

Air Title V Operating Permit (AOP) - Renewal

version 2.5

(Submission #: HQ8-TQN8-GXZSG, version 1)

Digitally signed by:
CERIS-ND
Date: 2025.05.09 14:04:04 -05:00
Reason: Submission Data
Location: State of North Dakota

Details

Submission ID HQ8-TQN8-GXZSG

Form Input

Form Instructions

In accordance with 33.1-15-14-04.c. of the North Dakota Air Pollution Control Rules, a Title V permit renewal application must be submitted to the Department at least six months, but no more than eighteen months, prior to the expiration date. Permit renewal applications are incomplete unless all information requested in SFN 52824 is supplied. The current Title V permit will be the baseline reference for a renewal. The requirements (40 CFR 70.5(c) & NDAC 33.1-15-14-06.4.c) to include a citation and description of all applicable requirements and a description of or reference to any applicable test method for determining compliance with each applicable requirement may be met by accomplishing either or both of the following: 1) provide an annotated (red-lined) copy of the current permit indicating all changes needed to reflect the current facility configuration, applicable requirements and test methods; 2) provide a narrative that conveys all changes needed to the current permit to reflect the current facility configuration, all applicable requirements and test methods.

FOR ACID RAIN UNITS ONLY ♦ Submit with the Title V permit renewal application all Acid Rain renewal applications (the Acid Rain Permit Application, the Phase II NOx Compliance Plan, and if applicable, the Phase II NOx Averaging Plan).

When completing the online application, if uploaded files are provided in each section (when indicated), do not include those same files in the General Document Upload/File Upload section. If uploading the application files in the General Document Upload/File Upload section, only fill out the required (asterisked) sections of the online application.

Section A - Permit Information

Permit Number

AOP-28405

Permit Version

3

Issue Date

12/20/2021

Expiration Date

12/30/2025

Permittee

Company Name

City of Grand Forks

Address

724 North 47th Street

Grand Forks, ND 58203

United States

Responsible Official

Prefix

NONE PROVIDED

First Name

Lisa

Last Name

Botnen

Title

Environmental Management Director

Phone Type

Business

Number

701-738-8761

Extension

Email

lsbotnen@grandforksgov.com

Address

724 North 47th Street

Grand Forks, ND 58203

United States

Contact Person for Air Pollution Matters

Prefix

NONE PROVIDED

First Name

Lisa

Last Name

Botnen

Title

Environmental Management Director

Phone Type

Business

Number

701-738-8761

Extension

Email

lsbotnen@grandforksgov.com

Address

724 North 47th Street

Grand Forks, ND 58203

United States

Section B (Part 1) - Facility Information

Facility Name

City of Grand Forks - Grand Forks Municipal Solid Waste Landfill

Have you added, removed, or made any modifications to equipment since your last operating permit issuance?

No

Is this source subject to Title IV Acid Rain regulations?

No

Is this a portable source?

No

Facility Location

5500 54th Avenue North

Grand Forks, ND 58203

United States

County

Grand Forks

Facility Location:
47.98000000000000,-97.11440000000000

5500 54th Avenue North, Grand Forks, ND

Section B (Part 2) - Additional Location Information

Legal Description of Facility Site

Qtr Qtr	Qtr	Section	Township	Range
NONE PROVIDED	NW	13	152N	51W

Land area at facility site (indicate whether measurement is in acres or sq. ft.)
NONE PROVIDED

MSL elevation at facility
NONE PROVIDED

Section C - Nature of Business

General Nature of Business

Describe Nature of Business	NAICS Code	SIC Code
Municipal solid waste landfill	562212	4953-Refuse Systems

Actual Start of Construction Date
NONE PROVIDED

Actual End of Construction Date
NONE PROVIDED

Facility Startup Date
NONE PROVIDED

Section D - Process Equipment Information (1 of 1)

Emission Unit - EU-01

Emission Unit ID
EU-01

Emission Unit Description
Landfill Gas Fugitive Emissions

Emission Point ID
NONE PROVIDED

Emission Point Description
Fugitive emissions from municipal solid waste landfill

Emission Process Description
See attached application report section 2.0

Emission Unit Status
Existing, no change

Applicable PTCs

PTC Number
NONE PROVIDED

Applicable Federal Air Programs

Program Code
Title V Permits
New Source Performance Standards

NSPS Air Program Subparts

Subpart
Subpart XXX - MUNICIPAL SOLID WASTE LANDFILLS THAT COMMENCED CONSTRUCTION, RECONSTRUCTION, OR MODIFICATION AFTER JULY 17, 2014

Applicable State Regulations

Regulation
33.1-15-17-02. Restriction of Fugitive Particulate Emissions.
33.1-15-01. General Provisions.
33.1-15-14-06. Title V Permit to Operate.
33.1-15-12. Standards of Performance for New Stationary Sources.

Emission Unit form

Download the emission unit form linked here, complete it, and upload it to this application using the attachment control below.

When completing the online application, if uploaded files are provided in each section (when indicated), do not include those same files in the General Document Upload/File Upload section. If uploading the application files in the General Document Upload/File Upload section, only fill out the required (asterisked) sections of the online application.

[EMISSION UNIT FOR TITLE V PERMIT TO OPERATE \(SFN61006\)](#)

Attach Emission Unit Form

FORM SFN61006_flat.pdf - 04/11/2025 09:06 AM

Comment

NONE PROVIDED

Section F - Facility-Wide Applicable Regulations and Potential to Emit (PTE)

Applicable Federal Air Programs

Program Code

Applicable State Regulations

Regulation

Potential to Emit (PTE)

Pollutant	Tons Per Year Without Fugitives	Tons Per Year With Fugitives
NOx	0	0
CO	0	1.23
VOCs	0	4.82
SO2	0	0
PM	0	0
PM10	0	0
PM2.5	0	0
Total HAPs	0	3.87
NONMETHANE ORGANIC COMPOUNDS	0	6.84

Emission Calculations Document Upload

Using the attachment control below, upload emission calculations documents.

When completing the online application, if uploaded files are provided in each section (when indicated), do not include those same files in the General Document Upload/File Upload section. If uploading the application files in the General Document Upload/File Upload section, only fill out the required (asterisked) sections of the online application.

Attach Emission Calculations Documents

App D - Potential Emission Calculations_2025-04.pdf - 04/11/2025 09:13 AM

Comment

NONE PROVIDED

Section G - Compliance Schedule

Will your facility be in compliance with all applicable requirements effective at the time of permit issuance?

Yes

Will your facility be in compliance with all applicable requirements effective after the time of permit issuance?

Yes

Section H - Flexible Permits

Are you requesting a flexible permit?

No

Section I - Compliance Assurance Monitoring (CAM)

To determine if your facility is subject to CAM, review the information provided at the following link.

[Compliance Assurance Monitoring \(CAM\) Guidance](#)

Is the facility identified in this application in compliance with applicable monitoring and compliance certification requirements?

Compliance Assurance Monitoring (CAM) not applicable.

Section K - Redline Permit Upload

Use the attachment control below to upload a redline version of your existing permit document, showing any changes.

When completing the online application, if uploaded files are provided in each section (when indicated), do not include those same files in the General Document Upload/File Upload section. If uploading the application files in the General Document Upload/File Upload section, only fill out the required (asterisked) sections of the online application.

Attach redline version of permit here

December 2021 Final Title V Permit_Redline.pdf - 04/11/2025 09:29 AM

Comment

NONE PROVIDED

Section L - General Document Upload

File Upload

Use the attachment control below to upload any other information necessary for application review, such as plot plans, process diagrams, maps, etc.

When completing the online application, if uploaded files are provided in each section (when indicated), do not include those same files in the General Document Upload/File Upload section. If uploading the application files in the General Document Upload/File Upload section, only fill out the required (asterisked) sections of the online application.

Attachments

City of Grand Forks MSW TV Renewal_2025-04.pdf - 04/11/2025 09:30 AM

Comment

Application report, includes narrative of process and emission units, potential emission calculations, and site figure

Additional Forms

NONE PROVIDED

Agreements and Signature(s)

SUBMISSION AGREEMENTS

- ☒ I am the owner of the account used to perform the electronic submission and signature.
- ☒ I have the authority to submit the data on behalf of the facility I am representing.
- ☒ I agree that providing the account credentials to sign the submission document constitutes an electronic signature equivalent to my written signature.
- ☒ I have reviewed the electronic form being submitted in its entirety, and agree to the validity and accuracy of the information contained within it to the best of my knowledge.

I certify under penalty of law that the enclosed documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I also certify that the source(s) identified in this application is/are in compliance with all applicable requirements except those requirements for which a compliance schedule has been submitted in the Compliance Schedule Form or Compliance Schedule Section of the application. I understand that failure to comply with any term of a compliance schedule is considered to be a violation of regulation NDAC 33.1-15-14-06.1.e. The source will continue to comply with the current applicable requirements with which it is in compliance. The source will meet, on a timely basis, any applicable requirement, which becomes effective during the permit term. The source is properly implementing any required risk management plan in accordance with section 112(r) of the federal clean air act, if appropriate.

I certify, as the Responsible Official, that I have read and understood the above requirements and conditions applicable to my source/facility and that the information and attachments provided in this application are true, accurate, and complete to the best of my knowledge." Further, I agree to comply with the provisions of Chapter 23.1-06 of the North Dakota Century Code and all rules and regulations of the Department, or revisions thereof. I also understand a permit is nontransferable and, if granted a permit, I will promptly notify the Department upon sale or legal transfer of this permitted establishment.

Note: This certification must be signed by a "responsible official" as defined in NDAC 33.1-15-14-06.1.

**Signed
By**

Lisa Botnen on 05/09/2025 at 2:00 PM

December 20, 2021

Mr. Todd Feland
City Administrator
City of Grand Forks City Hall
255 N Fourth Street
Grand Forks, ND 58203

Received
12/23/21


Re: Air Pollution Control
Title V (Renewal)
Permit to Operate

Dear Mr. Feland:

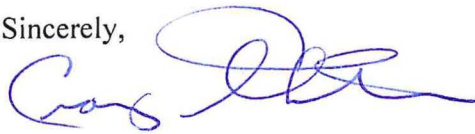
Pursuant to the Air Pollution Control Rules of the State of North Dakota, the Department of Environmental Quality has reviewed your permit application dated June 26, 2020 (revised April 23, 2021) for the Grand Forks Municipal Solid Waste Landfill located in Grand Forks County, North Dakota.

Based on our review of the permit application and other relevant documents, the Department hereby issues a Permit to Operate for the source. The Department's issuance of the permit is contingent upon compliance with the conditions outlined in the permit. Please review each condition carefully and note the restrictions placed on the source units. For your information, no comments were received during the 30-day public comment and 45-day EPA review periods.

Note that the above-referenced permit addresses only air quality requirements applicable to your facility. Other divisions (Water Quality, Waste Management and Municipal Facilities) within the Department of Environmental Quality may have additional requirements. Contact information for the various divisions is listed at the bottom of this letter.

If you have any questions, please contact me at (701)328-5283 or email cristy.jones@nd.gov.

Sincerely,



Cristy Jones
Environmental Scientist
Division of Air Quality

CJ:saj

Enc:

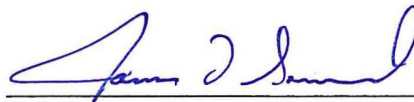
xc/enc: Dan Fagnant, EPA/R8 (email - fagnant.daniel@epa.gov)
Gail Fallon, EPA/R8 (email - fallon.gail@epa.gov)

**AIR POLLUTION CONTROL
TITLE V PERMIT TO OPERATE**

Permittee: Name: City of Grand Forks Address: P.O. Box 5200 Grand Forks, ND 58206-5200	Permit Number: AOP-28405 v3.0 Source Name: Grand Forks Municipal Solid Waste Landfill
Source Location: Sec. 13, T152N, R51W 5500 - 54 th Avenue N Grand Forks, ND 58203 Grand Forks County	Source Type: Landfill
Expiration Date: December 30, 2025	

Pursuant to Chapter 23.1-06 of the North Dakota Century Code (NDCC), and the Air Pollution Control Rules of the State of North Dakota, Article 33.1-15 of the North Dakota Administrative Code (NDAC), and in reliance on statements and representations heretofore made by the permittee (i.e., owner) designated above, a Title V Permit to Operate is hereby issued authorizing such permittee to operate the emissions units at the location designated above. This Title V Permit to Operate is subject to all applicable rules and orders now or hereafter in effect of the North Dakota Department of Environmental Quality (Department) and to any conditions specified on the following pages. All conditions are enforceable by EPA and citizens under the Clean Air Act unless otherwise noted.

Renewal: 12/20/21



James L. Semerad
Director
Division of Air Quality

Grand Forks Municipal Solid Waste Landfill
Title V Permit to Operate
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1. **Emission Unit Identification:**

The emission units regulated by this permit are as follows:

Emission Unit Description	Emission Unit (EU)	Emission Point (EP)	Air Pollution Control Equipment
Municipal solid waste landfill with a total capacity of approximately $9.04 \times 10^6 \text{ m}^3$ (~11.83 x 10⁶ yd³) of waste Change from $11.83 \times 10^6 \text{ yd}^3$ to $14.65 \times 10^6 \text{ yd}^3$	1	1	None ^A
Storage/Office Building Heating - Propane fired infrared heating/hot water heater/forced air rated at approximately $0.622 \times 10^6 \text{ Btu/hr}$	NA ^B	NA	None
Fugitive Dust Emissions	FUG ^B	FUG	Fugitive Dust Control Condition 4.B

^A Future changes in the estimated size of the landfill or the kind of waste disposed, which could change the Nonmethane Organic Compound (NMOC) emissions, may result in required control equipment per Condition 4.B.

^B Insignificant units/activities.

2. **Applicable Standards, Restrictions and Miscellaneous Conditions:**

A. **Fuel Restrictions:** The infrared heating and forced air is restricted to combusting only commercial propane as defined by the Gas Processors Association.

Applicable Requirement: NDAC 33.1-15-14-06.5.b(1)

B. **New Source Performance Standards (NSPS):** The permittee shall comply with all applicable requirements of the following NDAC 33.1-15-12-02 and 40 CFR 60 subparts in addition to complying with Subpart A - General Provisions.

- 1) ~~Subpart Cf Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills.~~ Changes from Subpart Cf to NSPS XXX- Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification After July 17, 2014

Applicable Requirement: NDAC 33.1-15-12

C. **Fugitive Dust Control:** The permittee shall control Fugitive Dust (EU FUG) as follows:

- 1) Implement watering during land clearing, topsoil and overburden removal, and other material handling operations, unless natural moisture is sufficient to control fugitive particulate emissions.
- 2) Water stockpiles, both active and inactive, as necessary to control fugitive particulate emissions.
- 3) Vegetate closed landfill surfaces within one year of disturbance.

- 4) Water unpaved on-site haul roads as often as necessary to control fugitive particulate emissions.
- 5) Limit vehicle speeds on unpaved roads and disturbed areas on-site.
- 6) Minimize the size of the working face.
- 7) Apply cover to disposed solid waste as often as practical. The application of cover shall serve to control fugitive particulate emissions, odor production, and accumulation of litter. If the planned operations are shown to be ineffective in controlling any of the mentioned issues, remedial action shall be taken on a case-by-case basis.

Applicable Requirement: 33.1-15-14-06.5.b(1)

3. Emission Unit Limits:

Emission Unit Description	EU	EP	Pollutant/ Parameter	Emission Limit	NDAC Applicable Requirement
Municipal solid waste landfill	1	1	NMOC or NMOC & Surface Emissions of Methane (SEM)	34 Mg/yr threshold ^{A, B} or ≥34 Mg/yr & <50 Mg/yr & <500 ppm thresholds ^{B, C}	33.1-15-12-02, Subpart Cf

^A As determined by Tier 1, Tier 2 or Tier 3 of the subpart.

^B Exceeding the emission limit (threshold) requires additional monitoring or control as outlined in Condition 4.A, Condition 5, and Condition 6, respectively.

^C As determined by Tier 4 and either Tier 1 or Tier 2 of the subpart.

Applicability changes from Subpart Cf to NSPS XXX for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification After July 17, 2014; 40 CFR 60.762(b)(2)

4. Monitoring Requirements and Conditions:

A. Requirements:

Emission Unit Description	Pollutant/Parameter	Monitoring Requirement (Method)	Condition Number	NDAC Applicable Requirement
Municipal solid waste landfill	NMOC (as hexane)	NMOC Emissions Sampling/Calculation or NMOC Emissions Sampling/Calculation & SEM Monitoring	4.B	33.1-15-12, Subpart Cf, Section 60.35f(a)(1) through 60.35f(a)(6)

B. **Monitoring Conditions:** The permittee shall calculate the annual NMOC emission rate per Equation 1 or Equation 2 provided in ~~NDAC 33.1-15-12, Subpart Cf, §60.35f(a)(1)~~, depending upon the known actual year-to-year solid waste acceptance rate. As a result of the NMOC emission rate calculated per the aforementioned equations, monitoring shall be conducted as outlined below.

- 1) Tier 1: Changes to NDAC 33.1-15-12, NSPS XXX 40 CFR 60.762(b)(1)(i)
 - a) If the NMOC emission rate is less than 34 Mg/year, the permittee shall recalculate the NMOC annually according to ~~§60.33f(e)~~ and submit an annual NMOC emission rate report (annual emissions inventory report) per ~~§60.38f(c)~~, except as provided in ~~§60.38f(c)(3)~~.
 - b) If the NMOC emission rate is equal to or greater than 34 Mg/year, the permittee shall conduct one of the following:
 - 1] Within in one year of determining an NMOC emission rate equal to or greater than 34 Mg/year, submit a gas collection and control system design per ~~§60.38f(d)~~, operate the system within 30 months according to ~~§60.33f(b) and (c)~~, and conduct monitoring per ~~§60.37f~~;
 - 2] Use the Tier 2 site-specific NMOC concentration recalculation method specified in ~~§60.35f(a)(3)~~ and Condition 4.B.2);or
 - 3] Determine the site-specific methane generation rate constant per Tier 3 methods as specified in ~~§60.35f(a)(4)~~ and Condition 4.B.3).
- 2) Tier 2: The permittee shall determine the site-specific NMOC concentration per the method specified in ~~§60.35f(a)(3)~~.

- a) If the NMOC emission rate is less than 34 Mg/year according to ~~§60.35f(3)~~, the permittee shall conduct monitoring per Condition 4.B.1)a).
- b) If the NMOC mass emission rate is equal to or greater than 34 Mg/year, the permittee shall conduct one of the following:
 - 1] Within in one year of determining an NMOC emission rate equal to or greater than 34 Mg/year, submit a gas collection and control system design per ~~§60.38f(d)~~, operate the system within 30 months according to ~~§60.33f(b) and (c)~~, and conduct monitoring per ~~§60.37f~~;
 - 2] Determine the site-specific methane generation rate constant per Tier 3 methods specified in ~~§60.35f(a)(4) Condition 4.B.3)~~; or
 - 3] Conduct Tier 4 surface methane emissions monitoring per ~~§60.35f(a)(6)~~ and Condition 4.B.4).
- 3) Tier 3: The permittee shall determine a site-specific methane generation constant and a site-specific NMOC concentration according to ~~§60.35f(a)(4)~~.
 - a) If the NMOC emission rate is less than 34 Mg/year according to ~~§60.35f(4)~~, the permittee shall recalculate the NMOC mass emission rate per ~~§60.35f(a)(1)~~, ~~§60.35f(a)(3)~~ and ~~§60.35f(a)(4)~~.
 - b) If the NMOC mass emission rate is equal to or greater than 34 Mg/year using both the Tier 2 and Tier 3 methods, the permittee shall conduct one of the following:
 - 1] Within in one year of determining an NMOC emission rate equal to or greater than 34 Mg/year, submit a gas collection and control system design per ~~§60.38f(d)~~, operate the system within 30 months according to ~~§60.33f(b) and (c)~~, and conduct monitoring per ~~§60.37f~~; or
 - 2] Conduct Tier 4 surface methane emissions monitoring per ~~§60.35f(a)(6)~~ and Condition 4.B.4).
- 4) Tier 4: The NMOC emission rate shall be equal to or greater than 34 Mg/year but less than 50 Mg/year to qualify for Tier 4 reporting. The permittee shall demonstrate that the surface methane emissions are below 500 ppm on a quarterly basis according to ~~§60.35f(a)(6)~~. Monitoring shall be conducted per ~~§60.37f(f)~~.
 - a) For facilities that report a site-specific methane concentration greater than 500 parts per million from the landfill surface, the permittee shall submit a gas collection and control system design per ~~§60.38f(d)~~ operate the system within 30 months according to ~~§60.33f(b) and (c)~~.

5. **Recordkeeping Requirements and Conditions:**

A. The permittee shall maintain compliance monitoring records according to §60.39f and as outlined in the Monitoring Records table (below) that includes the following information.

- 1) The date, place (as defined in the permit) and time of sampling or measurement.
- 2) The date(s) testing was performed.
- 3) The company, entity, or person that performed the testing.
- 4) The testing techniques or methods used.
- 5) The results of such testing.
- 6) The operating conditions that existed at the time of sampling or measurement.

Applicable Requirement: NDAC 33.1-15-14-06.5.a(3)(b)[1]

Monitoring Records

Emission Unit Description	Pollutant/ Parameter	Compliance Monitoring Record
Municipal solid waste landfill	NMOC	NMOC Calculations/Emissions Test Data
	or NMOC & SEM Monitoring	or NMOC Calculations/Emissions Test Data & Surface Emission Monitoring of Methane Data

B. **Recordkeeping Conditions:**

- 1) The permittee shall retain readily accessible paper or electronic records per ~~40 CFR 60, §60.39f(a)~~, including the design capacity, the current amount of solid waste in-place, and the year-by-year acceptance rate. Off-site records that are retrievable within four hours may be maintained in lieu of on-site records.

Applicable Requirement: NDAC 33.1-15-12, ~~Subpart Cf~~ Changes to NSPS XXX

- 2) Tier 4 Recordkeeping: Permittees demonstrating compliance per Tier 4 site-specific surface methane emissions monitoring shall maintain records per §60.39f(g).

Applicable Requirement: NDAC 33.1-15-12, ~~Subpart Cf~~ Changes to NSPS XXX

- 3) The permittee shall retain records of all required monitoring data and support information for a period of at least five years from the date of the monitoring sampling, measurement,

report, or application. Support information includes all calibration and maintenance records and all original strip-chart recordings/computer printouts of continuous monitoring instrumentation, and copies of all reports required by the permit.

Applicable Requirements: NDAC 33.1-15-14-06.5.a(3)(b)[2]

6. **Reporting:**

- A. The permittee shall conduct reporting according to ~~40 CFR 60, §60.38f~~ and, if applicable, shall submit an annual NMOC emission rate report (annual emissions inventory report) in a format provided or approved by the Department. This report shall be submitted by March 15 of each year, unless the provisions of §60.38f(c)(3) are met, or the permittee elects to install a collection and control system that complies with §60.33f(b) and (c). Insignificant units/activities listed in this permit do not need to be included in the report.

