (Max O2 = 22%)
30 - 100%	±<2.0%	±<2.0%	NA
Resolution	0.01%	0.01%	0.01%
T90	<30s	<30s	<13s

Pressure Sensors

	Range		
Static	(-)5 H2O to 5" H2O	(-)130" H2O to 130" H2O	Comments
Accuracy	0.375"	+/- 2% of reading	According to sensor manufacture specs.
Resolution	0.001	0.01	
T90	<1 ms	<10 ms	
Differential			
Accuracy	0.375"	+/- 2% of reading	According to sensor manufacture specs.
Resolution	0.001	0.01	
T90	<1 ms	<10 ms	
Available			
Accuracy	NA	+/- 2% of reading	
Resolution	NA	0.01	
T90	NA	<10 ms	

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Note: All statements about sensor accuracy and product tolerances are subject to change in the final released unit. This technical specification sheet will be updated when final product is quoted.

Technical Specifications



Pump Specifications

" H2O	Flow (cc/min)
-138	260
-56	650
-11	1010
11	1030
56	740
138	440

Battery Specifications

Battery Life	up to 1000 full charge cycles
Battery Construction	NiMH (no memory)
Charge Time	4 hours from complete discharge

Battery Life (NiMH)

Temperature (°F)	Life (hours)
77	13.8
50	13.1
32	10.5
14	6.6
-4	2.6

WARRANTY EXCLUSIONS AND DISCLAIMER. Elkins Earthworks, LLC. does not guaranty or warrant the results obtained through use of the Products. Accuracy and precision may be affected by:

- 1) improper or inadequate maintenance by Customer;
- 2) Customer or third party supplied products, software, interfacing or supplies;
- 3) unauthorized modification;
- 4) improper use or operation outside of the specifications for the Product;
- 5) misuse, abuse, negligence, accident;
- 6) or damage caused by accident, lightning or other electrical discharge, fresh or salt water immersion or spray, or exposure to environmental conditions for which the Product is not intended;
- 7) unauthorized maintenance or repair; normal wear and tear on consumable parts (e.g., batteries).

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3/19/2008



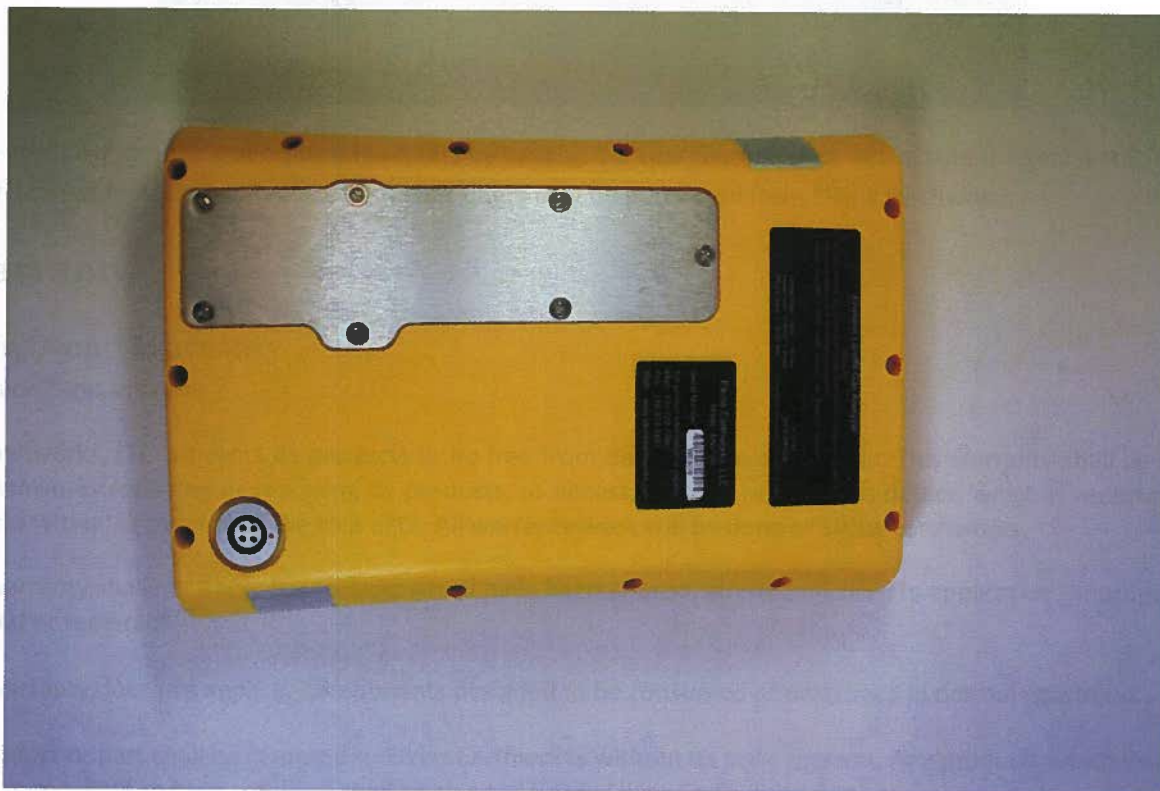
12 Envision™ Maintenance

12.1 Factory Maintenance

The Envision™ gas analyzer should be returned to the factory at a minimum once per year for inspection and factory calibration.