Applicable Requirement: NDAC 33.1-15-12, ~~Subpart Cf~~ Changes to NSPS XXX

B. Tier 1:

- 1) If the five consecutive year annual emission rate is less than 34 Mg/year, then an estimate of the NMOC emission rate over that five-year period may be submitted in lieu of an annual report. The five consecutive year report shall be revised every five-year period and the report shall include the following:
 - a) the current mass of solid waste at the facility; and
 - b) the estimate waste acceptance rate for each of the five years for which an NMOC emission rate is estimated.

Applicable Requirements: NDAC 33.1-15-14-02, ~~Subpart Cf, §60.35f~~ and NDAC 33.1-15-23-04

- C. Tier 2: The permittee shall submit the NMOC concentration, and corresponding NMOC emission rate calculated per ~~§60.35f(a)(3)~~ to the Department within 60 days after the determination of the results of the Tier 2 evaluation.

- 1) If the Tier 2 calculation demonstrates that the NMOC is less than 34 Mg/year, then the permittee shall submit a periodic estimate of the NMOC emission rate per ~~§60.38f(c)~~ unless the provisions of ~~§60.38f(c)(3)~~ are met.
- 2) If using the site-specific NMOC concentration obtained from Tier 2 procedures result in a NMOC emissions rate equal to or greater than 34 Mg year, then the permittee shall conduct reporting according to Tier 3 (Condition 6.D.) or Tier 4 (Condition 6.E.) reporting requirements.

Applicable Requirements: NDAC 33.1-15-14-02, ~~Subpart Cf, §60.35f~~

D. Tier 3:

- 1) If the Tier 2 site specific NMOC concentration and Tier 3 site-specific methane generation rate is less than 34 Mg/year, then the permittee shall submit an annual NMOC emission rate report as provided in §60.38f(c) unless the provisions of §60.38f(c)(3) are met.
- 2) If the Tier 2 site specific NMOC concentration and Tier 3 site-specific methane generation rate is equal to or greater than 34 Mg/year, then the permittee shall either:
 - a) Conduct reporting according to Tier 4 procedures specified in ~~§60.35f(a)(4) once~~, and that value shall be used in all annual NMOC emission rate calculations; or
 - b) Submit a gas collection and control system design plan according to ~~§60.767(e)~~, then install and operate the system within 30 months per §60.762(b)(2)(ii) and (iii).

Applicable Requirements: NDAC 33.1-15-14-02, ~~Subpart Cf, §60.35f~~

E. Tier 4: For facilities that elect to monitor site specific surface methane emissions per §60.35f(a)(6), the permittee shall conduct Tier 4 reporting according to ~~§60.38f(d)(4)(iii)~~.

- 1) For facilities that report a site-specific methane concentration greater than 500 parts per million from the landfill surface, the permittee shall submit a gas collection and control system design per ~~§60.38f(d)~~ operate the system within 30 months according to ~~§60.33f(b)~~ and (c), and conduct reporting per ~~§60.37f and §60.38f(d)~~.
- 2) For facilities that demonstrate site-specific methane concentration less than 500 parts per million, the permittee shall submit an annual Tier 4 methane surface emission report (annual emissions inventory report).

Applicable Requirements: NDAC 33.1-15-14-02, Subpart Cf, §60.35f

F. The permittee shall submit an annual compliance certification report in accordance with NDAC 33.1-15-14-06.5.c(5) within 45 days after December 31 of each year in a format provided or approved by the Department.

Applicable Requirement: NDAC 33.1-15-14-06.5.c(5)

G. For emission units where the method of compliance monitoring is demonstrated by an EPA Test Method or a portable analyzer test, the test report shall be submitted to the Department within 60 days after completion of the test.

Applicable Requirement: NDAC 33.1-15-14-06.5.a(6)(e)

7. **Facility Wide Operating Conditions:**

A. **Ambient Air Quality Standards:**

- 1) Particulate and gases. The permittee shall not emit air contaminants in such a manner or amount that would violate the standards of ambient air quality listed in Table 1 of NDAC 33.1-15-02, external to buildings, to which the general public has access.
- 2) Radioactive substances. The permittee shall not release into the ambient air any radioactive substances exceeding the concentrations specified in NDAC 33.1-10.
- 3) Other air contaminants. The permittee shall not emit any other air contaminants in concentrations that would be injurious to human health or well-being or unreasonably interfere with the enjoyment of property or that would injure plant or animal life.
- 4) Disclaimer. Nothing in any other part or section of this permit may in any manner be construed as authorizing or legalizing the emission of air contaminants in such manner that would violate the standards in Paragraphs 1), 2) and 3) of this condition.

Applicable Requirements: NDAC 33.1-15-02-04 and 40 CFR 50.1(e)

- B. **Fugitive Emissions:** The release of fugitive emissions shall comply with the applicable requirements in NDAC 33.1-15-17.

Applicable Requirement: NDAC 33.1-15-17

- C. **Open Burning:** The permittee may not cause, conduct, or permit open burning of refuse, trade waste, or other combustible material, except as provided for in Section 33.1-15-04-02 and may not conduct, cause, or permit the conduct of a salvage operation by open burning. Any permissible open burning under NDAC 33.1-15-04-02 must comply with the requirements of that section.

Applicable Requirement: NDAC 33.1-15-04

- D. **Asbestos Renovation or Demolition:** Any asbestos renovation or demolition at the facility shall comply with emission standard for asbestos in NDAC 33.1-15-13.

Applicable Requirement: NDAC 33.1-15-13-02

E. **Requirements for Organic Compounds Gas Disposal:**

- 1) Any organic compounds, gases and vapors which are generated as wastes as the result of storage, refining or processing operations and which contain hydrogen sulfide shall be incinerated, flared or treated in an equally effective manner before being released into the ambient air.
- 2) Each flare must be equipped and operated with an automatic ignitor or a continuous burning pilot.

Applicable Requirement: NDAC 33.1-15-07-02

- F. **Rotating Pumps and Compressors:** All rotating pumps and compressors handling volatile organic compounds must be equipped and operated with properly maintained seals designed for their specific product service and operating conditions.

Applicable Requirement: NDAC 33.1-15-07-01.5

G. **Shutdowns/Malfunction/Continuous Emission Monitoring System Failure:**

- 1) Maintenance Shutdowns. In the case of shutdown of air pollution control equipment for necessary scheduled maintenance, the intent to shut down such equipment shall be reported to the Department at least 24 hours prior to the planned shutdown provided that the air contaminating source will be operated while the control equipment is not in service. Such prior notice shall include the following:
 - a) Identification of the specific facility to be taken out of service as well as its location and permit number.
 - b) The expected length of time that the air pollution control equipment will be out of service.
 - c) The nature and estimated quantity of emissions of air pollutants likely to be emitted during the shutdown period.
 - d) Measures, such as the use of off-shift labor and equipment, that will be taken to minimize the length of the shutdown period.
 - e) The reasons that it would be impossible or impractical to shut down the source operation during the maintenance period.
 - f) Nothing in this subsection shall in any manner be construed as authorizing or legalizing the emission of air contaminants in excess of the rate allowed by this article or a permit issued pursuant to this article.

Applicable Requirement: NDAC 33.1-15-01-13.1

- 2) Malfunctions.
 - a) When a malfunction in any installation occurs that can be expected to last longer than 24 hours and cause the emission of air contaminants in violation of this article or other applicable rules and regulations, the person responsible for such installation shall notify the Department of such malfunction as soon as possible during normal working hours. The notification must contain a statement giving all pertinent facts, including the estimated duration of the breakdown. The Department shall be notified when the condition causing the malfunction has been corrected.

- b) Immediate notification to the Department is required for any malfunction that would threaten health or welfare or pose an imminent danger. During normal working hours the Department can be contacted at 701-328-5188. After hours the Department can be contacted through the 24-hour state radio emergency number 1-800-472-2121. If calling from out of state, the 24-hour number is 701-328-9921.
- c) Unavoidable Malfunction. The owner or operator of a source who believes any excess emissions resulted from an unavoidable malfunction shall submit a written report to the Department which includes evidence that:
 - [1] The excess emissions were caused by a sudden, unavoidable breakdown of technology that was beyond the reasonable control of the owner or operator.
 - [2] The excess emissions could not have been avoided by better operation and maintenance, did not stem from an activity or event that could have been foreseen and avoided, or planned for.
 - [3] To the extent practicable, the source maintained and operated the air pollution control equipment and process equipment in a manner consistent with good practice for minimizing emissions, including minimizing any bypass emissions.
 - [4] Any necessary repairs were made as quickly as practicable, using off-shift labor and overtime as needed and possible.
 - [5] All practicable steps were taken to minimize the potential impact of the excess emissions on ambient air quality.
 - [6] The excess emissions are not part of a recurring pattern that may have been caused by inadequate operation or maintenance, or inadequate design of the malfunctioning equipment.

The report shall be submitted within 30 days of the end of the calendar quarter in which the malfunction occurred or within 30 days of a written request by the Department, whichever is sooner.

The burden of proof is on the owner or operator of the source to provide sufficient information to demonstrate that an unavoidable equipment malfunction occurred. The Department may elect not to pursue enforcement action after considering whether excess emissions resulted from an unavoidable equipment malfunction. The Department will evaluate, on a case-by-case basis, the information submitted by the owner or operator to determine whether to pursue enforcement action.

Applicable Requirement: NDAC 33.1-15-01-13.2

- 3) Continuous Emission Monitoring System Failures. When a failure of a continuous emission monitoring system occurs, an alternative method for measuring or estimating emissions must be undertaken as soon as possible. The owner or operator of a source that

uses an alternative method shall have the burden of demonstrating that the method is accurate. Timely repair of the emission monitoring system must be made. The provisions of this subsection do not apply to sources that are subject to monitoring requirements in Chapter 33.1-15-21 (40 CFR 75, Acid Rain Program).

Applicable Requirement: NDAC 33.1-15-01-13.3

H. **Noncompliance Due to an Emergency:** The permittee may seek to establish that noncompliance with a technology-based emission limitation under this permit was due to an emergency. To do so, the permittee shall demonstrate the affirmative defense of emergency through properly signed, contemporaneous operating logs, or other relevant evidence that:

- 1) An emergency occurred, and that the permittee can identify the cause(s) of the emergency;
- 2) The permitted facility was at the time being properly operated;
- 3) During the period of the emergency the permittee took all reasonable steps to minimize levels of emissions that exceeded the emissions standards, or other requirements in this permit; and
- 4) The permittee submitted notice of the emergency to the Department within one working day of the time when emission limitations were exceeded longer than 24-hours due to the emergency. This notice must contain a description of the emergency, any steps taken to mitigate emissions, and corrective actions taken. Those emergencies not reported within one working day, as well as those that were, will be included in the semi-annual report.

In any enforcement proceeding, the permittee seeking to establish the occurrence of an emergency has the burden of proof.

Technology-based emission limits are those established on the basis of emission reductions achievable with various control measures or process changes (e.g., a New Source Performance Standard) rather than those established to attain a health-based air quality standard.

An "emergency" means any situation arising from sudden and reasonably unforeseeable events beyond the control of this source, including acts of God, which requires immediate corrective action to restore normal operation, and that causes this source to exceed a technology-based emission limitation under this permit, due to unavoidable increases in emissions attributable to the emergency. An emergency shall not include noncompliance to the extent caused by improperly designed equipment, lack of preventative maintenance, careless or improper operation, or operator error.

Applicable Requirement: NDAC 33.1-15-14-06.5.g

I. **Air Pollution from Internal Combustion Engines:** The permittee shall comply with all applicable requirements of NDAC 33.1-15-08-01 – Internal Combustion Engine Emissions Restricted.

Applicable Requirement: NDAC 33.1-15-08-01

J. Prohibition of Air Pollution:

- 1) The permittee shall not permit or cause air pollution, as defined in NDAC 33.1-15-01-04.
- 2) Nothing in any other part of this permit or any other regulation relating to air pollution shall in any manner be construed as authorizing or legalizing the creation or maintenance of air pollution.

Applicable Requirement: NDAC 33.1-15-01-15

K. Performance Tests:

- 1) The Department may reasonably require the permittee to make or have made tests, at a reasonable time or interval, to determine the emission of air contaminants from any source, for the purpose of determining whether the permittee is in violation of any standard or to satisfy other requirements of NDCC 23.1-06. All tests shall be made, and the results calculated in accordance with test procedures approved or specified by the Department including the North Dakota Department of Environmental Quality Emission Testing Guideline. All tests shall be conducted by reputable, qualified personnel. The Department shall be given a copy of the test results in writing and signed by the person responsible for the tests.
- 2) The Department may conduct tests of emissions of air contaminants from any source. Upon request of the Department, the permittee shall provide necessary and adequate access into stacks or ducts and such other safe and proper sampling and testing facilities, exclusive of instruments and sensing devices, as may be necessary for proper determination of the emission of air contaminants.

Applicable Requirement: NDAC 33.1-15-01-12

- 3) Except for sources subject to 40 CFR 63, the permittee shall notify the Department by submitting a Proposed Test Plan, or its equivalent, at least 30 calendar days in advance of any tests of emissions of air contaminants required by the Department. The permittee shall notify the Department at least 60 calendar days in advance of any performance testing required under 40 CFR 63, unless otherwise specified by the subpart. If the permittee is unable to conduct the performance test on the scheduled date, the permittee shall notify the Department as soon as practicable when conditions warrant and shall coordinate a new test date with the Department.

Failure to give the proper notification may prevent the Department from observing the test. If the Department is unable to observe the test because of improper notification, the test results may be rejected.

Applicable Requirements: NDAC 33.1-15-14-06.5.a(3)(a), NDAC 33.1-15-12-02 Subpart A (40 CFR 60.8), NDAC 33.1-15-13-01.2 Subpart A (40 CFR 61.13), NDAC 33.1-15-22-03 Subpart A (40 CFR 63.7)

- L. **Pesticide Use and Disposal:** Any use of a pesticide or disposal of surplus pesticides and empty pesticide containers shall comply with the requirements in NDAC 33.1-15-10.

Applicable Requirements: NDAC 33.1-15-10-01 and NDAC 33.1-15-10-02

- M. **Air Pollution Emergency Episodes:** When an air pollution emergency episode is declared by the Department, the permittee shall comply with the requirements in NDAC 33.1-15-11.

Applicable Requirements: NDAC 33.1-15-11-01 through NDAC 33.1-15-11-04

- N. **Stratospheric Ozone Protection:** The permittee shall comply with any applicable standards for recycling and emissions reduction pursuant to 40 CFR 82, Subpart F, except as provided for MVACs in Subpart B:

- 1) Persons opening appliances for maintenance, service, repair, or disposal must comply with the required practices pursuant to Section 82.156.
- 2) Equipment used during the maintenance, service, repair, or disposal of appliances must comply with the standards for recycling and recovery equipment pursuant to Section 82.158.
- 3) Persons performing maintenance, service, repair, or disposal of appliances must be certified by an approved technician certification program pursuant to Section 82.161.
- 4) Persons owning commercial or industrial process refrigeration equipment must comply with the leak repair requirements pursuant to Section 82.156.

Applicable Requirement: 40 CFR 82

- O. **Chemical Accident Prevention:** The permittee shall comply with all applicable requirements of Chemical Accident Prevention pursuant to 40 CFR 68. The permittee shall comply with the requirements of this part no later than the latest of the following dates:

- 1) Three years after the date on which a regulated substance is first listed under this part; or
- 2) The date on which a regulated substance is first present above a threshold quantity in a process.

Applicable Requirement: 40 CFR 68

- P. **Air Pollution Control Equipment:** The permittee shall maintain and operate air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. The manufacturer's recommended Operations and Maintenance (O&M) procedures, or a site-specific O&M procedure developed from the manufacturer's recommended O&M procedures, shall be followed to assure proper operation and maintenance of the equipment. The permittee shall have the O&M procedures available onsite and provide the Department with a copy when requested.

Applicable Requirement: NDAC 33.1-15-14-06.5.b(1)

- Q. **Prevention of Significant Deterioration of Air Quality** (40 CFR 52.21 as incorporated by NDAC Chapter 33.1-15-15): If this facility is classified as a major stationary source under the Prevention of Significant Deterioration of Air Quality (PSD) rules, a Permit to Construct must be obtained from the Department for any project which meets the definition of a “major modification” under 40 CFR 52.21(b)(2).

If this facility is classified as a major stationary source under the PSD rules and the permittee elects to use the method specified in 40 CFR 52.21(b)(41)(ii)(a) through (c) for calculating the projected actual emissions of a proposed project, then the permittee shall comply with all applicable requirements of 40 CFR 52.21(r)(6).

Applicable Requirement: NDAC 33.1-15-15-01.2

8. **General Conditions:**

- A. **Annual Fee Payment:** The permittee shall pay an annual fee, for administering and monitoring compliance, which is determined by the actual annual emissions of regulated contaminants from the previous calendar year. The Department will send a notice, identifying the amount of the annual permit fee, to the permittee of each affected installation. The fee is due within 60 days following the date of such notice. Any source that qualifies as a “small business” may petition the Department to reduce or exempt any fee required under this section. Failure to pay the fee in a timely manner or submit a certification for exemption may cause this Department to initiate action to revoke the permit.

Applicable Requirements: NDAC 33.1-15-14-06.5.a(7) and NDAC 33.1-15-23-04

- B. **Permit Renewal and Expiration:** This permit shall be effective from the date of its issuance for a fixed period of five years. The permittee’s right to operate this source terminates with the expiration of this permit unless a timely and complete renewal application is submitted at least six months, but no more than 18 months, prior to the date of permit expiration. The Department shall approve or disapprove the renewal application within 60 days of receipt. Unless the Department requests additional information or otherwise notifies the applicant of incompleteness, the application shall be deemed complete. For timely and complete renewal applications for which the Department has failed to issue or deny the renewal permit before the expiration date of the previous permit, all terms and conditions of the permit, including any permit shield previously granted shall remain in effect until the renewal permit has been issued or denied. The application for renewal shall include the current permit number, description of any permit revisions and off-permit changes that occurred during the permit term, and any applicable requirements that were promulgated and not incorporated into the permit during the permit term.

Applicable Requirements: NDAC 33.1-15-14-06.4 and NDAC 33.1-15-14-06.6

- C. **Transfer of Ownership or Operation:** This permit may not be transferred except by procedures allowed in Chapter 33.1-15-14 and is to be returned to the Department upon the destruction or change of ownership of the source unit(s), or upon expiration, suspension or revocation of this permit. A change in ownership or operational control of a source is treated as an administrative permit amendment if no other change in the permit is necessary and provided that a written

agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittee has been submitted to the Department.

Applicable Requirement: NDAC 33.1-15-14-06.6.d

- D. **Property Rights:** This permit does not convey any property rights of any sort, or any exclusive privilege.

Applicable Requirement: NDAC 33.1-15-14-06.5.a(6)(d)

- E. **Submissions:**

- 1) Reports, test data, monitoring data, notifications, and requests for renewal shall be submitted to the Department using a format provided or approved by the Department. Physical submittals shall be submitted to:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324

- 2) Any application form, report or compliance certification submitted shall be certified as being true, accurate, and complete by a responsible official.

Applicable Requirement: NDAC 33.1-15-14-06.4.d

- F. **Right of Entry:** Any duly authorized officer, employee or agent of the North Dakota Department of Environmental Quality may enter and inspect any property, premise or place listed on this permit or where records are kept concerning this permit at any reasonable time for the purpose of ascertaining the state of compliance with this permit and the North Dakota Air Pollution Control Rules. The Department may conduct tests and take samples of air contaminants, fuel, processing material, and other materials which affect or may affect emissions of air contaminants from any source. The Department shall have the right to access and copy any records required by the Department's rules and to inspect monitoring equipment located on the premises.

Applicable Requirements: NDAC 33.1-15-14-06.5.c(2) and NDAC 33.1-15-01-06

- G. **Compliance:** The permittee must comply with all conditions of this permit. Any noncompliance with a federally-enforceable permit condition constitutes a violation of the Federal Clean Air Act. Any noncompliance with any State enforceable condition of this permit constitutes a violation of NDCC Chapter 23.1-06 and NDAC 33.1-15. Violation of any condition of this permit is grounds for enforcement action, for permit termination, revocation and reissuance or modification, or for denial of a permit renewal application. Noncompliance may also be grounds for assessment of penalties under the NDCC 23.1-06. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

Applicable Requirements: NDAC 33.1-15-14-06.5.a(6)(a) and NDAC 33.1-15-14-06.5.a(6)(b)

- H. **Duty to Provide Information:** The permittee shall furnish to the Department, within a reasonable time, any information that the Department may request in writing to determine whether cause

exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit. This includes instances where an alteration, repair, expansion, or change in method of operation of the source occurs. Upon request, the permittee shall also furnish to the Department copies of records that the permittee is required to keep by this permit, or for information claimed to be confidential, the permittee may furnish such recourse directly to the Department along with a claim of confidentiality. The permittee, upon becoming aware that any relevant facts were omitted, or incorrect information was submitted in the permit application, shall promptly submit such supplementary facts or corrected information. Items that warrant supplemental information submittal include, but are not limited to, changes in the ambient air boundary and changes in parameters associated with emission points (i.e., stack parameters). The permittee shall also provide additional information as necessary to address any requirements that become applicable to the source after the date a complete renewal application was submitted but prior to release of a draft permit.

Applicable Requirements: NDAC 33.1-15-14-06.5.a(6)(e), NDAC 33.1-15-14-06.6.b(3) and NDAC 33.1-15-14-06.4.b

I. **Reopening for Cause:** The Department will reopen and revise this permit as necessary to remedy deficiencies in the following circumstances:

- 1) Additional applicable requirements under the Federal Clean Air Act become applicable to the permittee with a remaining permit term of three or more years. Such a reopening shall be completed no later than 18 months after promulgation of the applicable requirement. No such reopening is required if the effective date of the requirement is later than the expiration date of this permit.
- 2) The Department or the United States Environmental Protection Agency determines that this permit contains a material mistake or inaccurate statements were made in establishing the emissions standards or other terms or conditions of this permit.
- 3) The Department or the United States Environmental Protection Agency determines that the permit must be revised or revoked to assure compliance with the applicable requirements.
- 4) Reopenings shall not be initiated before a notice of intent to reopen is provided to the permittee by the Department at least 30 days in advance of the date that this permit is to be reopened, except that the Department may provide a shorter time period in the case of an emergency. Proceedings to reopen and issue this permit shall follow the same procedures as apply to initial permit issuance and shall affect only those parts of this permit for which cause to reopen exists. Such reopening shall be made as expeditiously as practicable.

Applicable Requirement: NDAC 33.1-15-14-06.6.f

J. **Permit Changes:** The permit may be modified, revoked, reopened, and reissued or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Applicable Requirement: NDAC 33.1-15-14-06.5.a(6)(c)

K. **Off-Permit Changes:** A permit revision is not required for changes that are not addressed or prohibited by this permit, provided the following conditions are met:

- 1) No such change may violate any term or condition of this permit.
- 2) Each change must comply with all applicable requirements.
- 3) Changes under this provision may not include changes or activities subject to any requirement under Title IV or that are modifications under any provision of Title I of the Federal Clean Air Act.
- 4) A Permit to Construct under NDAC 33.1-15-14-02 has been issued, if required.
- 5) Before the permit change is made, the permittee must provide written notice to both the Department and Air Program (8P-AR), Office of Partnerships & Regulatory Assistance, US EPA Region 8, 1595 Wynkoop Street, Denver, CO 80202-1129, except for changes that qualify as insignificant activities in Section 33.1-15-14-06. This notice shall describe each change, the date of the change, any change in emissions, pollutants emitted, and any applicable requirement that would apply as a result.
- 6) The permittee shall record all changes that result in emissions of any regulated air pollutant subject to any applicable requirement not otherwise regulated under this permit, and the emissions resulting from those changes. The record shall reside at the permittee's facility.

Applicable Requirement: NDAC 33.1-15-14-06.6.b(3)

L. **Administrative Permit Amendments:** This permit may be revised through an administrative permit amendment, if the revision to this permit accomplishes one of the following:

- 1) Corrects typographical errors.
- 2) Identifies a change in the name, address or phone number of any person identified in this permit or provides a similar minor administrative change at the source.
- 3) Requires more frequent monitoring or reporting by the permittee.
- 4) Allows for a change in ownership or operational control of the source where the Department determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new permittee has been submitted to the Department.
- 5) Incorporates into the Title V permit the requirements from a Permit to Construct when the review was substantially equivalent to Title V requirements for permit issuance, renewal, reopenings, revisions and permit review by the United States Environmental Protection Agency and affected state review, that would be applicable to the change if it were subject to review as a permit modification and compliance requirements substantially equivalent to Title V requirements for permit content were contained in the Permit to Construct.
- 6) Incorporates any other type of change which the Administrator of the United States Environmental Protection Agency has approved as being an administrative permit amendment as part of the Department's approved Title V operating permit program.

Applicable Requirement: NDAC 33.1-15-14-06.6.d

M. **Minor Permit Modification:** This permit may be revised by a minor permit modification, if the proposed permit modification meets the following requirements:

- 1) Does not violate any applicable requirement.
- 2) Does not involve significant changes to existing monitoring, reporting, or recordkeeping requirements in this permit.
- 3) Does not require or change a case-by-case determination of an emission limitation or other standard, or a source-specific determination for temporary sources of ambient impacts, or a visibility or increment analysis.
- 4) Does not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject. Such terms and conditions include a federally enforceable emissions cap assumed to avoid classification as a modification under any provision of Title I of the Federal Clean Air Act; and alternative emissions limit approved pursuant to regulations promulgated under Section 112(i)(5) of the Federal Clean Air Act.
- 5) Is not a modification under NDAC 33.1-15-12, 33.1-15-13, and 33.1-15-15 or any provision of Title I of the Federal Clean Air Act.
- 6) Is not required to be processed as a significant modification.

Applicable Requirement: NDAC 33.1-15-14-06.6.e(1)

N. **Significant Modifications:**

- 1) Significant modification procedures shall be used for applications requesting permit modifications that do not qualify as minor permit modifications or as administrative amendments. Every significant change in existing monitoring permit terms or conditions and every relaxation of reporting or recordkeeping permit terms or conditions shall be considered significant. Nothing therein shall be construed to preclude the permittee from making changes consistent with this subsection that would render existing permit compliance terms and conditions irrelevant.
- 2) Significant permit modifications shall meet all Title V requirements, including those for applications, public participation, review by affected states, and review by the United States Environmental Protection Agency, as they apply to permit issuance and permit renewal. The Department shall complete review of significant permit modifications within nine months after receipt of a complete application.

Applicable Requirement: NDAC 33.1-15-14-06.6.e(3)

O. **Operational Flexibility:** The permittee is allowed to make a limited class of changes within the permitted facility that contravene the specific terms of this permit without applying for a permit revision, provided the changes do not exceed the emissions allowable under this permit, are not Title I modifications and a Permit to Construct is not required. This class of changes does not include changes that would violate applicable requirements; or changes to federally-enforceable

permit terms or conditions that are monitoring, recordkeeping, reporting, or compliance certification requirements.

The permittee is required to send a notice to both the Department and Air Program (8P-AR), Office of Partnerships & Regulatory Assistance, US EPA Region 8, 1595 Wynkoop Street, Denver, CO 80202-1129, at least seven days in advance of any change made under this provision. The notice must describe the change, when it will occur and any change in emissions, and identify any permit terms or conditions made inapplicable as a result of the change. The permittee shall attach each notice to its copy of this permit. Any permit shield provided in this permit does not apply to changes made under this provision.

Applicable Requirement: NDAC 33.1-15-14-06.6.b(2)

P. **Relationship to Other Requirements:** Nothing in this permit shall alter or affect the following:

- 1) The provisions of Section 303 of the Federal Clean Air Act (emergency orders), including the authority of the administrator of the United States Environmental Protection Agency under that section.
- 2) The liability of an owner or operator of a source for any violation of applicable requirements prior to or at the time of permit issuance.
- 3) The ability of the United States Environmental Protection Agency to obtain information from a source pursuant to Section 114 of the Federal Clean Air Act.
- 4) Nothing in this permit shall relieve the permittee of the requirement to obtain a Permit to Construct.

Applicable Requirements: NDAC 33.1-15-14-06.3 and NDAC 33.1-15-14-06.5.f(3)(a), (b) and (d)

Q. **Severability Clause:** The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

Applicable Requirement: NDAC 33.1-15-14-06.5.a(5)

R. **Circumvention:** The permittee shall not cause or permit the installation or use of any device of any means which conceals or dilutes an emission of air contaminants which would otherwise violate this permit.

Applicable Requirement: NDAC 33.1-15-01-08

9. **State Enforceable Only Conditions (not Federally enforceable):**

A. **General Odor Restriction:** The permittee shall not discharge into the ambient air any objectionable odorous air contaminant which exceeds the limits established in NDAC 33.1-15-16.

Applicable Requirement: NDAC 33.1-15-16

- B. **Hydrogen Sulfide Restriction:** The permittee shall not discharge into the ambient air hydrogen sulfide (H₂S) in concentrations that would be objectionable on land owned or leased by the complainant or in areas normally accessed by the general public. For the purpose of complaint resolution, two samples with concentrations greater than 0.05 parts per million (50 parts per billion) sampled at least 15 minutes apart within a two-hour period and measured in accordance with Section 33.1-15-16-04 constitute a violation.

Applicable Requirement: NDAC 33.1-15-16-02.1

CITY OF GRAND FORKS – MUNICIPAL
SOLID WASTE LANDFILL

TITLE V AIR PERMIT RENEWAL APPLICATION

TITLE V RENEWAL APPLICATION
PROJECT NO. 170711

REVISION 0
APRIL 2025

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List of Abbreviations

Abbreviation	Term/Phrase/Name
CAA	Clean Air Act
NDDEQ	North Dakota Department of Environmental Quality
NDAC	North Dakota Administrative Code
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NMOC	Non-methane organic compound
NSPS	New Source Performance Standards
NSR	New Source Review
CO	Carbon monoxide
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
N ₂ O	Nitrogen oxide
PM	Particulate matter
PM ₁₀	Particulate matter less than 10 microns in diameter
PM _{2.5}	Particulate matter less than 2.5 microns in diameter
SO ₂	Sulfur dioxide
PSD	Prevention of Significant Deterioration
VOC	Volatile organic compound
MSWLF	Municipal Solid Waste Landfill
GHG	Greenhouse gas
GWP	Global warming potential
HAP	Hazardous Air Pollutant
lb/hr	Pounds per hour
lb/MMBtu	Pounds per million British thermal units
lb/MW-hr	Pound per megawatt hour
tpy	Tons per year

1.0 Introduction

The City of Grand Fork (City) owns and operates the Grand Forks Municipal Solid Waste Landfill (MSWLF) located at 5500 54th Avenue North, Grand Forks, North Dakota. The MSWLF is located in Grand Forks County and is bounded by North 69th Street, 70th Avenue North, North 55th Street, and 54th Avenue North. See Figure 1 for a site location map. The MSWLF is regulated under North Dakota Solid Waste Permit Number 0347, issued by the North Dakota Department of Environmental Quality (NDDEQ). Air emission units at the MSWLF operate under Title V Air Permit, Permit No. AOP-28405 v3.0, which expires on December 30, 2025. An administratively complete renewal application is due no later than 6 months prior to the expiration date, or July 30, 2025. This renewal application is being submitted to the NDDEQ to comply with North Dakota Administrative Code (NDAC) Section 33-15-14-06.4 through 33-15-14-06.6, and the conditions of the existing Title V Permit for permit renewal.

1.1 Facility Description

The MSWLF is comprised of a solid waste disposal area, a pump station building, and a storage/office building to house facility vehicles used for landfilling activities. The MSWLF receives waste from the City of Grand Fork and surrounding areas, including the Grand Forks Air Force Base and smaller communities in, and surrounding, Grand Forks County.

The solid waste stream disposed of at the MSWLF originates from residential, commercial, and industrial sources, and is generally described as municipal solid waste (MSW). Significant quantities of the City's total solid waste stream (e.g. recycled materials, construction and demolition waste, and water treatment sludge) are diverted from the MSWLF. The MSWLF uses a payloador, a bulldozer, and a compactor for routine landfilling operations. A water truck is used for dust control as necessary for unpaved surfaces.

The total capacity of the MSWLF is approximately 15,600,000 cubic yards (cy), and the total available space for MSW is approximately 14,650,000 cy. Annual disposal quantities are projected to have a 1% annual growth rate over the life of the MSWLF. Assuming a waste density of 1,200 lb/cy, the total landfill capacity for MSW in tonnage is approximately 8,790,000 tons, or approximately 7,947,000 megagrams. Because the design capacity exceeds 2.5 million megagrams and was modified after July 17, 2014, the MSWLF is subject to New Source Performance Standard (NSPS) Subpart XXX. The MSWLF was previously subject to NSPS Cf.

1.2 Odor Control

To help minimize potential odors generated by the landfill, soil or alternative cover is placed over the disposed waste.

1.3 Application Contents

In addition to this Narrative, the renewal application is comprised of the following components:

- Supporting emission calculations and site figures (Appendix A)
- Redlined copy of the current air permit (Appendix B)
- 2024 Tier 2 NMOC Report (Appendix C)
- Online renewal application form submitted through CERIS (Appendix D)

2.0 Application Discussion

The following emission units are present at the MSWLF.

2.1 EU-01 Landfill Gas Fugitive Emissions

The MSWLF is subject to emission regulations under NDAC Section 33.1-15-14-01.9, as referenced in NDAC Section 33.1-15-14-06. The MSWLF generates landfill gas (LFG), which contains the following regulated air pollutants: greenhouse gases (GHGs), non-methane organic compounds (NMOCs), volatile organic compounds (VOCs), hazardous air pollutants (HAPs) and Carbon Monoxide (CO) generated by the microbial breakdown of buried waste. CO may exist in landfills in small quantities; therefore, a conservative assumption to include CO emissions from the landfill has been made and included in the fugitive emissions estimate.

2.2 Insignificant Activities

The following insignificant activities are not required to be included in permit application but should be listed.

2.2.1 Fossil fuel- burning heaters

Stationary fossil fuel-burning equipment is installed in the storage / office building for comfort heating and consists of five propane-fueled infrared heating units, a supplemental propane-fueled air heating unit, and a small water heater. The maximum combined heat input for the storage / office building heaters is approximately 622,000 Btu/hr. The units are considered insignificant activities based on potential emissions in accordance with emission limits for insignificant activities listed in NDAC 33.1-15-14-06(4)(c). Supporting calculations presented in Appendix A demonstrate that emissions are at insignificant levels.

2.2.2 Fugitive Dust

Fugitive dust particulate matter emissions from operation and construction activities are not included as part of this application. Best management practices, such as watering on an as-needed basis, are implemented to reduce fugitive particulate emissions in accordance with NDAC Section 33-15-17. All vehicles used at the MSWLF will comply with NDAC Chapter 33.1-15-08.

2.3 Proposed Modifications

There are no proposed changes to the existing emission units or operating scenarios since the last permit renewal application except for an increase in the Landfill's MSW capacity. The LFG model has been updated based on historical actual and projected waste acceptance.

3.0 Emission Estimates

The potential emissions from EUI – 1 are limited by the total LFG that will be generated and passively emitted from the waste mass. LFG generation rates, in cubic feet per minute (cfm), were developed using the EPA's LandGEM Model V.3.02 (LandGEM). The inputs into LandGEM include the modeled disposal estimates and the AP-42 default parameters for sites with a 30-year normal annual precipitation less than 25 inches. The actual annual 30-year normal precipitation in Grand Forks, North Dakota is 21.74 inches (NOWData - NOAA Online Weather Data).

AP-42 default parameters prescribed for the landfill to estimate potential to emit include a methane generation rate (k) of 0.02/year and a potential methane generation capacity (Lo) of 170 cubic meters per megagram (m³/Mg). The site-specific non-methane organic compound (NMOC) emission rate of 242.6 ppmv as hexane was used based on the 2024 Tier 2 investigation (see Appendix C).

Historical disposal rates between 2009 and 2024 (based on scale receipts) were entered into LandGEM. For subsequent years, an estimated disposal quantity was entered based on a 1% annual growth rate from the report year 2024's tonnage. The model estimated waste rates for 5-years past 2024, as the typical operating air permit will be required to be renewed every 5-years.

Fugitive emissions of GHG, NMOCs, VOCs, and HAPs, are calculated as the product of the LFG flowrate and the concentration of each compound generated at standard temperature and pressure of 1 atm and 25°C. The concentrations of constituents present in the LFG at the MSWLF are derived from AP-42 section 2.4 (August 2024). An example calculation is provided below,

Example Calculation:

$$\begin{aligned}
 \text{Benzene} &= \frac{78.11 \text{ g}}{\text{mol}} \times \frac{2.40 \text{ ppm}}{1,000,000} \times \frac{379.40 \text{ cf}}{\text{min}} \times \frac{525,600 \text{ min}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lbs}} \times \frac{1 \text{ lb}}{453.6 \text{ g}} \times \frac{1 \text{ mol}}{24.465 \text{ L @ STP}} \\
 &\times \frac{28.32 \text{ L}}{1 \text{ cf}} = \frac{0.0509 \text{ tons}}{\text{year}}
 \end{aligned}$$

4.0 Regulatory Review

4.1 State Regulations:

The following relevant state regulations were reviewed for applicability:

NDAC 33.1-15-12-02: This regulation incorporates NSPS Subpart Cf and applies to municipal solid waste landfills that commenced construction, modification or reconstruction on new airspace prior to July 17, 2014. It also incorporates NSPS XXX which applies to municipal solid waste landfills that commenced construction, reconstruction or modification after July 17, 2014. The facility has modified the facility since 2014 and is no longer subject to NSPS Subpart Cf.

NDAC 33.1-15-05-01: This regulation restricts particulate matter emissions from industrial processes, the MSWLF will take measures such that emissions from insignificant operations do not exceed the specified limits to comply with this regulation.

NDAC 33.1-15-07-02: This regulation requires that organic compound gases and vapors, except from emergency systems, be incinerated, flared, or treated before release into the atmosphere. Each flare must be equipped with an automatic igniter or continuous burning pilot. This regulation is not applicable, the MSWLF is subject to NSPS emission guidelines and below emission thresholds for control.

NDAC 33.1-15-07-01.5 This regulation requires that all rotating pumps handling volatile organic compounds (VOCs) be equipped with proper seals to control emissions. If there are any applicable pumps at the MSWLF for leachate will comply with the regulation.

4.2 Federal Regulations

4.2.1 NSPS (Part 60)

Subpart A (General Provisions)

Subpart A applies because the Facility is subject to an NSPS.

Subpart Cf (Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills)

Subpart Cf applies to MSWF that commenced construction, modification or reconstruction on new airspace prior to July 17, 2014., requiring them to control landfill gas emissions and report based on size and emissions thresholds. Subpart Cf has historically applied to the site but is no longer subject since modification occurred after July 17, 2014.

Subpart XXX (Standards of Performance for Municipal Solid Waste Landfills That Commenced Construction, Reconstruction, or Modification After July 17, 2014)

As the MSWLF commenced modification after July 17, 2014 the MSWLF is subject to Subpart XXX. The MSWLF will be subject to monitoring requirements listed in 40 CFR 60.762(b)(1)(i), for calculating an annual NMOC emission rate (or alternatively a 5-year estimate). The MSWLF completed a Tier 2 NMOC sampling and emission rate report in August of 2024; the report is found in Appendix C. NMOC emission rates are estimated not exceed the threshold of 34 Mg/year and, therefore, is not required to collect and control the LFG.

4.2.2 NESHAP (Part 61)

Subpart A (General Provisions)

Subpart A applies because the Facility is subject to NESHAP Standard.

Subpart M (National Emission Standard for Asbestos)

This subpart applies as the Facility accepts asbestos containing materials.

4.2.3 State Plans (Part 62)

Subpart OOO (Federal Plan Requirements for Municipal Solid Waste Landfills That Commenced Construction On or Before July 17, 2014 and Have Not Been Modified or Reconstructed Since July 17, 2014)

Subpart OOO applies to existing municipal solid waste landfills that commenced construction on or before July 17, 2014, have not been modified or reconstructed since, and are located in states or territories without an EPA-approved state plan under 40 CFR Part 60, Subpart Cf. Subpart OOO does not apply because the Facility was modified after July 17, 2014.

No other Part 62 subparts apply to the Facility.

4.2.4 NESHAP (Part 63)

Subpart AAAA (National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills)

Subpart AAAA is not applicable to the MSWLF at the time of this Title V Application Renewal because uncontrolled emissions do not exceed the 50 Mg/yr NMOC threshold. Subpart AAAA is unlikely to become applicable during the Permit period.

4.2.5 Compliance Assurance Monitoring (Part 64)

There are no pollutant specific emission units that exceed Part 70 major source thresholds and use control equipment; therefore, compliance assurance monitoring is not required

4.2.6 Operating Permits (Part 70-71)

A Part 70 Permit is required¹ because the MSW landfill is subject to NSPS Subpart XXX and has a design capacity equal to or greater than 2.5 million Mg and 2.5 million cubic meters which.

4.2.7 Acid Rain (Parts 72-77)

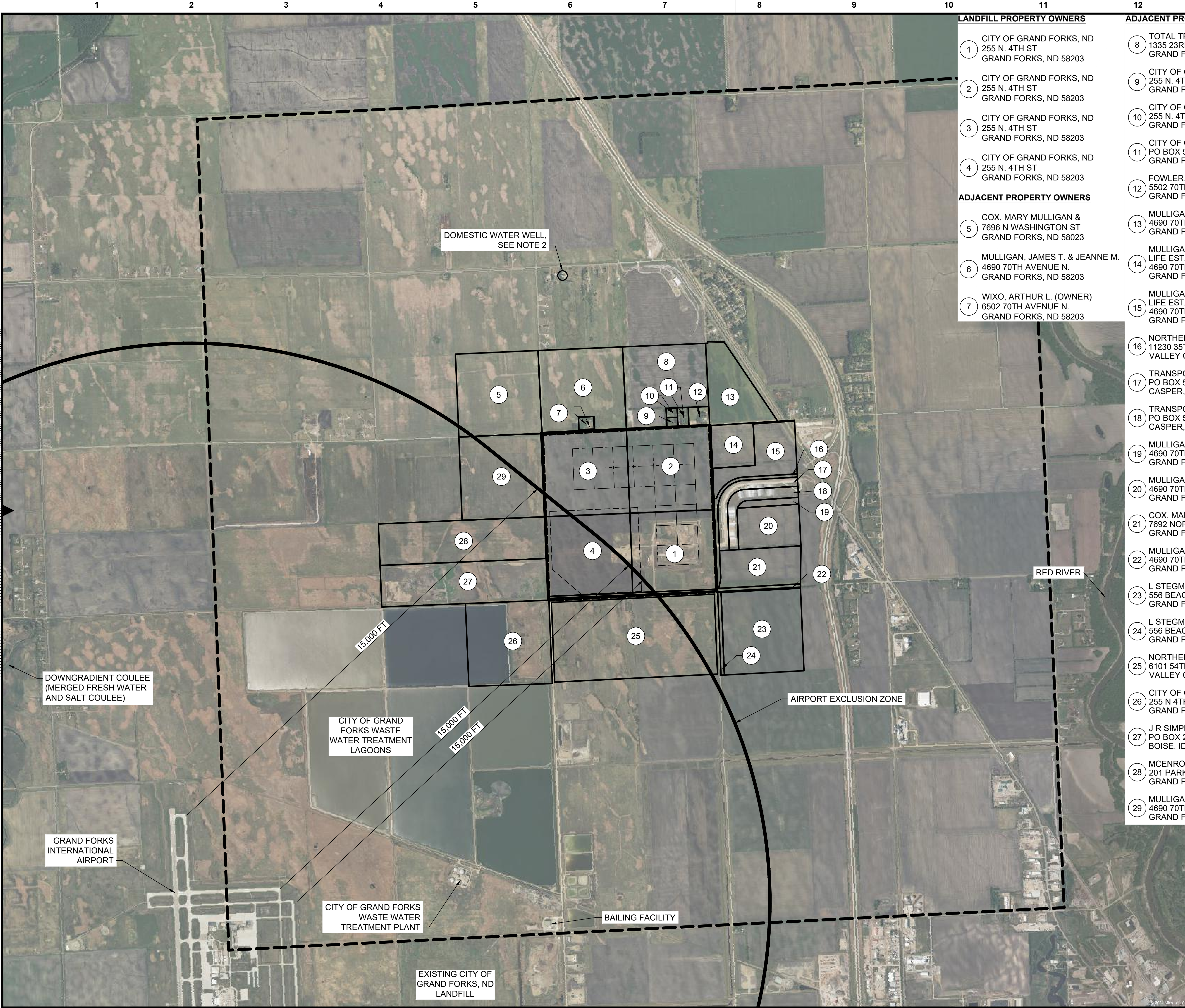
Acid rain regulations do not apply to the Landfill because there are no electric generators on site with a capacity of 25 MW or greater.

4.2.8 GHG Reporting (Part 98)

The Mandatory Greenhouse Gas Reporting Regulation (40 CFR Part 98), Subpart C and Subpart HH typically applies to MSW Landfills, however estimated emissions currently are below 25,000 tpy of CO₂e so it is currently not required to complete such reporting.

¹ 40 CFR 60.762(c)

Figure 1: Site Vicinity Map



LANDFILL PROPERTY OWNERS

- 1 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203
- 2 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203
- 3 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203
- 4 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203

ADJACENT PROPERTY OWNERS

- 5 COX, MARY MULLIGAN &
7696 N WASHINGTON ST
GRAND FORKS, ND 58023
- 6 MULLIGAN, JAMES T. & JEANNE M.
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 7 WIXO, ARTHUR L. (OWNER)
6502 70TH AVENUE N.
GRAND FORKS, ND 58203

ADJACENT PROPERTY OWNERS (CTD.)