12.2 Field Maintenance

The Envision™ gas monitor has two internal filters. Over time these filters may clog or fowled and may need to be changed. In order to change the filters, locate the aluminum door on the back of the Envision™ gas analyzer under the protective black boot.



Remove the aluminum filter door by loosening the flathead screws and lifting the door off of the enclosure. **Warning: do not remove the filter door in dusty or wet atmospheres as the internal components can get damaged.**

APPENDIX B

ESTIMATED EX ANTE GHG EMISSION REDUCTIONS

**CARBON CREDIT EVALUATION
SENECA MEADOWS, INC.**

Year	Stage 1		Stage 2		Stage 3	
	Estimated Range of Credits	Median	Estimated Range of Credits	Median	Estimated Range of Credits	Median
2009						
2010	47,239 - 234,582	140,910	4,251 - 21,112	12,682		
2011	45,387 - 212,258	128,823	55,103 - 272,452	163,777		
2012	43,607 - 192,059	117,833	103,960 - 499,873	301,916		
2013	41,897 - 173,782	107,840	99,884 - 452,304	276,094	50,815 - 252,338	151,576
2014					87,357 - 419,682	253,519
2015					83,931 - 379,744	231,837
2016					80,640 - 343,606	212,123
2017						
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						
2026						

Notes:

All values expressed as metric tons of carbon dioxide equivalents (metric tons CO₂eq)

**CARBON CREDIT EVALUATION
SENECA MEADOWS, INC.**

Year	Stage 4		Stage 5		Stage 6	
	Estimated Range of Credits	Median	Estimated Range of Credits	Median	Estimated Range of Credits	Median
2009						
2010						
2011						
2012						
2013						
2014	12,308 - 61,118	36,713				
2015	50,445 - 247,085	148,765				
2016	48,467 - 223,572	136,020	12,259 - 60,878	36,569		
2017	46,567 - 202,296	124,432	62,507 - 306,994	184,751		
2018			110,784 - 529,689	320,237	40,682 - 202,021	121,352
2019			116,586 - 529,665	323,125	77,226 - 372,192	224,709
2020					74,198 - 336,773	205,486
2021					71,289 - 304,725	188,007
2022						
2023						
2024						
2025						
2026						

Notes:

All values expressed as metric tons of carbon dioxide equivalents (metric tons CO₂eq)

**CARBON CREDIT EVALUATION
SENECA MEADOWS, INC.**

Year	Stage 7		Stage 8		Stage 9	
	Estimated Range of Credits	Median	Estimated Range of Credits	Median	Estimated Range of Credits	Median
2009						
2010						
2011						
2012						
2013						
2014						
2015						
2016						
2017						
2018						
2019	16,905 - 83,950	50,428				
2020	66,959 - 327,813	197,386				
2021	115,050 - 548,468	331,759				
2022	143,927 - 662,076	403,002	17,391 - 86,360	51,875		
2023			64,215 - 314,052	189,134	3,389 - 16,830	10,109
2024			61,697 - 284,166	172,932	54,092 - 267,673	160,883
2025			59,278 - 257,124	158,201	96,453 - 463,090	279,772
2026					92,671 - 419,021	255,846

Notes:

All values expressed as metric tons of carbon dioxide equivalents (metric tons CO₂eq)

Totals

**CARBON CREDIT EVALUATION
SENECA MEADOWS, INC.**

Year	Total	
	Estimated Range of Credits	Median
2009		
2010	51,490 - 255,694	153,592
2011	100,489 - 484,710	292,600
2012	147,567 - 691,932	419,750
2013	192,596 - 878,424	535,510
2014	99,664 - 480,799	290,232
2015	134,377 - 626,829	380,603
2016	141,367 - 628,056	384,712
2017	109,074 - 509,291	309,182
2018	151,466 - 731,711	441,589
2019	210,718 - 985,807	598,262
2020	141,157 - 664,585	402,871
2021	186,339 - 853,193	519,766
2022	161,318 - 748,437	454,877
2023	67,604 - 330,882	199,243
2024	115,790 - 551,840	333,815
2025	155,731 - 720,215	437,973
2026	92,671 - 419,021	255,846

2,259,419 - 10,561,427 6,410,423

Notes:

All values expressed as metric tons of carbon dioxide equivalents (metric tons CO₂eq)

APPENDIX C

PROJECT CONTACT INFORMATION

PROJECT CONTACT LIST

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