- 8 TOTAL TRANS CARE INC.
1335 23RD AVENUE, NE.
GRAND FORKS, ND 58203
- 9 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203
- 10 CITY OF GRAND FORKS, ND
255 N. 4TH ST
GRAND FORKS, ND 58203
- 11 CITY OF GRAND FORKS, ND
PO BOX 5200
GRAND FORKS, ND 58206-5200
- 12 FOWLER, DANIEL M. & MELISSA S.
5502 70TH AVE N.
GRAND FORKS, ND 58203
- 13 MULLIGAN, JAMES & JEANNE M.
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 14 MULLIGAN, JAMES & JEANNE M.
LIFE ESTATE (ST. MICHAEL'S FOUNDATION)
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 15 MULLIGAN, JAMES & JEANNE M.
LIFE ESTATE (ST. MICHAEL'S FOUNDATION)
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 16 NORTHERN PLAINS NITROGEN, LLP
11230 35TH ST SE
VALLEY CITY, ND 58072
- 17 TRANSPORTATION PARTNERS
PO BOX 51647
CASPER, WY 82605
- 18 TRANSPORTATION PARTNERS
PO BOX 51647
CASPER, WY 82605
- 19 MULLIGAN, JAMES & JEANNE M.
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 20 MULLIGAN, JAMES & JEANNE M.
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 21 COX, MARY COLLEEN & FOY DUKE
7692 NORTH WASHINGTON STREET
GRAND FORKS, ND 58203
- 22 MULLIGAN, JAMES & JEANNE M.
4690 70TH AVENUE N.
GRAND FORKS, ND 58203
- 23 L STEGMAN LAND LIMITED LIABILITY
556 BEACON CIR
GRAND FORKS, ND 58203
- 24 L STEGMAN LAND LIMITED LIABILITY
556 BEACON CIR
GRAND FORKS, ND 58203
- 25 NORTHERN PLAINS NITROGEN ADDITION
6101 54TH AVE N
VALLEY CITY, ND 58072
- 26 CITY OF GRAND FORKS
255 N 4TH ST
GRAND FORKS, ND 58203
- 27 J R SIMPLOT COMPANY
PO BOX 27
BOISE, ID 83707
- 28 MCENROE, MICHAEL J & JONI K**
201 PARK AVE
GRAND FORKS, ND 58072
- 29 MULLIGAN, JAMES T
4690 70TH AVENUE N.
GRAND FORKS, ND 58203

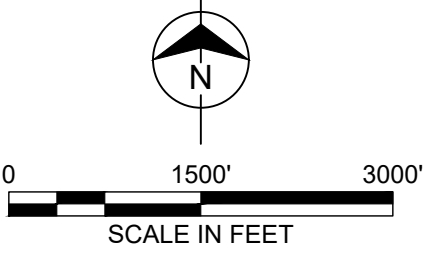
no.	date	by	ckd	description
0	08/05/24	BEH	BSW	ISSUED FOR PERMIT

LEGEND:

- AIRPORT EXCLUSION BOUNDARY
- TWO-MILE BOUNDARY FROM MSW LANDFILL PROPERTY LINE
- PROPOSED LANDFILL CELL BOUNDARIES
- PROPERTY BOUNDARIES
- DOMESTIC WATER WELL WITHIN 2 MILES OF PROPOSED LANDFILL SITE (SEE NOTE 2)

NOTES:

- PROPERTY OWNERSHIP INFORMATION WAS OBTAINED FROM THE GRAND FORKS COUNTY, NORTH DAKOTA DATABASE ON OCTOBER 11, 2021.
- THE DOMESTIC WATER WELL LOCATED WITHIN 2 MILES OF THE MSWLF IS OWNED BY RAYMOND WILKENS. THE STREET ADDRESS OF HIS PROPERTY IS 13821 23RD AVENUE NORTHEAST.
- AERIAL IMAGERY RETREIVED FROM BING MAPS, NOVEMBER 2023.



FOR PERMITTING PURPOSES ONLY



8201 NORMAN CENTER DRIVE, SUITE 500
BLOOMINGTON, MN 55437
952-656-6003
Burns & McDonnell Engineering Company, Inc.
Licensee No. 016PE

date	AUGUST 2024	detailed	S. PASHUPATIHAL
designed	B. HOFFMAN	checked	B. WELDON



MSW LANDFILL 0347 PERMIT MODIFICATION
Grand Forks County, ND

MSW LANDFILL VERTICAL EXPANSION

SITE VICINITY MAP

project	157343	contract	8698
drawing	C001	rev.	0
sheet	4	of	26
file	157343C001.dwg	sheets	



BRYAN WELDON
CIVIL
PE-40158

Figure 2: Site Condition

APPENDIX A – POTENTIAL EMISSION CALCULATIONS

**City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal**

Summary Table			
Emission point → Pollutant ↓	Fugitive Landfill Gas- EU-01 (tpy)	Propane Heaters- Insignificant activity (tpy)	Total Facility Emissions (tpy)
PM	-	0.02	0.02
PM10	-	0.02	0.02
PM2.5	-	0.02	0.02
NOx	-	0.39	0.39
SO2	-	0.05	0.05
CO	1.01	0.23	1.23
VOC	4.79	0.03	4.82
NMOC	6.84	-	6.84
Total HAPs	3.87	-	3.87
CO2 (anthropogenic)	0.00	377.61	377.61
CO2 (biogenic)	74,069.35	0.00	74,069.35
CH4	2,362.43	0.02	2,362.45
N2O	-	0.00	0.00
GHG CO2e	74,069.35	379.07	74,448.41

*See Tables 1-2 for further details and LangGEM model report

City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal

Table 1: EU-01 Fugitive Landfill Gas

Landfill Gas Constituents	CAS No.	Molecular Weight	AP-42 Default Concentration ^A (ppmv)	Fugitive Emission Rate (lb/hr) ^B	Annual Fugitive Emissions (TPY)	VOC
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	133.41	0.48	0.0048	0.0210	HAP
1,1,2,2-Tetrachloroethane	79-34-5	167.85	1.1	0.0138	0.0604	HAP/VOC
1,1-Dichloroethane (ethylidene dichloride)	75-34-3	98.97	2.4	0.0177	0.0777	HAP/VOC
1,1-Dichloroethene (vinylidene chloride)	75-35-4	96.94	0.20	0.0014	0.0063	HAP/VOC
1,2-Dichloroethane (ethylene dichloride)	107-06-2	98.96	0.41	0.0030	0.0133	HAP/VOC
1,2-Dichloropropane (propylene dichloride)	78-87-5	112.99	0.18	0.0015	0.0067	HAP/VOC
2-Propanol (isopropyl alcohol)	67-63-0	60.11	50	0.2246	0.9836	VOC
Acetone	67-64-1	58.08	7.0	0.0304	0.1330	not regulated
Acrylonitrile	107-13-1	53.06	6.3	0.0250	0.1094	HAP/VOC
Bromodichloromethane	75-27-4	163.83	3.1	0.0379	0.1662	VOC
Butane	106-97-8	58.12	5.0	0.0217	0.0951	VOC
Carbon disulfide	75-15-0	76.13	0.58	0.0033	0.0145	HAP/VOC
Carbon monoxide	630-08-0	28.01	110	0.2302	1.0083	N/A
Carbon tetrachloride	56-23-5	153.84	4.00E-03	0.0000	0.0002	HAP/VOC
Carbonyl sulfide	463-58-1	60.07	0.49	0.0022	0.0096	HAP/VOC
Chlorobenzene	108-90-7	112.56	0.25	0.0021	0.0092	HAP/VOC
Chlorodifluoromethane	75-45-6	86.47	1.3	0.0084	0.0368	Non-HAP
Chloroethane (ethyl chloride)	75-00-3	64.52	1.3	0.0063	0.0274	HAP/VOC
Chloroform	67-66-3	119.39	3.00E-02	0.0003	0.0012	HAP/VOC
Chloromethane	74-87-3	50.49	1.2	0.0045	0.0198	HAP/VOC
Dichlorobenzene	95-50-1	147	0.21	0.0023	0.0101	HAP/VOC
Dichlorodifluoromethane	75-71-8	120.91	16	0.1445	0.6331	Non-HAP
Dichlorofluoromethane	75-43-4	102.92	2.6	0.0200	0.0876	VOC
Dichloromethane (methylene chloride)	75-09-2	84.94	14	0.0888	0.3892	HAP
Dimethyl sulfide (methyl sulfide)	75-18-3	62.13	7.8	0.0362	0.1586	VOC
Ethane	74-84-0	30.07	890	1.9996	8.7581	Non-HAP
Ethanol	64-17-5	46.08	27	0.0930	0.4072	VOC
Ethyl mercaptan (ethanethiol)	75-08-1	62.13	2.3	0.0107	0.0468	VOC
Ethylbenzene	100-41-4	106.16	4.6	0.0365	0.1598	HAP/VOC
Ethylene dibromide	106-93-4	187.88	1.00E-03	0.0000	0.0001	HAP/VOC
Fluorotrichloromethane	75-69-4	137.38	0.76	0.0078	0.0342	VOC
Hexane	110-54-3	86.18	6.6	0.0425	0.1861	HAP/VOC
Hydrogen sulfide	7783-06-4	34.08	36	0.0917	0.4015	HAP
Mercury (total)	7439-97-6	200.61	2.90E-04	0.0000	0.0000	HAP
Methyl ethyl ketone	78-93-3	72.11	7.1	0.0383	0.1675	HAP/VOC
Methyl isobutyl ketone	108-10-1	100.16	1.9	0.0142	0.0623	HAP/VOC
Methyl mercaptan	74-93-1	48.11	2.5	0.0090	0.0394	VOC
Pentane	109-66-0	72.15	3.3	0.0178	0.0779	VOC
Perchloroethylene (tetrachloroethylene)	127-18-4	165.83	3.7	0.0458	0.2008	HAP
Propane	74-98-6	44.09	11	0.0362	0.1587	VOC
t-1,2-dichloroethene	156-60-5	96.94	2.8	0.0203	0.0888	VOC
Trichloroethylene (trichloroethene)	79-01-6	131.4	2.8	0.0275	0.1204	HAP/VOC
Vinyl chloride	75-01-4	62.5	7.3	0.0341	0.1493	HAP/VOC
Xylenes	1330-20-7	106.16	12	0.0952	0.4169	HAP/VOC
Benzene	71-43-2	78.11	1.9	0.0111	0.0486	HAP/VOC
Toluene		92.12	39	0.2684	1.1757	HAP
Toluene	Max Individual HAP	-	-	0.2684	1.1757	-
Total HAPS				0.882	3.865	-

Pollutant	Molecular Weight	Concentration in landfill (ppmv)	Fugitive Emissions (lb/hr)	Fugitive Emissions (TPY)	Notes
NMOC ^C	86.18	242.60	1.56	6.84	
VOC	-	-	1.09	4.79	Sum of VOC pollutants from AP 42 default concentrations
Methane	16.04	500,000.00	539.37	2,362.43	Methane assumed as 50%, 10% default methane oxidation due to soil cover assumed
CO2 (Biogenic, from LFG)	44.01	500,000.00	1644.09	7,201.12	CO2 generated in landfill, assumed 1-methane fraction, 0.5
CO2 (Biogenic, from methane oxidation)	-	-	-	720.07	CO2 in LFG from methane oxidation
Total CO2B	-	-	-	7,921.19	Sum of CO2 in LFG and from methane Oxidation
GHG CO2e	-	-	-	74,069.35	CO2 & COGWP + CH4 X GWP

Notes:

(A) Pollutant type, molecular weight and concentration from AP 42Table 2.4-1. DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS (8/2024)

(B) Fugitive emissions calculated based on ideal gas law and estiamted landfill gas generation from LandGEM Model Vesion 3.02 in 2030

Landfill gas generation rate 487.96 scfm, per LandGEM Version 3.02 in 2030
(C) 2024 Tier 2 NMOC Concentration (ppmv as hexane) 242.6

(D) A 10% default methane oxidation is assumed to occur due to soil cover

Tons of methane generated 2,624.93 tons
Tons of methane assumed to be oxidized by soil cover (10% oxidation) 262.49 tons (methane generated x 10% oxidation rate)
Biogenic CO2 generated from CH4 oxidation 720.07 tons CO2 (mass of methane oxidized) x (MW CO2/MW CH4); assume 100% conversion to CO2)

**City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal**

Table 2: Insignificant Emission Units- Propane Heaters

Heating Units	Capacity	Units
IRH-1	66,000	Btu/h
IRH-2	100,000	Btu/h
IRH-3	100,000	Btu/h
IRH-4	100,000	Btu/h
IRH-5	100,000	Btu/h
UH-1	80,000	Btu/h
HWH-1	76,000	Btu/h
Total	622,000	Btu/h

Input Parameter	Value	Units
Heat Content	90,500	btu/gal
Max Fuel Input	0.007	10 ³ gal/hr
Hours of operations	8760	hrs

Pollutants	Emission Factor ^A B,C,D	Units	Emissions (lb/hr)	Emissions (tpy)	Insignificant Emissions Threshold (tpy)
PM	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
PM10	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
PM 2.5	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
SO ₂	<u>1.50</u>	(lb/ per 10 ³ gallons)	0.010	0.045	2
NO _x	13.00	(lb/ per 10 ³ gallons)	0.089	0.391	2
CO	7.50	(lb/ per 10 ³ gallons)	0.052	0.226	2
TOC/VOC	1.00	(lb/ per 10 ³ gallons)	0.007	0.030	2
CO ₂	62.87	(kg CO2/mmBtu)	86.212	377.608	2
N ₂ O	0.0006	(kg CH ₄ /mmBtu	0.001	0.004	2
CH ₄	0.0030	(kg N ₂ O/mmBtu)	0.004	0.018	NA
CO2e	-	-	-	379.068	NA

Notes

(A):Propane Emission Factors taken from AP 42 Section 1.5: Liquefied Petroleum Gas Combustion (Version 2008)

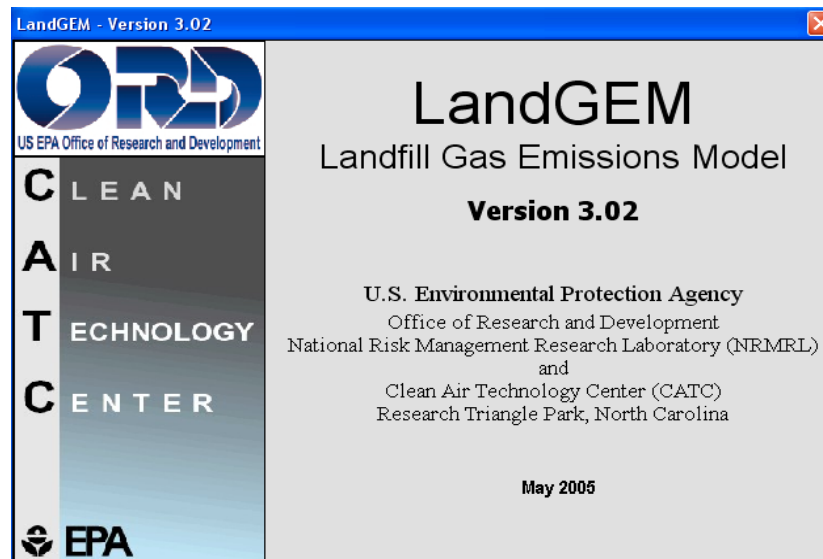
(B) The Gas Processors Association ("GPA") provides product specifications for liquefied petroleum gases. These specifications may be found in Figure 2-1 (GPA Liquefied Petroleum Gas Specifications - GPA Standard 2140-92) of the Engineering Data Book (10th Edition, 1994) published by the Gas Processors Suppliers Association. Total sulfur standards are provided in units of ppmw. For commercial propane, the standard is 185 ppmw as S (**254 ppmv as S**, 239 ppmv as H₂S).

1 grain Sulfur/100 SCF = 16.92 ppmv/ Sulfur @ 60°F & 14.73 PSI @ STP
@ 254 ppmv as Sulfur = 15.01182033 grains per 100 SCF

(C) 40 CFR Part 98 Table C-1:Propane fuel CO₂ emission =62.87 kg CO₂/MMBtu, 1 KG = 2.2.20462 lb

(D) 40 CFR Part 98 Table C-2: Propane CH₄ emission = 0.003 kg CH₄/MMBtu, N₂O = 0.0006 kg N₂O / MMBtu

(E) CO₂e = (Global Warming Potential, GWP) * (Emission). GWP from 40 CFR Part 98 Table A-1. CO₂ = 1, CH₄ = 28, N₂O = 265



Summary Report

Landfill Name or Identifier: Grand Forks Active MSWLF

Date: Tuesday, February 4, 2025

Description/Comments:

Grand Forks Title V Renewal 12/2024

Methane Generation Rate (k) based on 30-year normal precipitation data (<25 inches / year)

NMOC Concentration based on Oct 2024 Tier 2 Testing- 242.6 ppmv as hexane

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^n \sum_{j=0.1}^1 k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH_4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at <http://www.epa.gov/ttnatw01/landfill/landflpg.html>.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for conventional landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	2009	
Landfill Closure Year (with 80-year limit)	2087	
Actual Closure Year (without limit)	2087	
Have Model Calculate Closure Year?	No	
Waste Design Capacity		<i>megagrams</i>

MODEL PARAMETERS

Methane Generation Rate, k	0.020	<i>year⁻¹</i>
Potential Methane Generation Capacity, L ₀	170	<i>m³/Mg</i>
NMOC Concentration	243	<i>ppmv as hexane</i>
Methane Content	50	<i>% by volume</i>

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	Total landfill gas
Gas / Pollutant #2:	Methane
Gas / Pollutant #3:	Carbon dioxide
Gas / Pollutant #4:	NMOC

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2009	13,332	14,665	0	0
2010	52,394	57,633	13,332	14,665
2011	61,385	67,523	65,726	72,298
2012	63,327	69,660	127,110	139,821
2013	64,409	70,849	190,438	209,481
2014	67,673	74,440	254,846	280,331
2015	73,774	81,151	322,519	354,771
2016	68,376	75,214	396,292	435,922
2017	68,369	75,206	464,669	511,136
2018	67,850	74,635	533,038	586,342
2019	68,737	75,611	600,888	660,977
2020	65,246	71,770	669,625	736,588
2021	58,777	64,655	734,871	808,358
2022	61,624	67,786	793,648	873,013
2023	62,240	68,464	855,271	940,799
2024	61,741	67,916	917,511	1,009,262
2025	62,359	68,595	979,253	1,077,178
2026	62,982	69,281	1,041,612	1,145,773
2027	63,612	69,974	1,104,594	1,215,054
2028	64,248	70,673	1,168,206	1,285,027
2029	64,891	71,380	1,232,455	1,355,700
2030	65,540	72,094	1,297,346	1,427,080
2031	66,195	72,815	1,362,886	1,499,174
2032	66,195	72,815	1,429,081	1,571,989
2033	66,195	72,815	1,495,276	1,644,804
2034	66,195	72,815	1,561,471	1,717,618
2035	66,195	72,815	1,627,666	1,790,433
2036	66,195	72,815	1,693,862	1,863,248
2037	66,195	72,815	1,760,057	1,936,062
2038	66,195	72,815	1,826,252	2,008,877
2039	66,195	72,815	1,892,447	2,081,692
2040	66,195	72,815	1,958,642	2,154,507
2041	66,195	72,815	2,024,838	2,227,321
2042	66,195	72,815	2,091,033	2,300,136
2043	66,195	72,815	2,157,228	2,372,951
2044	66,195	72,815	2,223,423	2,445,766
2045	66,195	72,815	2,289,618	2,518,580
2046	66,195	72,815	2,355,814	2,591,395
2047	66,195	72,815	2,422,009	2,664,210
2048	66,195	72,815	2,488,204	2,737,024

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2049	66,195	72,815	2,554,399	2,809,839
2050	66,195	72,815	2,620,594	2,882,654
2051	66,195	72,815	2,686,790	2,955,469
2052	66,195	72,815	2,752,985	3,028,283
2053	66,195	72,815	2,819,180	3,101,098
2054	66,195	72,815	2,885,375	3,173,913
2055	66,195	72,815	2,951,570	3,246,728
2056	66,195	72,815	3,017,766	3,319,542
2057	66,195	72,815	3,083,961	3,392,357
2058	66,195	72,815	3,150,156	3,465,172
2059	66,195	72,815	3,216,351	3,537,986
2060	66,195	72,815	3,282,547	3,610,801
2061	66,195	72,815	3,348,742	3,683,616
2062	66,195	72,815	3,414,937	3,756,431
2063	66,195	72,815	3,481,132	3,829,245
2064	66,195	72,815	3,547,327	3,902,060
2065	66,195	72,815	3,613,523	3,974,875
2066	66,195	72,815	3,679,718	4,047,690
2067	66,195	72,815	3,745,913	4,120,504
2068	66,195	72,815	3,812,108	4,193,319
2069	66,195	72,815	3,878,303	4,266,134
2070	66,195	72,815	3,944,499	4,338,948
2071	66,195	72,815	4,010,694	4,411,763
2072	66,195	72,815	4,076,889	4,484,578
2073	66,195	72,815	4,143,084	4,557,393
2074	66,195	72,815	4,209,279	4,630,207
2075	66,195	72,815	4,275,475	4,703,022
2076	66,195	72,815	4,341,670	4,775,837
2077	66,195	72,815	4,407,865	4,848,652
2078	66,195	72,815	4,474,060	4,921,466
2079	66,195	72,815	4,540,255	4,994,281
2080	66,195	72,815	4,606,451	5,067,096
2081	66,195	72,815	4,672,646	5,139,910
2082	66,195	72,815	4,738,841	5,212,725
2083	66,195	72,815	4,805,036	5,285,540
2084	66,195	72,815	4,871,231	5,358,355
2085	66,195	72,815	4,937,427	5,431,169
2086	66,195	72,815	5,003,622	5,503,984
2087	0	0	5,069,817	5,576,799
2088	0	0	5,069,817	5,576,799

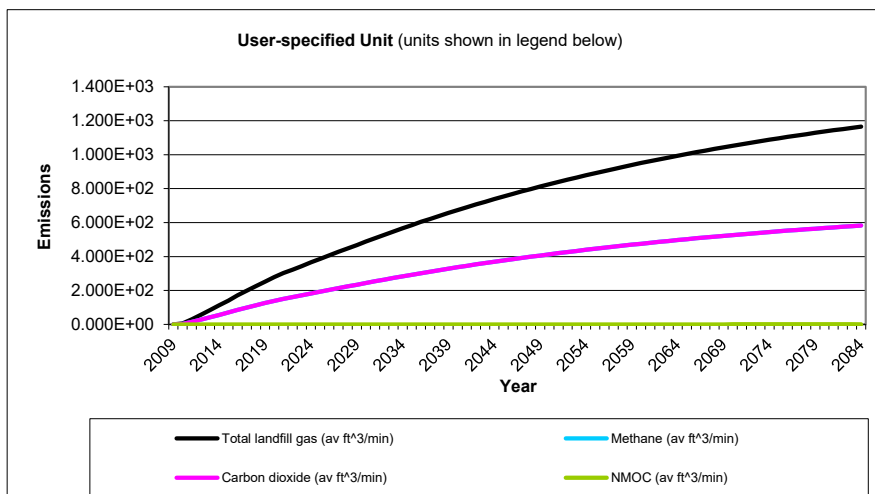
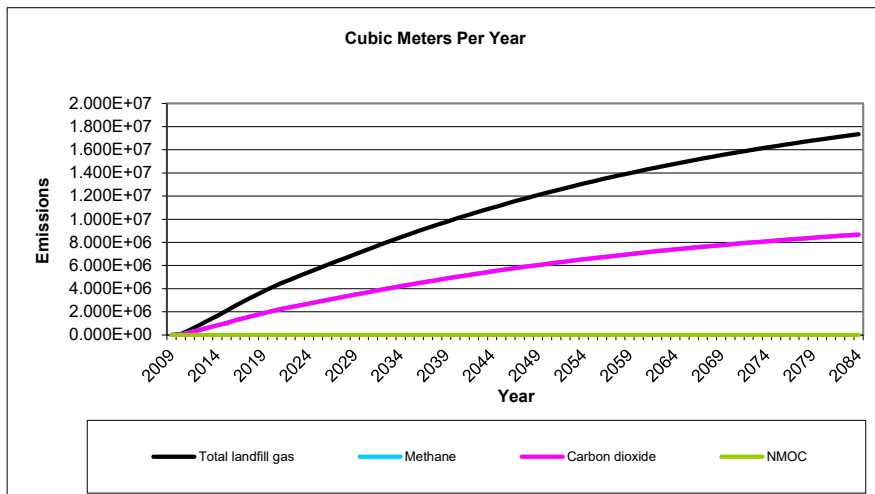
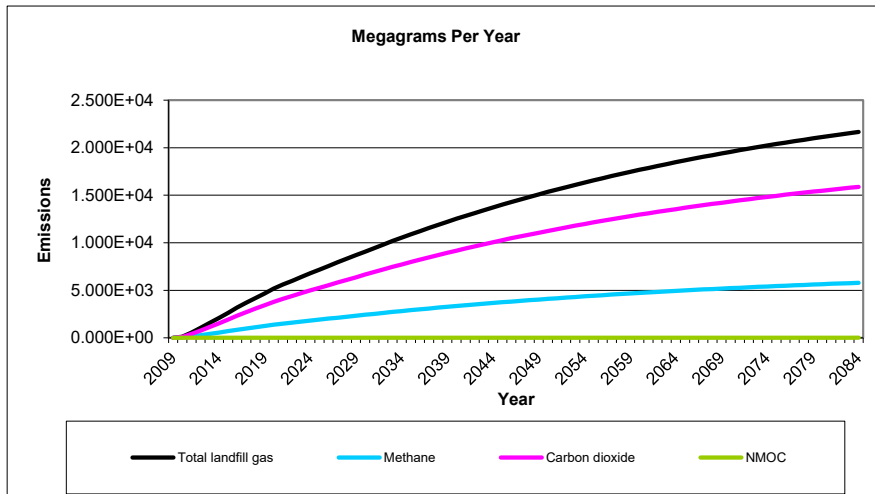
Pollutant Parameters

Gas / Pollutant Default Parameters:				User-specified Pollutant Parameters:	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC		86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2- Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

<i>Gas / Pollutant Default Parameters:</i>				<i>User-specified Pollutant Parameters:</i>	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs



Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	1.122E+02	8.984E+04	6.037E+00	2.997E+01	4.492E+04	3.018E+00
2011	5.509E+02	4.412E+05	2.964E+01	1.472E+02	2.206E+05	1.482E+01
2012	1.057E+03	8.461E+05	5.685E+01	2.822E+02	4.231E+05	2.842E+01
2013	1.569E+03	1.256E+06	8.440E+01	4.190E+02	6.281E+05	4.220E+01
2014	2.080E+03	1.665E+06	1.119E+02	5.555E+02	8.327E+05	5.595E+01
2015	2.608E+03	2.088E+06	1.403E+02	6.966E+02	1.044E+06	7.016E+01
2016	3.177E+03	2.544E+06	1.709E+02	8.487E+02	1.272E+06	8.547E+01
2017	3.690E+03	2.955E+06	1.985E+02	9.856E+02	1.477E+06	9.926E+01
2018	4.192E+03	3.357E+06	2.255E+02	1.120E+03	1.678E+06	1.128E+02
2019	4.680E+03	3.748E+06	2.518E+02	1.250E+03	1.874E+06	1.259E+02
2020	5.166E+03	4.137E+06	2.779E+02	1.380E+03	2.068E+06	1.390E+02
2021	5.613E+03	4.494E+06	3.020E+02	1.499E+03	2.247E+06	1.510E+02
2022	5.996E+03	4.802E+06	3.226E+02	1.602E+03	2.401E+06	1.613E+02
2023	6.396E+03	5.122E+06	3.441E+02	1.709E+03	2.561E+06	1.721E+02
2024	6.793E+03	5.440E+06	3.655E+02	1.815E+03	2.720E+06	1.828E+02
2025	7.179E+03	5.748E+06	3.862E+02	1.917E+03	2.874E+06	1.931E+02
2026	7.561E+03	6.055E+06	4.068E+02	2.020E+03	3.027E+06	2.034E+02
2027	7.942E+03	6.359E+06	4.273E+02	2.121E+03	3.180E+06	2.136E+02
2028	8.320E+03	6.662E+06	4.476E+02	2.222E+03	3.331E+06	2.238E+02
2029	8.696E+03	6.963E+06	4.678E+02	2.323E+03	3.482E+06	2.339E+02
2030	9.070E+03	7.262E+06	4.880E+02	2.423E+03	3.631E+06	2.440E+02
2031	9.442E+03	7.560E+06	5.080E+02	2.522E+03	3.780E+06	2.540E+02
2032	9.812E+03	7.857E+06	5.279E+02	2.621E+03	3.928E+06	2.639E+02
2033	1.017E+04	8.147E+06	5.474E+02	2.718E+03	4.074E+06	2.737E+02
2034	1.053E+04	8.432E+06	5.665E+02	2.813E+03	4.216E+06	2.833E+02
2035	1.088E+04	8.711E+06	5.853E+02	2.906E+03	4.356E+06	2.927E+02
2036	1.122E+04	8.985E+06	6.037E+02	2.997E+03	4.492E+06	3.018E+02
2037	1.156E+04	9.253E+06	6.217E+02	3.087E+03	4.626E+06	3.109E+02
2038	1.188E+04	9.516E+06	6.394E+02	3.174E+03	4.758E+06	3.197E+02
2039	1.221E+04	9.774E+06	6.567E+02	3.260E+03	4.887E+06	3.283E+02
2040	1.252E+04	1.003E+07	6.737E+02	3.344E+03	5.013E+06	3.368E+02
2041	1.283E+04	1.027E+07	6.903E+02	3.427E+03	5.137E+06	3.451E+02
2042	1.313E+04	1.052E+07	7.066E+02	3.508E+03	5.258E+06	3.533E+02
2043	1.343E+04	1.075E+07	7.226E+02	3.587E+03	5.377E+06	3.613E+02
2044	1.372E+04	1.099E+07	7.382E+02	3.665E+03	5.494E+06	3.691E+02
2045	1.401E+04	1.122E+07	7.536E+02	3.741E+03	5.608E+06	3.768E+02
2046	1.429E+04	1.144E+07	7.686E+02	3.816E+03	5.720E+06	3.843E+02
2047	1.456E+04	1.166E+07	7.834E+02	3.889E+03	5.830E+06	3.917E+02
2048	1.483E+04	1.187E+07	7.979E+02	3.961E+03	5.937E+06	3.989E+02
2049	1.509E+04	1.209E+07	8.120E+02	4.031E+03	6.043E+06	4.060E+02
2050	1.535E+04	1.229E+07	8.259E+02	4.100E+03	6.146E+06	4.130E+02
2051	1.560E+04	1.250E+07	8.395E+02	4.168E+03	6.248E+06	4.198E+02
2052	1.585E+04	1.269E+07	8.529E+02	4.234E+03	6.347E+06	4.264E+02
2053	1.610E+04	1.289E+07	8.660E+02	4.299E+03	6.444E+06	4.330E+02
2054	1.633E+04	1.308E+07	8.788E+02	4.363E+03	6.540E+06	4.394E+02
2055	1.657E+04	1.327E+07	8.914E+02	4.425E+03	6.633E+06	4.457E+02
2056	1.680E+04	1.345E+07	9.037E+02	4.487E+03	6.725E+06	4.519E+02
2057	1.702E+04	1.363E+07	9.158E+02	4.547E+03	6.815E+06	4.579E+02
2058	1.724E+04	1.381E+07	9.276E+02	4.605E+03	6.903E+06	4.638E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	1.746E+04	1.398E+07	9.392E+02	4.663E+03	6.989E+06	4.696E+02
2060	1.767E+04	1.415E+07	9.506E+02	4.719E+03	7.074E+06	4.753E+02
2061	1.788E+04	1.431E+07	9.618E+02	4.775E+03	7.157E+06	4.809E+02
2062	1.808E+04	1.448E+07	9.727E+02	4.829E+03	7.238E+06	4.863E+02
2063	1.828E+04	1.464E+07	9.834E+02	4.882E+03	7.318E+06	4.917E+02
2064	1.847E+04	1.479E+07	9.939E+02	4.934E+03	7.396E+06	4.969E+02
2065	1.866E+04	1.495E+07	1.004E+03	4.985E+03	7.473E+06	5.021E+02
2066	1.885E+04	1.510E+07	1.014E+03	5.036E+03	7.548E+06	5.071E+02
2067	1.904E+04	1.524E+07	1.024E+03	5.085E+03	7.621E+06	5.121E+02
2068	1.922E+04	1.539E+07	1.034E+03	5.133E+03	7.694E+06	5.169E+02
2069	1.939E+04	1.553E+07	1.043E+03	5.180E+03	7.764E+06	5.217E+02
2070	1.957E+04	1.567E+07	1.053E+03	5.226E+03	7.834E+06	5.263E+02
2071	1.974E+04	1.580E+07	1.062E+03	5.272E+03	7.902E+06	5.309E+02
2072	1.990E+04	1.594E+07	1.071E+03	5.316E+03	7.968E+06	5.354E+02
2073	2.006E+04	1.607E+07	1.080E+03	5.359E+03	8.033E+06	5.398E+02
2074	2.022E+04	1.619E+07	1.088E+03	5.402E+03	8.097E+06	5.441E+02
2075	2.038E+04	1.632E+07	1.097E+03	5.444E+03	8.160E+06	5.483E+02
2076	2.053E+04	1.644E+07	1.105E+03	5.485E+03	8.222E+06	5.524E+02
2077	2.069E+04	1.656E+07	1.113E+03	5.525E+03	8.282E+06	5.565E+02
2078	2.083E+04	1.668E+07	1.121E+03	5.565E+03	8.341E+06	5.604E+02
2079	2.098E+04	1.680E+07	1.129E+03	5.603E+03	8.399E+06	5.643E+02
2080	2.112E+04	1.691E+07	1.136E+03	5.641E+03	8.456E+06	5.681E+02
2081	2.126E+04	1.702E+07	1.144E+03	5.678E+03	8.511E+06	5.719E+02
2082	2.139E+04	1.713E+07	1.151E+03	5.715E+03	8.566E+06	5.755E+02
2083	2.153E+04	1.724E+07	1.158E+03	5.750E+03	8.619E+06	5.791E+02
2084	2.166E+04	1.734E+07	1.165E+03	5.785E+03	8.671E+06	5.826E+02
2085	2.179E+04	1.745E+07	1.172E+03	5.819E+03	8.723E+06	5.861E+02
2086	2.191E+04	1.755E+07	1.179E+03	5.853E+03	8.773E+06	5.895E+02
2087	2.204E+04	1.764E+07	1.186E+03	5.886E+03	8.822E+06	5.928E+02
2088	2.216E+04	1.730E+07	1.162E+03	5.769E+03	8.648E+06	5.810E+02
2089	2.117E+04	1.695E+07	1.139E+03	5.655E+03	8.477E+06	5.695E+02
2090	2.075E+04	1.662E+07	1.117E+03	5.543E+03	8.309E+06	5.583E+02
2091	2.034E+04	1.629E+07	1.094E+03	5.433E+03	8.144E+06	5.472E+02
2092	1.994E+04	1.597E+07	1.073E+03	5.326E+03	7.983E+06	5.364E+02
2093	1.954E+04	1.565E+07	1.051E+03	5.220E+03	7.825E+06	5.257E+02
2094	1.916E+04	1.534E+07	1.031E+03	5.117E+03	7.670E+06	5.153E+02
2095	1.878E+04	1.504E+07	1.010E+03	5.016E+03	7.518E+06	5.051E+02
2096	1.841E+04	1.474E+07	9.903E+02	4.916E+03	7.369E+06	4.951E+02
2097	1.804E+04	1.445E+07	9.707E+02	4.819E+03	7.223E+06	4.853E+02
2098	1.768E+04	1.416E+07	9.514E+02	4.724E+03	7.080E+06	4.757E+02
2099	1.733E+04	1.388E+07	9.326E+02	4.630E+03	6.940E+06	4.663E+02
2100	1.699E+04	1.361E+07	9.141E+02	4.538E+03	6.803E+06	4.571E+02
2101	1.665E+04	1.334E+07	8.960E+02	4.448E+03	6.668E+06	4.480E+02
2102	1.632E+04	1.307E+07	8.783E+02	4.360E+03	6.536E+06	4.391E+02
2103	1.600E+04	1.281E+07	8.609E+02	4.274E+03	6.406E+06	4.304E+02
2104	1.568E+04	1.256E+07	8.438E+02	4.189E+03	6.280E+06	4.219E+02
2105	1.537E+04	1.231E+07	8.271E+02	4.106E+03	6.155E+06	4.136E+02
2106	1.507E+04	1.207E+07	8.108E+02	4.025E+03	6.033E+06	4.054E+02
2107	1.477E+04	1.183E+07	7.947E+02	3.945E+03	5.914E+06	3.974E+02
2108	1.448E+04	1.159E+07	7.790E+02	3.867E+03	5.797E+06	3.895E+02
2109	1.419E+04	1.136E+07	7.635E+02	3.791E+03	5.682E+06	3.818E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.391E+04	1.114E+07	7.484E+02	3.716E+03	5.569E+06	3.742E+02
2111	1.364E+04	1.092E+07	7.336E+02	3.642E+03	5.459E+06	3.668E+02
2112	1.337E+04	1.070E+07	7.191E+02	3.570E+03	5.351E+06	3.595E+02
2113	1.310E+04	1.049E+07	7.048E+02	3.499E+03	5.245E+06	3.524E+02
2114	1.284E+04	1.028E+07	6.909E+02	3.430E+03	5.141E+06	3.454E+02
2115	1.259E+04	1.008E+07	6.772E+02	3.362E+03	5.039E+06	3.386E+02
2116	1.234E+04	9.879E+06	6.638E+02	3.296E+03	4.940E+06	3.319E+02
2117	1.209E+04	9.684E+06	6.507E+02	3.230E+03	4.842E+06	3.253E+02
2118	1.185E+04	9.492E+06	6.378E+02	3.166E+03	4.746E+06	3.189E+02
2119	1.162E+04	9.304E+06	6.251E+02	3.104E+03	4.652E+06	3.126E+02
2120	1.139E+04	9.120E+06	6.128E+02	3.042E+03	4.560E+06	3.064E+02
2121	1.116E+04	8.939E+06	6.006E+02	2.982E+03	4.470E+06	3.003E+02
2122	1.094E+04	8.762E+06	5.887E+02	2.923E+03	4.381E+06	2.944E+02
2123	1.073E+04	8.589E+06	5.771E+02	2.865E+03	4.294E+06	2.885E+02
2124	1.051E+04	8.419E+06	5.656E+02	2.808E+03	4.209E+06	2.828E+02
2125	1.031E+04	8.252E+06	5.544E+02	2.753E+03	4.126E+06	2.772E+02
2126	1.010E+04	8.089E+06	5.435E+02	2.698E+03	4.044E+06	2.717E+02
2127	9.901E+03	7.928E+06	5.327E+02	2.645E+03	3.964E+06	2.664E+02
2128	9.705E+03	7.771E+06	5.222E+02	2.592E+03	3.886E+06	2.611E+02
2129	9.513E+03	7.618E+06	5.118E+02	2.541E+03	3.809E+06	2.559E+02
2130	9.325E+03	7.467E+06	5.017E+02	2.491E+03	3.733E+06	2.508E+02
2131	9.140E+03	7.319E+06	4.918E+02	2.441E+03	3.659E+06	2.459E+02
2132	8.959E+03	7.174E+06	4.820E+02	2.393E+03	3.587E+06	2.410E+02
2133	8.782E+03	7.032E+06	4.725E+02	2.346E+03	3.516E+06	2.362E+02
2134	8.608E+03	6.893E+06	4.631E+02	2.299E+03	3.446E+06	2.316E+02
2135	8.437E+03	6.756E+06	4.539E+02	2.254E+03	3.378E+06	2.270E+02
2136	8.270E+03	6.622E+06	4.450E+02	2.209E+03	3.311E+06	2.225E+02
2137	8.106E+03	6.491E+06	4.361E+02	2.165E+03	3.246E+06	2.181E+02
2138	7.946E+03	6.363E+06	4.275E+02	2.122E+03	3.181E+06	2.138E+02
2139	7.789E+03	6.237E+06	4.190E+02	2.080E+03	3.118E+06	2.095E+02
2140	7.634E+03	6.113E+06	4.107E+02	2.039E+03	3.057E+06	2.054E+02
2141	7.483E+03	5.992E+06	4.026E+02	1.999E+03	2.996E+06	2.013E+02
2142	7.335E+03	5.873E+06	3.946E+02	1.959E+03	2.937E+06	1.973E+02
2143	7.190E+03	5.757E+06	3.868E+02	1.920E+03	2.879E+06	1.934E+02
2144	7.047E+03	5.643E+06	3.792E+02	1.882E+03	2.822E+06	1.896E+02
2145	6.908E+03	5.531E+06	3.717E+02	1.845E+03	2.766E+06	1.858E+02
2146	6.771E+03	5.422E+06	3.643E+02	1.809E+03	2.711E+06	1.821E+02
2147	6.637E+03	5.315E+06	3.571E+02	1.773E+03	2.657E+06	1.785E+02
2148	6.506E+03	5.209E+06	3.500E+02	1.738E+03	2.605E+06	1.750E+02
2149	6.377E+03	5.106E+06	3.431E+02	1.703E+03	2.553E+06	1.715E+02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	8.223E+01	4.492E+04	3.018E+00	7.813E-02	2.180E+01	1.464E-03
2011	4.038E+02	2.206E+05	1.482E+01	3.836E-01	1.070E+02	7.191E-03
2012	7.744E+02	4.231E+05	2.842E+01	7.358E-01	2.053E+02	1.379E-02
2013	1.150E+03	6.281E+05	4.220E+01	1.092E+00	3.047E+02	2.048E-02
2014	1.524E+03	8.327E+05	5.595E+01	1.448E+00	4.040E+02	2.715E-02
2015	1.911E+03	1.044E+06	7.016E+01	1.816E+00	5.066E+02	3.404E-02
2016	2.329E+03	1.272E+06	8.547E+01	2.212E+00	6.172E+02	4.147E-02
2017	2.704E+03	1.477E+06	9.926E+01	2.569E+00	7.168E+02	4.816E-02
2018	3.072E+03	1.678E+06	1.128E+02	2.919E+00	8.144E+02	5.472E-02
2019	3.430E+03	1.874E+06	1.259E+02	3.259E+00	9.092E+02	6.109E-02
2020	3.786E+03	2.068E+06	1.390E+02	3.597E+00	1.004E+03	6.743E-02
2021	4.114E+03	2.247E+06	1.510E+02	3.908E+00	1.090E+03	7.326E-02
2022	4.395E+03	2.401E+06	1.613E+02	4.175E+00	1.165E+03	7.827E-02
2023	4.688E+03	2.561E+06	1.721E+02	4.454E+00	1.243E+03	8.349E-02
2024	4.979E+03	2.720E+06	1.828E+02	4.730E+00	1.320E+03	8.867E-02
2025	5.261E+03	2.874E+06	1.931E+02	4.999E+00	1.395E+03	9.370E-02
2026	5.542E+03	3.027E+06	2.034E+02	5.265E+00	1.469E+03	9.869E-02
2027	5.820E+03	3.180E+06	2.136E+02	5.530E+00	1.543E+03	1.037E-01
2028	6.097E+03	3.331E+06	2.238E+02	5.793E+00	1.616E+03	1.086E-01
2029	6.373E+03	3.482E+06	2.339E+02	6.055E+00	1.689E+03	1.135E-01
2030	6.647E+03	3.631E+06	2.440E+02	6.315E+00	1.762E+03	1.184E-01
2031	6.920E+03	3.780E+06	2.540E+02	6.574E+00	1.834E+03	1.232E-01
2032	7.191E+03	3.928E+06	2.639E+02	6.832E+00	1.906E+03	1.281E-01
2033	7.457E+03	4.074E+06	2.737E+02	7.085E+00	1.977E+03	1.328E-01
2034	7.717E+03	4.216E+06	2.833E+02	7.332E+00	2.046E+03	1.374E-01
2035	7.973E+03	4.356E+06	2.927E+02	7.575E+00	2.113E+03	1.420E-01
2036	8.223E+03	4.492E+06	3.018E+02	7.813E+00	2.180E+03	1.465E-01
2037	8.469E+03	4.626E+06	3.109E+02	8.046E+00	2.245E+03	1.508E-01
2038	8.709E+03	4.758E+06	3.197E+02	8.275E+00	2.309E+03	1.551E-01
2039	8.945E+03	4.887E+06	3.283E+02	8.499E+00	2.371E+03	1.593E-01
2040	9.176E+03	5.013E+06	3.368E+02	8.719E+00	2.432E+03	1.634E-01
2041	9.403E+03	5.137E+06	3.451E+02	8.934E+00	2.492E+03	1.675E-01
2042	9.625E+03	5.258E+06	3.533E+02	9.145E+00	2.551E+03	1.714E-01
2043	9.843E+03	5.377E+06	3.613E+02	9.352E+00	2.609E+03	1.753E-01
2044	1.006E+04	5.494E+06	3.691E+02	9.555E+00	2.666E+03	1.791E-01
2045	1.027E+04	5.608E+06	3.768E+02	9.753E+00	2.721E+03	1.828E-01
2046	1.047E+04	5.720E+06	3.843E+02	9.948E+00	2.775E+03	1.865E-01
2047	1.067E+04	5.830E+06	3.917E+02	1.014E+01	2.829E+03	1.901E-01
2048	1.087E+04	5.937E+06	3.989E+02	1.033E+01	2.881E+03	1.936E-01
2049	1.106E+04	6.043E+06	4.060E+02	1.051E+01	2.932E+03	1.970E-01
2050	1.125E+04	6.146E+06	4.130E+02	1.069E+01	2.982E+03	2.004E-01
2051	1.144E+04	6.248E+06	4.198E+02	1.087E+01	3.031E+03	2.037E-01
2052	1.162E+04	6.347E+06	4.264E+02	1.104E+01	3.080E+03	2.069E-01
2053	1.180E+04	6.444E+06	4.330E+02	1.121E+01	3.127E+03	2.101E-01
2054	1.197E+04	6.540E+06	4.394E+02	1.137E+01	3.173E+03	2.132E-01
2055	1.214E+04	6.633E+06	4.457E+02	1.154E+01	3.218E+03	2.162E-01
2056	1.231E+04	6.725E+06	4.519E+02	1.170E+01	3.263E+03	2.192E-01
2057	1.247E+04	6.815E+06	4.579E+02	1.185E+01	3.307E+03	2.222E-01
2058	1.264E+04	6.903E+06	4.638E+02	1.201E+01	3.349E+03	2.250E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	1.279E+04	6.989E+06	4.696E+02	1.216E+01	3.391E+03	2.279E-01
2060	1.295E+04	7.074E+06	4.753E+02	1.230E+01	3.432E+03	2.306E-01
2061	1.310E+04	7.157E+06	4.809E+02	1.245E+01	3.473E+03	2.333E-01
2062	1.325E+04	7.238E+06	4.863E+02	1.259E+01	3.512E+03	2.360E-01
2063	1.340E+04	7.318E+06	4.917E+02	1.273E+01	3.551E+03	2.386E-01
2064	1.354E+04	7.396E+06	4.969E+02	1.286E+01	3.589E+03	2.411E-01
2065	1.368E+04	7.473E+06	5.021E+02	1.300E+01	3.626E+03	2.436E-01
2066	1.382E+04	7.548E+06	5.071E+02	1.313E+01	3.662E+03	2.461E-01
2067	1.395E+04	7.621E+06	5.121E+02	1.326E+01	3.698E+03	2.485E-01
2068	1.408E+04	7.694E+06	5.169E+02	1.338E+01	3.733E+03	2.508E-01
2069	1.421E+04	7.764E+06	5.217E+02	1.350E+01	3.767E+03	2.531E-01
2070	1.434E+04	7.834E+06	5.263E+02	1.362E+01	3.801E+03	2.554E-01
2071	1.446E+04	7.902E+06	5.309E+02	1.374E+01	3.834E+03	2.576E-01
2072	1.459E+04	7.968E+06	5.354E+02	1.386E+01	3.866E+03	2.598E-01
2073	1.471E+04	8.033E+06	5.398E+02	1.397E+01	3.898E+03	2.619E-01
2074	1.482E+04	8.097E+06	5.441E+02	1.408E+01	3.929E+03	2.640E-01
2075	1.494E+04	8.160E+06	5.483E+02	1.419E+01	3.959E+03	2.660E-01
2076	1.505E+04	8.222E+06	5.524E+02	1.430E+01	3.989E+03	2.680E-01
2077	1.516E+04	8.282E+06	5.565E+02	1.440E+01	4.018E+03	2.700E-01
2078	1.527E+04	8.341E+06	5.604E+02	1.451E+01	4.047E+03	2.719E-01
2079	1.537E+04	8.399E+06	5.643E+02	1.461E+01	4.075E+03	2.738E-01
2080	1.548E+04	8.456E+06	5.681E+02	1.471E+01	4.103E+03	2.757E-01
2081	1.558E+04	8.511E+06	5.719E+02	1.480E+01	4.130E+03	2.775E-01
2082	1.568E+04	8.566E+06	5.755E+02	1.490E+01	4.156E+03	2.792E-01
2083	1.578E+04	8.619E+06	5.791E+02	1.499E+01	4.182E+03	2.810E-01
2084	1.587E+04	8.671E+06	5.826E+02	1.508E+01	4.207E+03	2.827E-01
2085	1.597E+04	8.723E+06	5.861E+02	1.517E+01	4.232E+03	2.844E-01
2086	1.606E+04	8.773E+06	5.895E+02	1.526E+01	4.257E+03	2.860E-01
2087	1.615E+04	8.822E+06	5.928E+02	1.534E+01	4.281E+03	2.876E-01
2088	1.583E+04	8.648E+06	5.810E+02	1.504E+01	4.196E+03	2.819E-01
2089	1.552E+04	8.477E+06	5.695E+02	1.474E+01	4.113E+03	2.763E-01
2090	1.521E+04	8.309E+06	5.583E+02	1.445E+01	4.031E+03	2.709E-01
2091	1.491E+04	8.144E+06	5.472E+02	1.416E+01	3.952E+03	2.655E-01
2092	1.461E+04	7.983E+06	5.364E+02	1.388E+01	3.873E+03	2.602E-01
2093	1.432E+04	7.825E+06	5.257E+02	1.361E+01	3.797E+03	2.551E-01
2094	1.404E+04	7.670E+06	5.153E+02	1.334E+01	3.721E+03	2.500E-01
2095	1.376E+04	7.518E+06	5.051E+02	1.308E+01	3.648E+03	2.451E-01
2096	1.349E+04	7.369E+06	4.951E+02	1.282E+01	3.576E+03	2.402E-01
2097	1.322E+04	7.223E+06	4.853E+02	1.256E+01	3.505E+03	2.355E-01
2098	1.296E+04	7.080E+06	4.757E+02	1.231E+01	3.435E+03	2.308E-01
2099	1.270E+04	6.940E+06	4.663E+02	1.207E+01	3.367E+03	2.262E-01
2100	1.245E+04	6.803E+06	4.571E+02	1.183E+01	3.301E+03	2.218E-01
2101	1.221E+04	6.668E+06	4.480E+02	1.160E+01	3.235E+03	2.174E-01
2102	1.196E+04	6.536E+06	4.391E+02	1.137E+01	3.171E+03	2.131E-01
2103	1.173E+04	6.406E+06	4.304E+02	1.114E+01	3.108E+03	2.089E-01
2104	1.149E+04	6.280E+06	4.219E+02	1.092E+01	3.047E+03	2.047E-01
2105	1.127E+04	6.155E+06	4.136E+02	1.071E+01	2.987E+03	2.007E-01
2106	1.104E+04	6.033E+06	4.054E+02	1.049E+01	2.927E+03	1.967E-01
2107	1.083E+04	5.914E+06	3.974E+02	1.029E+01	2.869E+03	1.928E-01
2108	1.061E+04	5.797E+06	3.895E+02	1.008E+01	2.813E+03	1.890E-01
2109	1.040E+04	5.682E+06	3.818E+02	9.882E+00	2.757E+03	1.852E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.019E+04	5.569E+06	3.742E+02	9.686E+00	2.702E+03	1.816E-01
2111	9.993E+03	5.459E+06	3.668E+02	9.495E+00	2.649E+03	1.780E-01
2112	9.795E+03	5.351E+06	3.595E+02	9.307E+00	2.596E+03	1.744E-01
2113	9.601E+03	5.245E+06	3.524E+02	9.122E+00	2.545E+03	1.710E-01
2114	9.411E+03	5.141E+06	3.454E+02	8.942E+00	2.495E+03	1.676E-01
2115	9.225E+03	5.039E+06	3.386E+02	8.765E+00	2.445E+03	1.643E-01
2116	9.042E+03	4.940E+06	3.319E+02	8.591E+00	2.397E+03	1.610E-01
2117	8.863E+03	4.842E+06	3.253E+02	8.421E+00	2.349E+03	1.578E-01
2118	8.688E+03	4.746E+06	3.189E+02	8.254E+00	2.303E+03	1.547E-01
2119	8.516E+03	4.652E+06	3.126E+02	8.091E+00	2.257E+03	1.517E-01
2120	8.347E+03	4.560E+06	3.064E+02	7.931E+00	2.212E+03	1.487E-01
2121	8.182E+03	4.470E+06	3.003E+02	7.773E+00	2.169E+03	1.457E-01
2122	8.020E+03	4.381E+06	2.944E+02	7.620E+00	2.126E+03	1.428E-01
2123	7.861E+03	4.294E+06	2.885E+02	7.469E+00	2.084E+03	1.400E-01
2124	7.705E+03	4.209E+06	2.828E+02	7.321E+00	2.042E+03	1.372E-01
2125	7.553E+03	4.126E+06	2.772E+02	7.176E+00	2.002E+03	1.345E-01
2126	7.403E+03	4.044E+06	2.717E+02	7.034E+00	1.962E+03	1.318E-01
2127	7.256E+03	3.964E+06	2.664E+02	6.894E+00	1.923E+03	1.292E-01
2128	7.113E+03	3.886E+06	2.611E+02	6.758E+00	1.885E+03	1.267E-01
2129	6.972E+03	3.809E+06	2.559E+02	6.624E+00	1.848E+03	1.242E-01
2130	6.834E+03	3.733E+06	2.508E+02	6.493E+00	1.811E+03	1.217E-01
2131	6.699E+03	3.659E+06	2.459E+02	6.364E+00	1.776E+03	1.193E-01
2132	6.566E+03	3.587E+06	2.410E+02	6.238E+00	1.740E+03	1.169E-01
2133	6.436E+03	3.516E+06	2.362E+02	6.115E+00	1.706E+03	1.146E-01
2134	6.308E+03	3.446E+06	2.316E+02	5.994E+00	1.672E+03	1.124E-01
2135	6.184E+03	3.378E+06	2.270E+02	5.875E+00	1.639E+03	1.101E-01
2136	6.061E+03	3.311E+06	2.225E+02	5.759E+00	1.607E+03	1.079E-01
2137	5.941E+03	3.246E+06	2.181E+02	5.645E+00	1.575E+03	1.058E-01
2138	5.823E+03	3.181E+06	2.138E+02	5.533E+00	1.544E+03	1.037E-01
2139	5.708E+03	3.118E+06	2.095E+02	5.423E+00	1.513E+03	1.017E-01
2140	5.595E+03	3.057E+06	2.054E+02	5.316E+00	1.483E+03	9.965E-02
2141	5.484E+03	2.996E+06	2.013E+02	5.211E+00	1.454E+03	9.767E-02
2142	5.376E+03	2.937E+06	1.973E+02	5.108E+00	1.425E+03	9.574E-02
2143	5.269E+03	2.879E+06	1.934E+02	5.006E+00	1.397E+03	9.384E-02
2144	5.165E+03	2.822E+06	1.896E+02	4.907E+00	1.369E+03	9.199E-02
2145	5.063E+03	2.766E+06	1.858E+02	4.810E+00	1.342E+03	9.016E-02
2146	4.962E+03	2.711E+06	1.821E+02	4.715E+00	1.315E+03	8.838E-02
2147	4.864E+03	2.657E+06	1.785E+02	4.621E+00	1.289E+03	8.663E-02
2148	4.768E+03	2.605E+06	1.750E+02	4.530E+00	1.264E+03	8.491E-02
2149	4.673E+03	2.553E+06	1.715E+02	4.440E+00	1.239E+03	8.323E-02

APPENDIX B – REDLINE CURRENT OPERATING PERMIT

APPENDIX C – TIER 2 REPORT



October 14, 2024

Ms. Liz Trythall
Environmental Scientist, Division of Air Quality
North Dakota Department of Environmental Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324

Re: New Source Performance Standards – 40 CFR Part 60, Subpart Cf
Tier 2 Non-Methane Organic Compounds Sampling and Emissions Rate Report
Grand Forks Municipal Solid Waste Landfill, Grand Forks, North Dakota
NDDEQ Air Quality Permit #AOP-28405 v 3.0

Dear Ms. Trythall:

On behalf of the City of Grand Forks (City), Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) is providing this *Tier 2 Non-Methane Organic Compounds (NMOC) Sampling and Emissions Rate Report* (Report) to the North Dakota Department of Environmental Quality (NDDEQ) for the City's Municipal Solid Waste Landfill registered under Solid Waste Permit 0347, Title V Air Quality Permit AOP-28405 v 3.0 (MSWLF). The field sampling and analysis were conducted as described in the United States Code of Federal Regulations 40 CFR §60.764(a)(3).

Tier 2 field sampling activities were performed by Burns & McDonnell, Burns & McDonnell's subconsultant CPS, Ltd. (CPS), and Burns & McDonnell's direct push sampling contractor Dakota Technologies, LLC (Dakota Technologies) at the MSWLF on August 13-14, 2024 in accordance with the *Tier 2 Non-Methane Organic Compound Sampling and Reporting Work Plan* (Work Plan). The laboratory was conducted by a subcontracted laboratory, Enthalpy Analytical (Enthalpy).

The Tier 2 analysis indicates that the MSWLF's NMOC emission rate will be below the applicable 34 megagram per year (Mg/yr) threshold contained in Subpart XXX for the next five years. The field methodology, sample results, and results of the NMOC emission calculations are presented below.

FIELD METHODOLOGY

The field work was conducted under the supervision of Burns & McDonnell in general accordance with Appendix A of 40 CFR 60, Method 25C.

Per 40 CFR §60.764 (a)(3), at least two sample probes shall be installed per hectare of landfill surface that has retained waste for at least two years. The MSWLF area where waste has been retained for at least two years is approximately 12 hectares; therefore, a minimum of 24 samples were collected and analyzed. Four additional samples were collected as contingency. Approximate sample probe locations are illustrated in Attachment 1.

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The sampling activities were completed in general accordance with the Work Plan. A Geoprobe® unit was utilized by Dakota Technologies to collect subsurface landfill gas (LFG) samples. The surface probe sampling procedure consisted of advancing the Geoprobe® rod into the waste to a depth of approximately 2 meters below ground surface, extended a minimum of 3 feet into the waste. The tip of the probe was equipped with an expendable point. After the probe was fully advanced, the probe was then retracted approximately 1 foot to facilitate an unobstructed annulus for sampling. Disposable flexible lined tubing was connected from the tip of the probe to the sampling train.

The sampling train consisted of a flow control valve, a flow regulator, portable LFG analyzer (Landtec GEM™ or equivalent), pressure gauge, and Summa canister. Once the void space was created below the probe and the sampling train was connected, the sampling train up to the Summa canister was purged using a small air pump capable of pumping up to 200 milliliters per minute (mL/min). Once purged, the isolation valve on the sampling train was adjusted to connect to the Landtec GEM™, which purged the borehole. The Landtec GEM™ was used along to purge at least two sample probe volumes at a rate of approximately 500 mL/min in accordance with Appendix A of 40 CFR 60, Method 25C.

As the Landtec GEM™ was purging the borehole, methane, carbon dioxide, oxygen and balance gas readings were measured. Once the borehole had been purged of two volumes of air, the gas readings were monitored to determine the suitability of the sampling location. If gas levels were not suitable for sampling (balance gas greater than 20 percent and oxygen greater than 5 percent), the probe was either advanced an additional meter below ground surface or offset and resampled. If gas levels remained unsuitable for sampling, the location was abandoned according to the Work Plan.

Several sample probe locations were abandoned in the field due to negligible Methane readings. Additionally, several duplicate readings were organized in order to take additional samples and cannisters in case laboratory testing indicated canisters that did not meet the oxygen or nitrogen requirements. 'Duplicate' samples were offset 20 to 50 feet from other sample locations and therefore meet the sampling requirements. Attachment 2 includes latitude and longitude locations for all samples and 'duplicates', thus demonstrating their offset distances.

A one-liter sample was taken at the sample location by using the flow rate of the rotometer and amount of time for sampling. All samples were set for less than 500 ml/min flow rate from the rotometer. Four, one-liter LFG samples were composited per Summa canister. Following the collection of each sample the beginning and ending tank vacuum, ambient temperature,

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North Dakota Department of Environmental Quality
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barometric pressure, purging start and end time, sampling start and end time, sampling date, sample volume, sample ID, probe depth, canister ID, gas levels, and location in latitude and longitude were recorded in field notes. These field notes are included in Attachment 2 to this Report.

LFG samples were submitted to the Laboratory under standard chain of custody procedures for analysis. Each cannister displayed the cannister name, initial pressure, final pressure, sampling locations and date of sampling.

SAMPLE RESULTS

Following field activities, laboratory analysis was conducted by Enthalpy. Attachment 3 includes the laboratory report. A total of six Summa canisters were analyzed using EPA Methods 3C and 25C. Method 3C was performed to measure gas composition to determine if sample gas compositions indicate acceptable levels of air intrusion. The Method 3C results are summarized below in Table 1.

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TABLE 1: SUMMARY OF PERMANENT GASES ANALYSIS RESULTS (%)

Lab Sample ID	Field Sample ID	CH ₄	CO ₂	O ₂	N ₂
24H1297-01	GP-15, GP-10, GP-04, GP-18	21.4	61.4	0.55	ND ¹
24H1297-02	GP-24, GP-21, GP-16, GP-13	52.4	42.6	ND ¹	ND ¹
24H1297-03	GP-25, GP-26, GP-27, GP-12	46.7	48.9	ND ¹	ND ¹
24H1297-04	GP-22, GP-20, GP-23, GP-07	45.0	44.7	ND ¹	ND ¹
24H1297-05	GP-09, GP-11, GP-14, GP-17	40.0	54.8	ND ¹	ND ¹
24H1297-09	GP-09 Duplicate, GP-14 Duplicate, GP-06, GP-01	46.8	44.2	0.59	ND ¹
24H1297-10	GP-26 Duplicate, GP-20 Duplicate, GP-15 Duplicate, GP-01 Duplicate	24.9	59.8	ND ¹	ND ¹

¹ND = Not Detected

The Method 3C results show that all samples met the Method 25C criteria for air intrusion detection (<20% Nitrogen or <5% Oxygen).

Method 25C was performed by Enthalpy to determine the concentration of NMOC as carbon. The laboratory-measured NMOC value for each canister was converted by the laboratory in accordance with Method 25C. NMOC as hexane concentrations were then calculated through stoichiometry for the most conservative laboratory value. Table 2 below summarizes the analytical results expressed as both carbon and hexane.

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TABLE 2: SUMMARY OF NMOC ANALYSIS RESULTS

Lab Sample ID	Field Sample ID	Samples per Can	NMOC Concentration as Carbon (ppmv)	NMOC Concentration as Hexane (ppmv)	Weighted NMOC Concentration as Hexane (ppmv)
24H1297-01	GP-15, GP-10, GP-04, GP-18	4	2800	466.7	66.7
24H1297-02	GP-24, GP-21, GP-16, GP-13	4	602	100.3	14.3
24H1297-03	GP-25, GP-26, GP-27, GP-12	4	546	91.0	13.0
24H1297-04	GP-22, GP-20, GP-23, GP-07	4	1170	195.0	27.9
24H1297-05	GP-09, GP-11, GP-14, GP-17	4	1200	200.0	28.6
24H1297-09	GP-09 Duplicate, GP-14 Duplicate, GP-06, GP-01	4	1330	221.7	31.7
24H1297-10	GP-26 Duplicate, GP-20 Duplicate, GP-15 Duplicate, GP-01 Duplicate	4	2540	423.3	60.5
Total		28			242.6

The weighted average NMOC concentration as hexane of 242.6 parts per million by volume (ppmv) shown on Table 2 was calculated using the NMOC as carbon concentration from each canister, provided in Attachment 3. Each canister was weighted according to the number of samples in each can, with the assumption that each sample represents an equal portion of the landfill area. The weighted average NMOC concentration (as hexane) was calculated as follows:

$$\text{Weighted NMOC Concentration} = \sum (\text{NMOC Concentration of Can} \times \frac{\# \text{ of Samples in Can}}{\text{Total \# of Samples}})$$

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EMISSIONS CALCULATIONS

The EPA's Landfill Gas Model (LandGEM) Version 3.03 was used to calculate the annual NMOC emission rates. Historical tonnages between 2009 and 2022 were entered into the model. Subsequent disposal quantities were estimated with a 1 percent annual growth rate projected from the reported 2022 tonnage. Table 3 below summarizes the potential annual NMOC emission rates calculated for the MSWLF over the next five years. The LandGEM output is included as Attachment 4.

TABLE 3: ANNUAL NMOC EMISSIONS

Year	Disposal Rate (tons/year)	NMOC Emissions (Mg/year)
2024	69,148	4.73
2025	69,840	5.01
2026	70,538	5.28
2027	71,243	5.55
2028	71,956	5.82
2029	72,675	6.09

The MSWLF's NMOC emission rate will not exceed the applicable threshold of 34 Mg/year for this five-year reporting period. Therefore, as detailed in 40 CFR §60.764(a)(3)(iii), the MSWLF will be required to perform Tier 2 testing within the next five years. The next Tier 2 emissions report for the MSWLF will be submitted to NDDEQ in 2029 in accordance with 40 CFR §60.767(b)(1)(ii). If the actual waste acceptance rate exceeds the estimated tons per year in Table 3 in the next five years (2024-2029), a revised five-year emissions report will be submitted to NDDEQ.

Should you require any additional information, please contact Bryan Weldon at (612) 458-7512 / bweldon@burnsmcd.com or Brit Hoffman at (816) 839-7749 / behoffman@burnsmcd.com.

Sincerely,

Burns & McDonnell Engineering Company, Inc.

Ms. Liz Trythall
North Dakota Department of Environmental Quality
October 14, 2024
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Bryan Weldon, PE
Project Manager



Brit Hoffman, PE
Project Engineer

Attachments: Attachment 1 – Figure 1, 2024 Tier 2 Sampling Plan
Attachment 2 – Tier 2 Field Notes
Attachment 3 – Laboratory Analytical Results
Attachment 4 – LandGEM Emissions Calculations

cc: Sharon Lipsh, City of Grand Forks
Lisa Botnen, City of Grand Forks
Melissa Knutson, PE, CPS Ltd

ATTACHMENT 1 – FIGURE 1, 2024 TIER 2 SAMPLING PLAN



- LEGEND:**
- EXISTING CELL BOUNDARIES
 - LEACHATE FORCEMAIN
 - LEACHATE CLEANOUT PIPE
 - LEACHATE COLLECTION PIPE
 - LEACHATE RECIRCULATION PIPE
 - ACCESS ROAD
 - ASBESTOS DISPOSAL AREA
 - TIER 2 SAMPLING EXCLUSION AREA
 - APPROXIMATE TIER 2 SAMPLE PROBE LOCATION

APPROXIMATE SAMPLE LOCATIONS					
Name	Northing	Easting	Name	Northing	Easting
GP 1	375495.92	2796948.16	GP 15	375848.49	2797677.29
GP 2	375655.77	2796941.09	GP 16	375856.72	2797863.11
GP 3	375815.61	2796934.02	GP 17	375696.87	2797870.18
GP 4	375823.83	2797119.83	GP 18	375537.03	2797877.25
GP 5	375663.99	2797126.91	GP 19	376247.84	2797865.19
GP 6	375504.14	2797133.98	GP 20	376160.84	2797708.88
GP 7	375512.37	2797319.80	GP 21	376073.85	2797552.57
GP 8	375672.21	2797312.72	GP 22	376233.69	2797545.50
GP 9	375832.05	2797305.65	GP 23	376320.69	2797701.81
GP 10	375840.27	2797491.47	GP 24	376407.68	2797858.12
GP 11	375680.43	2797498.54	GP 25	376567.53	2797851.05
GP 12	375520.59	2797505.61	GP 26	376480.53	2797694.74
GP 13	375528.81	2797691.43	GP 27	376393.54	2797538.43
GP 14	375688.65	2797684.36			

- NOTE:**
- SITE TOPOGRAPHY IS BASED ON SEVERAL GROUND CONTROL SURVEYS INCLUDING THE SURVEY COMPLETED BY CPS DATED OCTOBER 15, 2020 AND THE SURVEY COMPLETED BY WSN DATED NOVEMBER 1, 2022.
 - CONTOUR INTERVAL IS 1 FOOT.
 - SITE COORDINATES ARE BASED ON:
HORIZONTAL DATUM:
NAD 83 STATE PLANE COORDINATE SYSTEM (NORTH ZONE) WITH 1996 ADJUSTMET
VERTICAL DATUM:
NGVD 1929
 - CURRENT TOPOGRAPHIC CONDITIONS MAY VARY DUE TO DAILY LANDFILL OPERATIONS.
 - CELL C BEGAN FILLING IN OCTOBER 2023 - NO PRESENCE OF WASTE OLDER THAN TWO YEARS.
 - SAMPLING EVENT TO AVOID DISTURBANCE OF THE CELL A LEACHATE SUMP.
 - SAMPLING EVENT TO AVOID DISTURBANCE OF THE ASBESTOS DISPOSAL AREA.
 - SAMPLING EVENT TO AVOID DISTURBANCE OF THE LEACHATE RECIRCULATION SYSTEM.

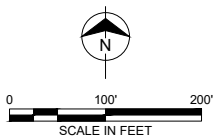


Figure 1
2024 TIER 2 SAMPLING PLAN
CITY OF GRAND FORKS
MSW LANDFILL

ATTACHMENT 2 - TIER 2 FIELD NOTES

Tier 2 LFG Sampling -- Field Data
Grand Forks MSWLF

✓

Sample: <u>GP-25</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>42728</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.08</u> mm Hg	Air Temp: <u>64°F</u> °F
Surveyed Location	Latitude: <u>97.11258°W</u>	Longitude: <u>47.98233°N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>8:39</u>	Purge Rate: <u>0.500</u> L/min
Purge Stop -	Time: <u>8:43</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>57.5</u> CO ₂ <u>42.3</u> O ₂ <u>0.1</u> Bal <u>0.1</u> Temp _____ °C		
Sample Start -	Time: <u>8:43</u>	Canister Pressure: <u>30</u> in. Hg
Sample Stop -	Time: <u>8:57</u>	Canister Pressure: <u>22</u> in. Hg
<u>0.500</u> L/min X <u>14</u> min = _____ L	Flow Rate	Time Sample Volume

8 Sampling

✓

Sample: <u>GP-26</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>42728</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.08</u> mm Hg	Air Temp: <u>67</u> °F
Surveyed Location	Latitude: <u>97.11310°W</u>	Longitude: <u>47.98210°N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>9:23</u>	Purge Rate: <u>1.0</u> L/min
Purge Stop -	Time: <u>9:26</u>	Volume Purged: <u>0.5</u> Liters
Gas Quality: CH ₄ <u>21.7</u> CO ₂ <u>70.9</u> O ₂ <u>0.1</u> Bal <u>7.4</u> Temp _____ °C		
Sample Start -	Time: <u>9:27</u>	Canister Pressure: <u>22</u> in. Hg
Sample Stop -	Time: <u>9:31</u>	Canister Pressure: <u>17</u> in. Hg
<u>0.5</u> L/min X <u>4</u> min = _____ L	Flow Rate	Time Sample Volume

7

X

Sample: <u>GP-27</u>	Probe Depth: <u>6'</u> 9' (Well ID if N/A)	Canister ID: <u>42728</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.07</u> mm Hg	Air Temp: <u>72</u> °F
Surveyed Location	Latitude: <u>97.11375°W</u>	Longitude: <u>47.98187°N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>10:02</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: _____	Volume Purged: _____ Liters
Gas Quality: CH ₄ _____ CO ₂ _____ O ₂ _____ Bal <u>22.6</u> Temp _____ °C		
Sample Start -	Time: _____	Canister Pressure: _____ in. Hg
Sample Stop -	Time: _____	Canister Pressure: _____ in. Hg
_____ L/min X _____ min = _____ L	Flow Rate	Time Sample Volume

Tier 2 LFG Sampling -- Field Data
Grand Forks MSWLF

✓

Sample: <u>GP-27</u>	Probe Depth: <u>7'</u> (Well ID if N/A)	Canister ID: <u>42728</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.07</u> mm Hg	Air Temp: <u>72</u> °F
Surveyed Location	Latitude: <u>97.11380° W</u>	Longitude: <u>47.98187° N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>10:10</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>10:14</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>55</u> CO ₂ <u>44.9</u> O ₂ <u>0</u> Bal <u>0.1</u> Temp _____ °C		
Sample Start -	Time: <u>10:15</u>	Canister Pressure: <u>17</u> in. Hg
Sample Stop -	Time: <u>10:18</u>	Canister Pressure: <u>11</u> in. Hg
<u>0.500</u> L/min X <u>3</u> min = <u>1.5</u> L Flow Rate Time Sample Volume		

5

X

Sample: <u>GP-22</u>	Probe Depth: <u>7'</u> (Well ID if N/A)	Canister ID: <u>44055</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.06</u> mm Hg	Air Temp: <u>75</u> °F
Surveyed Location	Latitude: <u>97.11372° W</u>	Longitude: <u>47.98147° N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>10:42</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>10:46</u>	Volume Purged: <u>2</u> Liters
Gas Quality: CH ₄ <u>23.6</u> CO ₂ <u>69.3</u> O ₂ <u>0.6</u> Bal <u>6.5</u> Temp _____ °C		
Sample Start -	Time: _____	Canister Pressure: _____ in. Hg
Sample Stop -	Time: _____	Canister Pressure: _____ in. Hg
_____ L/min X _____ min = _____ L Flow Rate Time Sample Volume		

Water in rotor meter from probe

✓

Sample: <u>GP-22</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>44055</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.05</u> mm Hg	Air Temp: <u>77</u> °F
Surveyed Location	Latitude: <u>97.11371° W</u>	Longitude: <u>47.98148° N</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>10:21 10:21</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>10:25</u>	Volume Purged: <u>2</u> Liters
Gas Quality: CH ₄ <u>55.9</u> CO ₂ <u>44</u> O ₂ <u>0</u> Bal <u>0.1</u> Temp _____ °C		
Sample Start -	Time: <u>10:26</u>	Canister Pressure: <u>30</u> in. Hg
Sample Stop -	Time: <u>11:35</u>	Canister Pressure: <u>24</u> in. Hg
<u>0.5</u> L/min X <u>9</u> min = _____ L Flow Rate Time Sample Volume		

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✓

Sample: <u>GP-20</u>	Probe Depth: <u>6</u>	(Well ID if N/A)	Canister ID: <u>44055</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>30.05</u> mm Hg	Air Temp: <u>78</u> °F	
Surveyed Location	Latitude: <u>47.98124° N</u>	Longitude: <u>97.11313° W</u>	
Leak Check <u>yes</u>			
Purge Start -	Time: <u>11:55</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop -	Time: <u>11:59</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>24.3</u> CO ₂ <u>59.3</u> O ₂ <u>0.0</u> Bal <u>16.4</u> Temp ____ °C			
Sample Start -	Time: <u>11:59</u>	Canister Pressure: <u>24</u> in. Hg	
Sample Stop -	Time: <u>12:06</u>	Canister Pressure: <u>17</u> in. Hg	
<u>0.5</u> L/min X <u>7</u> min = ____ L	Flow Rate	Time	Sample Volume

✓

Sample: <u>GP-23</u>	Probe Depth: <u>6</u>	(Well ID if N/A)	Canister ID: <u>44055</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.02</u> mm Hg	Air Temp: <u>80</u> °F	
Surveyed Location	Latitude: <u>47.9816° N</u>	Longitude: <u>97.11310° W</u>	
Leak Check <u>yes</u>			
Purge Start -	Time: <u>1:42</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop -	Time: <u>1:46</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>58.6</u> CO ₂ <u>41.2</u> O ₂ <u>0.1</u> Bal <u>0.1</u> Temp ____ °C			
Sample Start -	Time: <u>1:47</u>	Canister Pressure: <u>17</u> in. Hg	
Sample Stop -	Time: <u>1:50</u>	Canister Pressure: <u>11</u> in. Hg	
<u>0.5</u> L/min X <u>3</u> min = ____ L	Flow Rate	Time	Sample Volume

✓

Sample: <u>GP-24</u>	Probe Depth: <u>6</u>	(Well ID if N/A)	Canister ID: <u>41490</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.01</u> mm Hg	Air Temp: <u>80</u> °F	
Surveyed Location	Latitude: <u>47.98192° N</u>	Longitude: <u>97.11250° W</u>	
Leak Check <u>yes 28</u>			
Purge Start -	Time: <u>2:06</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop -	Time: <u>2:10</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>39.2</u> CO ₂ <u>57.8</u> O ₂ <u>0.2</u> Bal <u>2.8</u> Temp ____ °C			
Sample Start -	Time: <u>2:12</u>	Canister Pressure: <u>28</u> in. Hg	
Sample Stop -	Time: <u>2:21</u>	Canister Pressure: <u>23</u> in. Hg	
<u>0.5</u> L/min X <u>9</u> min = ____ L	Flow Rate	Time	Sample Volume

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Sample: <u>6P-19</u>	Probe Depth: <u>6</u> (Well ID if N/A)	Canister ID: <u>41490</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>30.01</u> mm Hg	Air Temp: <u>81</u> °F
Surveyed Location	Latitude: <u>47.98145° N</u>	Longitude: <u>97.11241° W</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>2:36</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>2:40</u>	Volume Purged: _____ Liters
Gas Quality: CH ₄ _____ CO ₂ _____ O ₂ _____ Bal _____ Temp _____ °C		
Sample Start -	Time: _____	Canister Pressure: _____ in. Hg
Sample Stop -	Time: _____	Canister Pressure: _____ in. Hg
$\frac{\text{Flow Rate}}{\text{L/min}} \times \frac{\text{Time}}{\text{min}} = \frac{\text{Sample Volume}}{\text{L}}$		
<u>retest CH₄ >> 7% less than zero</u>		

Sample: <u>6P-19</u>	Probe Depth: <u>7</u> (Well ID if N/A)	Canister ID: <u>41490</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>30.00</u> mm Hg	Air Temp: <u>81</u> °F
Surveyed Location	Latitude: <u>47.98150° N</u>	Longitude: <u>97.11247° W</u>
Leak Check _____		
Purge Start -	Time: <u>2:50</u>	Purge Rate: _____ L/min
Purge Stop -	Time: <u>2:55</u>	Volume Purged: _____ Liters
Gas Quality: CH ₄ <u>>> 7%</u> CO ₂ <u>43.5</u> O ₂ <u>0.0</u> Bal <u>>> 7%</u> Temp _____ °C		
Sample Start -	Time: _____	Canister Pressure: _____ in. Hg
Sample Stop -	Time: _____	Canister Pressure: _____ in. Hg
$\frac{\text{Flow Rate}}{\text{L/min}} \times \frac{\text{Time}}{\text{min}} = \frac{\text{Sample Volume}}{\text{L}}$		
<u>moved 10' west same thing</u>		

Sample: <u>6P-21</u>	Probe Depth: <u>7'</u> (Well ID if N/A)	Canister ID: <u>41490</u>
Date: <u>8/13/21</u>	Barometric Pres: <u>30.00</u> mm Hg	Air Temp: <u>81</u> °F
Surveyed Location	Latitude: <u>47.98102° N</u>	Longitude: <u>97.11370° W</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>3:13</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>3:17</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>58.5</u> CO ₂ <u>41.4</u> O ₂ <u>0</u> Bal <u>0.1</u> Temp _____ °C		
Sample Start -	Time: <u>3:11</u>	Canister Pressure: <u>23</u> in. Hg
Sample Stop -	Time: <u>3:24</u>	Canister Pressure: <u>17</u> in. Hg
$\frac{\text{Flow Rate}}{\text{L/min}} \times \frac{\text{Time}}{\text{min}} = \frac{\text{Sample Volume}}{\text{L}}$		
<u>0.5 L/min X 10 min = Sample Volume</u>		

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✓

Sample: <u>6P-16</u>	Probe Depth: <u>7'</u> (Well ID if N/A)	Canister ID: <u>41490</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>29.99</u> mm Hg	Air Temp: <u>81</u> °F
Surveyed Location	Latitude: <u>47.98040°N</u>	Longitude: <u>97.11256°W</u>
Leak Check <u>yes</u>		
Purge Start - Time: <u>3:43</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop - Time: <u>3:47</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>60.7</u> CO ₂ <u>38.5</u> O ₂ <u>0.3</u> Bal <u>0.6</u> Temp <u> </u> °C		
Sample Start - Time: <u>3:47</u>	Canister Pressure: <u>17</u> in. Hg	
Sample Stop - Time: <u>3:53</u>	Canister Pressure: <u>11</u> in. Hg	
<u>0.5</u> L/min X <u>6</u> min = <u> </u> L Flow Rate Time Sample Volume		

✓

Sample: <u>6P-15</u>	Probe Depth: <u>7'</u> (Well ID if N/A)	Canister ID: <u>41431</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>29.99</u> mm Hg	Air Temp: <u>79</u> °F
Surveyed Location	Latitude: <u>47.98036°N</u>	Longitude: <u>97.11331°W</u>
Leak Check <u>yes</u>		
Purge Start - Time: <u>4:05</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop - Time: <u>4:09</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>4.1</u> CO ₂ <u>79.6</u> O ₂ <u>1.1</u> Bal <u>15.2</u> Temp <u> </u> °C		
Sample Start - Time: <u>4:09</u>	Canister Pressure: <u>28</u> in. Hg	
Sample Stop - Time: <u>4:24</u>	Canister Pressure: <u>23</u> in. Hg	
<u>0.5</u> L/min X <u>15</u> min = <u> </u> L Flow Rate Time Sample Volume		

✓

Sample: <u>6P-10</u>	Probe Depth: <u>6.5</u> (Well ID if N/A)	Canister ID: <u>41431</u>
Date: <u>8/13/24</u>	Barometric Pres: <u>29.97</u> mm Hg	Air Temp: <u>80</u> °F
Surveyed Location	Latitude: <u>47.98037°N</u>	Longitude: <u>97.11405°W</u>
Leak Check <u>yes</u>		
Purge Start - Time: <u>4:54</u>	Purge Rate: <u>0.5</u> L/min	
Purge Stop - Time: <u>4:58</u>	Volume Purged: <u>2.0</u> Liters	
Gas Quality: CH ₄ <u>16.5</u> CO ₂ <u>79.5</u> O ₂ <u>0</u> Bal <u>4.0</u> Temp <u> </u> °C		
Sample Start - Time: <u>4:58</u>	Canister Pressure: <u>23</u> in. Hg	
Sample Stop - Time: <u>5:05</u>	Canister Pressure: <u>18</u> in. Hg	
<u>0.5</u> L/min X <u>7</u> min = <u> </u> L Flow Rate Time Sample Volume		

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✓

Sample: <u>6P-04</u>	Probe Depth: <u>6</u> (Well ID if N/A)	Canister ID: <u>41431</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>29.97</u> mm Hg	Air Temp: <u>80</u> °F
Surveyed Location	Latitude: <u>47.98038°N</u>	Longitude: <u>97.11560°W</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>5:27</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>5:31</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>22.1</u> CO ₂ <u>65.9</u> O ₂ <u>0.1</u> Bal <u>11.8</u> Temp _____ °C		
Sample Start -	Time: <u>5:32</u>	Canister Pressure: <u>18</u> in. Hg
Sample Stop -	Time: <u>5:36</u>	Canister Pressure: <u>12</u> in. Hg
<u>0.5</u> L/min X <u>4</u> min = _____ L	Flow Rate	Time Sample Volume

✓

Sample: <u>6P-03</u>	Probe Depth: <u>6</u> (Well ID if N/A)	Canister ID: <u>48101</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>29.96</u> mm Hg	Air Temp: <u>80</u> °F
Surveyed Location	Latitude: <u>47.98036°N</u>	Longitude: <u>97.11631°W</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>5:52</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>5:56</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>61.0</u> CO ₂ <u>38.8</u> O ₂ <u>0</u> Bal <u>0.2</u> Temp _____ °C		
Sample Start -	Time: <u>5:57</u>	Canister Pressure: <u>30</u> in. Hg
Sample Stop -	Time: <u>6:00</u>	Canister Pressure: <u>24</u> in. Hg
<u>0.5</u> L/min X <u>3</u> min = _____ L	Flow Rate	Time Sample Volume

✓

Sample: <u>6P-02</u>	Probe Depth: <u>6</u> (Well ID if N/A)	Canister ID: <u>48101</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>29.96</u> mm Hg	Air Temp: <u>81</u> °F
Surveyed Location	Latitude: <u>47.97996°N</u>	Longitude: <u>97.11633°W</u>
Leak Check <u>yes</u>		
Purge Start -	Time: <u>6:20</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>6:24</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>58.1</u> CO ₂ <u>41.6</u> O ₂ <u>0</u> Bal <u>0.3</u> Temp _____ °C		
Sample Start -	Time: <u>6:25</u>	Canister Pressure: <u>24</u> in. Hg
Sample Stop -	Time: <u>6:28</u>	Canister Pressure: <u>18</u> in. Hg
<u>0.5</u> L/min X _____ min = _____ L	Flow Rate	Time Sample Volume

Tier 2 LFG Sampling -- Field Data
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② ✓

Sample: <u>GP-20 DUP</u>	Probe Depth: <u>7' → 6'</u> (Well ID if N/A)	Canister ID: <u>49501</u>
Date: <u>8-13-2024</u>	Barometric Pres: <u>30.04</u> mm Hg	Air Temp: <u>79</u> °F
Surveyed Location	Latitude: <u>47.98124°N</u>	Longitude: <u>97.11307°W</u>
Leak Check <u>no gauge</u>		
Purge Start -	Time: <u>12:13</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>12:16</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>25.2</u> CO ₂ <u>56.3</u> O ₂ <u>0.3</u> Bal <u>18.2</u> Temp <u> </u> °C		
Sample Start -	Time: <u>12:16</u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u>12:21</u>	Canister Pressure: <u> </u> in. Hg
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$		

③ ✓

Sample: <u>GP-15 DUP</u>	Probe Depth: <u>8' → 7'</u> (Well ID if N/A)	Canister ID: <u>49501</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>29.98</u> mm Hg	Air Temp: <u>79</u> °F
Surveyed Location	Latitude: <u>47.98039°N</u>	Longitude: <u>97.11328°W</u>
Leak Check <u>no gauge</u>		
Purge Start -	Time: <u>4:33</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>4:37</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>4.7</u> CO ₂ <u>83.5</u> O ₂ <u>0</u> Bal <u>11.8</u> Temp <u> </u> °C		
Sample Start -	Time: <u>4:37</u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u>4:42</u>	Canister Pressure: <u> </u> in. Hg
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$		

④ ✓

Sample: <u>GP-26 DUP</u>	Probe Depth: <u>7' → 6'</u> (Well ID if N/A)	Canister ID: <u>49501</u>
Date: <u>8/13/2024</u>	Barometric Pres: <u>30.08</u> mm Hg	Air Temp: <u>70</u> °F
Surveyed Location	Latitude: <u>47.98210°N</u>	Longitude: <u>97.11310°W</u>
Leak Check <u>no gauge</u>		
Purge Start -	Time: <u>9:39</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>9:43</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>22.5</u> CO ₂ <u>71.0</u> O ₂ <u>0</u> Bal <u>6.5</u> Temp <u> </u> °C		
Sample Start -	Time: <u>9:43</u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u>9:48</u>	Canister Pressure: <u> </u> in. Hg
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$		

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✓

Sample: <u>6P-05</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>4801</u>
Date: <u>8/14/24</u>	Barometric Pres: <u>29.95</u> mm Hg	Air Temp: <u>66</u> °F
Surveyed Location	Latitude: <u>47.97999°N</u>	Longitude: <u>97.11558°W</u>

Leak Check <u>yes</u>		
Purge Start -	Time: <u>7:35</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>7:39</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>41.1</u> CO ₂ <u>58.7</u> O ₂ <u>0.1</u> Bal <u>0.1</u> Temp ____ °C		
Sample Start -	Time: <u>7:40</u>	Canister Pressure: <u>18</u> in. Hg
Sample Stop -	Time: <u>7:43</u>	Canister Pressure: <u>12</u> in. Hg
<u>0.5</u> L/min X <u>3</u> min = _____ L Flow Rate Time Sample Volume		

✓

Sample: <u>6P-08</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>48101</u>
Date: <u>8/14/24</u>	Barometric Pres: <u>29.95</u> mm Hg	Air Temp: <u>66</u> °F
Surveyed Location	Latitude: <u>47.98001°N</u>	Longitude: <u>97.11492°W</u>

Leak Check <u>yes</u>		
Purge Start -	Time: <u>7:56</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>8:00</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>50.9</u> CO ₂ <u>48.9</u> O ₂ <u>0.1</u> Bal <u>0.1</u> Temp ____ °C		
Sample Start -	Time: <u>8:00</u>	Canister Pressure: <u>12</u> in. Hg
Sample Stop -	Time: <u>8:02</u>	Canister Pressure: <u>7</u> in. Hg
<u>0.5</u> L/min X <u>2</u> min = _____ L Flow Rate Time Sample Volume		

✓

Sample: <u>6P-09</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>44231</u>
Date: <u>8/14/24</u>	Barometric Pres: <u>29.95</u> mm Hg	Air Temp: <u>68</u> °F
Surveyed Location	Latitude: <u>47.98037°N</u>	Longitude: <u>97.11460°W</u>

Leak Check <u>yes</u>		
Purge Start -	Time: <u>8:11</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>8:15</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>35.4</u> CO ₂ <u>63.9</u> O ₂ <u>0.6</u> Bal <u>0.1</u> Temp ____ °C		
Sample Start -	Time: <u>8:15</u>	Canister Pressure: <u>29</u> in. Hg
Sample Stop -	Time: <u>8:24</u>	Canister Pressure: <u>24</u> in. Hg
<u>0.5</u> L/min X <u>9</u> min = _____ L Flow Rate Time Sample Volume		

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Sample:	GP-11		Probe Depth:	6' (Well ID if N/A)		Canister ID:	44231	
Date:	8/14/24		Barometric Pres:	29.94 mm Hg		Air Temp:	69 °F	
Surveyed	Location	Latitude:	47.97998°N		Longitude:	97.11402°W		
Leak Check	yes							
Purge Start -	Time:	8:51		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	8:55		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	40.2	CO ₂	59.0	O ₂	0.6	Bal	0.2 °C
Sample Start -	Time:	8:56		Canister Pressure:	24		in. Hg	
Sample Stop -	Time:	9:02		Canister Pressure:	19		in. Hg	
	0.5	L/min	X	6	min =	L		
	Flow Rate			Time		Sample Volume		

X

Sample:	GP-14		Probe Depth:	6' (Well ID if N/A)		Canister ID:	44231	
Date:	8/14/24		Barometric Pres:	29.94 mm Hg		Air Temp:	70 °F	
Surveyed	Location	Latitude:			Longitude:			
Leak Check	yes							
Purge Start -	Time:	9:11		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	9:15		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	22.7%	CO ₂		O ₂		Bal	22.7% °C
Sample Start -	Time:			Canister Pressure:			in. Hg	
Sample Stop -	Time:			Canister Pressure:			in. Hg	
		L/min	X		min =	L		
	Flow Rate			Time		Sample Volume		

negative methane

✓

Sample:	GP-14		Probe Depth:	8' (7') (Well ID if N/A)		Canister ID:	44231	
Date:	8/14/24		Barometric Pres:	29.94 mm Hg		Air Temp:	70 °F	
Surveyed	Location	Latitude:	47.97996°N		Longitude:	97.11324°W		
Leak Check	yes							
Purge Start -	Time:	9:19		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	9:23		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	28.7	CO ₂	66.5	O ₂	0.1	Bal	4.7 °C
Sample Start -	Time:	9:23		Canister Pressure:	19		in. Hg	
Sample Stop -	Time:	9:27		Canister Pressure:	13		in. Hg	
	0.5	L/min	X	4	min =	L		
	Flow Rate			Time		Sample Volume		

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Sample:	<u>GP-17</u>	Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>44231</u>
Date:	<u>8/14/24</u>	Barometric Pres:	<u>29.94</u>	mm Hg	Air Temp:	<u>72</u> °F
Surveyed Location		Latitude:	<u>47.97987°N</u>	Longitude:	<u>97.11253°W</u>	
Leak Check	<u>yes</u>					
Purge Start -	Time:	<u>9:54</u>	Purge Rate:	<u>0.5</u>	L/min	
Purge Stop -	Time:	<u>9:58</u>	Volume Purged:	<u>2.0</u>	Liters	
Gas Quality:	CH ₄ <u>63.5</u>	CO ₂ <u>36.4</u>	O ₂ <u>0.0</u>	Bal <u>0.1</u>	Temp	°C
Sample Start -	Time:	<u>9:58</u>	Canister Pressure:	<u>13</u>	in. Hg	
Sample Stop -	Time:	<u>10:01</u>	Canister Pressure:	<u>7</u>	in. Hg	
	<u>0.5</u>	L/min	X	<u>3</u>	min =	<u> </u> L
	Flow Rate			Time		Sample Volume

X

Sample:	<u>GP-18</u>	Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>48083</u>
Date:	<u>8/14/24</u>	Barometric Pres:	<u>29.94</u>	mm Hg	Air Temp:	<u>72</u> °F
Surveyed Location		Latitude:	<u>47.97951°N</u>	Longitude:	<u>97.11253°W</u>	
Leak Check	<u>yes</u>					
Purge Start -	Time:	<u>10:12</u>	Purge Rate:	<u>0.5</u>	L/min	
Purge Stop -	Time:	<u>10:16</u>	Volume Purged:	<u>2.0</u>	Liters	
Gas Quality:	CH ₄ <u>63.4</u>	CO ₂ <u>36.5</u>	O ₂ <u>0</u>	Bal <u>0.1</u>	Temp	°C
Sample Start -	Time:	<u>10:16</u>	Canister Pressure:	<u>30.5</u>	in. Hg	
Sample Stop -	Time:	<u>10:26</u>	Canister Pressure:	<u>30.5</u>	in. Hg	
	<u>0.5</u>	L/min	X	<u> </u>	min =	<u> </u> L
	Flow Rate			Time		Sample Volume

tank broken?
gauge not moving

✓

Sample:	<u>GP-18</u>	Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>41431</u>
Date:	<u>8/14/24</u>	Barometric Pres:	<u>29.93</u>	mm Hg	Air Temp:	<u>73</u> °F
Surveyed Location		Latitude:	<u>47.97951°N</u>	Longitude:	<u>97.11253°W</u>	
Leak Check	<u>yes</u>					
Purge Start -	Time:	<u>10:28</u>	Purge Rate:	<u>0.5</u>	L/min	
Purge Stop -	Time:	<u>10:32</u>	Volume Purged:	<u>2.0</u>	Liters	
Gas Quality:	CH ₄ <u>63.2</u>	CO ₂ <u>36.7</u>	O ₂ <u>0</u>	Bal <u>0.1</u>	Temp	°C
Sample Start -	Time:	<u>10:32</u>	Canister Pressure:	<u>12</u>	in. Hg	
Sample Stop -	Time:	<u>10:35</u>	Canister Pressure:	<u>6</u>	in. Hg	
	<u>0.5</u>	L/min	X	<u>3</u>	min =	<u> </u> L
	Flow Rate			Time		Sample Volume

Tier 2 LFG Sampling -- Field Data
Grand Forks MSWLF

✓

Sample:	<u>GP-13</u>		Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>41490</u>
Date:	<u>8/14/24</u>		Barometric Pres:	<u>29.93</u>	mm Hg	Air Temp:	<u>73</u> °F
Surveyed Location	Latitude: <u>47.97953°N</u>		Longitude:		<u>97.11325°W</u>		
Leak Check	<u>yes</u>						
Purge Start -	Time: <u>10:47</u>		Purge Rate:	<u>0.5</u>	L/min		
Purge Stop -	Time: <u>10:51</u>		Volume Purged:	<u>2.0</u>	Liters		
Gas Quality:	CH ₄ <u>55.6</u>	CO ₂ <u>43.9</u>	O ₂ <u>0</u>	Bal <u>0.5</u>	Temp _____ °C		
Sample Start -	Time: <u>10:52</u>		Canister Pressure:	<u>11</u>	in. Hg		
Sample Stop -	Time: <u>10:55</u>		Canister Pressure:	<u>6</u>	in. Hg		
<u>0.5</u> L/min X <u>3</u> min = _____ L Flow Rate Time Sample Volume							

✓

Sample:	<u>GP-12</u>		Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>42728</u>
Date:	<u>8/14/24</u>		Barometric Pres:	<u>29.92</u>	mm Hg	Air Temp:	<u>73</u> °F
Surveyed Location	Latitude: <u>47.97952°N</u>		Longitude:		<u>97.11403°W</u>		
Leak Check	<u>yes</u>						
Purge Start -	Time: <u>11:08</u>		Purge Rate:	<u>0.5</u>	L/min		
Purge Stop -	Time: <u>11:12</u>		Volume Purged:	<u>2.0</u>	Liters		
Gas Quality:	CH ₄ <u>55.3</u>	CO ₂ <u>44.6</u>	O ₂ <u>0</u>	Bal <u>0.1</u>	Temp _____ °C		
Sample Start -	Time: <u>11:12</u>		Canister Pressure:	<u>11</u>	in. Hg		
Sample Stop -	Time: <u>11:15</u>		Canister Pressure:	<u>6</u>	in. Hg		
<u>0.5</u> L/min X <u>3</u> min = _____ L Flow Rate Time Sample Volume							

✓

Sample:	<u>GP-7</u>		Probe Depth:	<u>7'</u>	(Well ID if N/A)	Canister ID:	<u>44055</u>
Date:	<u>8/14/24</u>		Barometric Pres:	<u>29.92</u>	mm Hg	Air Temp:	<u>73</u> °F
Surveyed Location	Latitude: <u>47.97952°N</u>		Longitude:		<u>97.11478°W</u>		
Leak Check	<u>yes</u>						
Purge Start -	Time: <u>11:26</u>		Purge Rate:	<u>0.5</u>	L/min		
Purge Stop -	Time: <u>11:30</u>		Volume Purged:	<u>2.0</u>	Liters		
Gas Quality:	CH ₄ <u>59.3</u>	CO ₂ <u>40.5</u>	O ₂ <u>0</u>	Bal <u>0.2</u>	Temp _____ °C		
Sample Start -	Time: <u>11:30</u>		Canister Pressure:	<u>11</u>	in. Hg		
Sample Stop -	Time: <u>11:32</u>		Canister Pressure:	<u>6</u>	in. Hg		
<u>0.5</u> L/min X <u>2</u> min = _____ L Flow Rate Time Sample Volume							

Tier 2 LFG Sampling -- Field Data
Grand Forks MSWLF

✓

Sample: <u>GP-09 DUP</u>	Probe Depth: <u>6'</u> (Well ID if N/A)	Canister ID: <u>49347</u>
Date: <u>8/14/24</u>	Barometric Pres: <u>29.95</u> mm Hg	Air Temp: <u>69</u> °F
Surveyed Location	Latitude: <u>47.98036°N</u>	Longitude: <u>97.11462°W</u>

Leak Check <u>no gauge</u>		
Purge Start -	Time: <u>8:31</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>8:35</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>34.0</u> CO ₂ <u>65.9</u>	O ₂ <u>0</u>	Bal <u>0.1</u> Temp <u> </u> °C
Sample Start -	Time: <u>8:35</u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u>8:40</u>	Canister Pressure: <u> </u> in. Hg

0.5 L/min X 5 min = L
Flow Rate Time Sample Volume

✓

Sample: <u>GP-14 DUP</u>	Probe Depth: <u>8'7"</u> (Well ID if N/A)	Canister ID: <u>49347</u>
Date: <u>8/14/24</u>	Barometric Pres: <u>29.94</u> mm Hg	Air Temp: <u>71</u> °F
Surveyed Location	Latitude: <u>47.97997°N</u>	Longitude: <u>97.11325°W</u>

Leak Check <u>no gauge</u>		
Purge Start -	Time: <u>9:33</u>	Purge Rate: <u>0.5</u> L/min
Purge Stop -	Time: <u>9:37</u>	Volume Purged: <u>2.0</u> Liters
Gas Quality: CH ₄ <u>33.0</u> CO ₂ <u>66.9</u>	O ₂ <u>0</u>	Bal <u>0.1</u> Temp <u> </u> °C
Sample Start -	Time: <u>9:37</u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u>9:42</u>	Canister Pressure: <u> </u> in. Hg

0.5 L/min X 5 min = L
Flow Rate Time Sample Volume

Sample: <u> </u>	Probe Depth: <u> </u> (Well ID if N/A)	Canister ID: <u> </u>
Date: <u> </u>	Barometric Pres: <u> </u> mm Hg	Air Temp: <u> </u> °F
Surveyed Location	Latitude: <u> </u>	Longitude: <u> </u>

Leak Check <u> </u>		
Purge Start -	Time: <u> </u>	Purge Rate: <u> </u> L/min
Purge Stop -	Time: <u> </u>	Volume Purged: <u> </u> Liters
Gas Quality: CH ₄ <u> </u> CO ₂ <u> </u>	O ₂ <u> </u>	Bal <u> </u> Temp <u> </u> °C
Sample Start -	Time: <u> </u>	Canister Pressure: <u> </u> in. Hg
Sample Stop -	Time: <u> </u>	Canister Pressure: <u> </u> in. Hg

 L/min X min = L
Flow Rate Time Sample Volume

Tier 2 LFG Sampling -- Field Data
Grand Forks MSWLF

✓

Sample:	LP-6		Probe Depth:	7' (Well ID if N/A)		Canister ID:	49347	
Date:	8/14/24		Barometric Pres:	29.92 mm Hg		Air Temp:	73 °F	
Surveyed Location	Latitude: 47.978953° N		Longitude:		97.11558° W			
Leak Check	no gauge							
Purge Start -	Time:	11:42		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	11:46		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	57.0	CO ₂	42.8	O ₂	0	Bal	0.2 Temp °C
Sample Start -	Time:	11:46		Canister Pressure:			in. Hg	
Sample Stop -	Time:	11:51		Canister Pressure:			in. Hg	
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$								

✓

Sample:	LP-1		Probe Depth:	7' (Well ID if N/A)		Canister ID:	49347	
Date:	8/14/24		Barometric Pres:	29.91 mm Hg		Air Temp:	75 °F	
Surveyed Location	Latitude: 47.977951° N		Longitude:		97.11631° W			
Leak Check	no gauge							
Purge Start -	Time:	12:00		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	12:04		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	57.1	CO ₂	41.9	O ₂	0	Bal	1.0 Temp °C
Sample Start -	Time:	12:04		Canister Pressure:			in. Hg	
Sample Stop -	Time:	12:09		Canister Pressure:			in. Hg	
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$								

✓

Sample:	LP-1 DUP		Probe Depth:	7' (Well ID if N/A)		Canister ID:	49501	
Date:	8/14/24		Barometric Pres:	29.91 mm Hg		Air Temp:	75 °F	
Surveyed Location	Latitude: 47.977952° N		Longitude:		97.11631° W			
Leak Check	no gauge							
Purge Start -	Time:	12:14		Purge Rate:	0.5		L/min	
Purge Stop -	Time:	12:18		Volume Purged:	2.0		Liters	
Gas Quality:	CH ₄	56.9	CO ₂	42.3	O ₂	0	Bal	0.8 Temp °C
Sample Start -	Time:	12:18		Canister Pressure:			in. Hg	
Sample Stop -	Time:	12:23		Canister Pressure:			in. Hg	
$\frac{0.5 \text{ L/min}}{\text{Flow Rate}} \times \frac{5 \text{ min}}{\text{Time}} = \text{Sample Volume L}$								

ATTACHMENT 3 - LABORATORY ANALYTICAL RESULTS



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name:	Burns & McDonnell - Bloomington, MN	Date Received:	August 22, 2024 12:30
	8201 Norman Center Dr, Suite 500	Date Issued:	September 6, 2024 15:22
	Bloomington, MN 54437	Project Number:	237440
Submitted To:	Bryan Weldon	Purchase Order:	

Client Site I.D.: Grand Forks Tier II LFG Sampling

Enclosed are the results of analyses for samples received by the laboratory on 08/22/2024 12:30. If you have any questions concerning this report, please feel free to contact the laboratory.

Sincerely,

A handwritten signature in black ink that reads 'Sarah R. Endsley'.

Sarah R. Endsley
Laboratory Manager

End Notes:

The test results listed in this report relate only to the samples submitted to the laboratory and as received by the Laboratory.

Unless otherwise noted, the test results for solid materials are calculated on a wet weight basis. Analyses for pH, dissolved oxygen, temperature, residual chlorine and sulfite that are performed in the laboratory do not meet NELAC requirements due to extremely short holding times. These analyses should be performed in the field. The results of field analyses performed by the Sampler included in the Certificate of Analysis are done so at the client's request and are not included in the laboratory's fields of certification nor have they been audited for adherence to a reference method or procedure.

The signature on the final report certifies that these results conform to all applicable NELAC standards unless otherwise specified. For a complete list of the Laboratory's NELAC certified parameters please contact customer service.

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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN Date Received: August 22, 2024 12:30
8201 Norman Center Dr, Suite 500 Date Issued: September 6, 2024 15:22
Bloomington, MN 54437 Project Number: 237440
Submitted To: Bryan Weldon Purchase Order:
Client Site I.D.: Grand Forks Tier II LFG Sampling

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GP-15, GP-10, GP-04, GP-18	24H1297-01	Air	08/14/2024 10:35	08/22/2024 12:30
GP-24, GP-21, GP-16, GP-13	24H1297-02	Air	08/14/2024 10:55	08/22/2024 12:30
GP-25, GP-26, GP-27, GP-12	24H1297-03	Air	08/14/2024 11:15	08/22/2024 12:30
GP-22, GP-20, GP-23, GP-07	24H1297-04	Air	08/14/2024 11:32	08/22/2024 12:30
GP-09, GP-11, GP-14, GP-17	24H1297-05	Air	08/14/2024 10:01	08/22/2024 12:30
GP-09 Duplicate, GP-14 Duplicate, GP-06, GP-01	24H1297-09	Air	08/14/2024 12:09	08/22/2024 12:30
GP-26 Duplicate, GP-20 Duplicate, GP-15 Duplicate, GP-01 Duplicate	24H1297-10	Air	08/14/2024 12:23	08/22/2024 12:30



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-15, GP-10, GP-04, GP-18

Sub Description/Location:

Final Vacuum(in Hg): 6

Sample ID: 24H1297-01

Canister ID: 063-00239::41431

Receipt Vacuum(in Hg): 9.0

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 10:35

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	2800	170	170		466.7	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (1), N2 corrected	2790	170	170		465.0	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (2), N2 corrected	2790	170	170		465.0	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (3), N2 corrected	2820	170	170		470.0	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (Mean), O2 corrected	2790	170	170		465.0	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (1), O2 corrected	2780	170	170		463.3	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (2), O2 corrected	2780	170	170		463.3	28.3	28.3	5	1	8/27/24 14:51	NSD
TNMOC as Carbon (3), O2 corrected	2800	170	170		466.7	28.3	28.3	5	1	8/27/24 14:51	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	21.4	0.45	0.45					9	1	8/28/24 14:00	NSD
Carbon dioxide, as received	61.4	0.45	0.45					9	1	8/28/24 14:00	NSD
Oxygen (O2), as received	0.55	0.45	0.45					9	1	8/28/24 14:00	NSD
Hydrogen (H2), as received	12.6	0.54	0.54					27	1	8/29/24 18:07	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	8/28/24 14:00	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	8/28/24 14:00	NSD



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-24, GP-21, GP-16, GP-13

Sub Description/Location:

Final Vacuum(in Hg): 6

Sample ID: 24H1297-02

Canister ID: 063-00261::41490

Receipt Vacuum(in Hg): 8.2

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 10:55

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	602	85.0	85.0		100.3	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (1), N2 corrected	637	85.0	85.0		106.2	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (2), N2 corrected	574	85.0	85.0		95.7	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (3), N2 corrected	597	85.0	85.0		99.5	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (Mean), O2 corrected	601	85.0	85.0		100.2	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (1), O2 corrected	635	85.0	85.0		105.8	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (2), O2 corrected	572	85.0	85.0		95.3	14.2	14.2	2.5	1	8/27/24 16:50	NSD
TNMOC as Carbon (3), O2 corrected	595	85.0	85.0		99.2	14.2	14.2	2.5	1	8/27/24 16:50	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	52.4	0.45	0.45					9	1	8/28/24 14:44	NSD
Carbon dioxide, as received	42.6	0.45	0.45					9	1	8/28/24 14:44	NSD
Oxygen (O2), as received	ND	0.45	0.45					9	1	8/28/24 14:44	NSD
Hydrogen (H2), as received	2.11	0.18	0.18					9	1	8/28/24 14:44	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	8/28/24 14:44	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	8/28/24 14:44	NSD



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-25, GP-26, GP-27, GP-12

Sub Description/Location:

Final Vacuum(in Hg): 6

Sample ID: 24H1297-03

Canister ID: 063-00058::42728

Receipt Vacuum(in Hg): 8.2

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 11:15

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	546	85.0	85.0		91.0	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (1), N2 corrected	531	85.0	85.0		88.5	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (2), N2 corrected	535	85.0	85.0		89.2	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (3), N2 corrected	571	85.0	85.0		95.2	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (Mean), O2 corrected	546	85.0	85.0		91.0	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (1), O2 corrected	531	85.0	85.0		88.5	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (2), O2 corrected	535	85.0	85.0		89.2	14.2	14.2	2.5	1	8/28/24 12:00	NSD
TNMOC as Carbon (3), O2 corrected	571	85.0	85.0		95.2	14.2	14.2	2.5	1	8/28/24 12:00	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	46.7	0.45	0.45					9	1	9/3/24 20:20	NSD
Carbon dioxide, as received	48.9	0.45	0.45					9	1	9/3/24 20:20	NSD
Oxygen (O2), as received	ND	0.45	0.45					9	1	9/3/24 20:20	NSD
Hydrogen (H2), as received	3.86	0.18	0.18					9	1	9/3/24 20:20	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	9/3/24 20:20	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	9/3/24 20:20	NSD



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-22, GP-20, GP-23, GP-07

Sub Description/Location:

Final Vacuum(in Hg): 6

Sample ID: 24H1297-04

Canister ID: 063-00346::44055

Receipt Vacuum(in Hg): 8.2

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 11:32

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	1170	85.0	85.0		195.0	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (1), N2 corrected	1180	85.0	85.0		196.7	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (2), N2 corrected	1150	85.0	85.0		191.7	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (3), N2 corrected	1190	85.0	85.0		198.3	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (Mean), O2 corrected	1170	85.0	85.0		195.0	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (1), O2 corrected	1180	85.0	85.0		196.7	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (2), O2 corrected	1150	85.0	85.0		191.7	14.2	14.2	2.5	1	8/28/24 13:59	NSD
TNMOC as Carbon (3), O2 corrected	1190	85.0	85.0		198.3	14.2	14.2	2.5	1	8/28/24 13:59	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	45.0	0.45	0.45					9	1	9/3/24 21:04	NSD
Carbon dioxide, as received	44.7	0.45	0.45					9	1	9/3/24 21:04	NSD
Oxygen (O2), as received	ND	0.45	0.45					9	1	9/3/24 21:04	NSD
Hydrogen (H2), as received	8.02	0.36	0.36					18	1	9/4/24 16:18	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	9/3/24 21:04	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	9/3/24 21:04	NSD



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8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-09, GP-11, GP-14, GP-17

Sub Description/Location:

Final Vacuum(in Hg): 7

Sample ID: 24H1297-05

Canister ID: 063-00566::44231

Receipt Vacuum(in Hg): 8.6

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 10:01

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	1200	85.0	85.0		200.0	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (1), N2 corrected	1160	85.0	85.0		193.3	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (2), N2 corrected	1200	85.0	85.0		200.0	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (3), N2 corrected	1230	85.0	85.0		205.0	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (Mean), O2 corrected	1180	85.0	85.0		196.7	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (1), O2 corrected	1150	85.0	85.0		191.7	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (2), O2 corrected	1180	85.0	85.0		196.7	14.2	14.2	2.5	1	8/28/24 16:17	NSD
TNMOC as Carbon (3), O2 corrected	1220	85.0	85.0		203.3	14.2	14.2	2.5	1	8/28/24 16:17	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	40.0	0.45	0.45					9	1	9/3/24 21:48	NSD
Carbon dioxide, as received	54.8	0.45	0.45					9	1	9/3/24 21:48	NSD
Oxygen (O2), as received	ND	0.45	0.45					9	1	9/3/24 21:48	NSD
Hydrogen (H2), as received	3.56	0.18	0.18					9	1	9/3/24 21:48	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	9/3/24 21:48	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	9/3/24 21:48	NSD



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Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-09 Duplicate, GP-14 Duplicate,
GP-06, GP-01

Sub Description/Location:

Final Vacuum(in Hg): 5

Sample ID: 24H1297-09

Canister ID: 063-00866::49347

Receipt Vacuum(in Hg): 24.4

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 12:09

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	1330	306	306		221.7	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (1), N2 corrected	1420	306	306		236.7	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (2), N2 corrected	1350	306	306		225.0	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (3), N2 corrected	1210	306	306		201.7	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (Mean), O2 corrected	1320	306	306		220.0	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (1), O2 corrected	1410	306	306		235.0	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (2), O2 corrected	1350	306	306		225.0	51.0	51.0	9	1	9/3/24 18:25	NSD
TNMOC as Carbon (3), O2 corrected	1210	306	306		201.7	51.0	51.0	9	1	9/3/24 18:25	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	46.8	0.45	0.45					9	1	9/3/24 16:10	NSD
Carbon dioxide, as received	44.2	0.45	0.45					9	1	9/3/24 16:10	NSD
Oxygen (O2), as received	0.59	0.45	0.45					9	1	9/3/24 16:10	NSD
Hydrogen (H2), as received	1.64	0.18	0.18					9	1	9/3/24 16:10	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	9/3/24 16:10	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	9/3/24 16:10	NSD



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Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

ANALYTICAL RESULTS

Project Location:

Sample Description/Location:

Initial Vacuum(in Hg): 30

Field Sample #: GP-26 Duplicate, GP-20 Duplicate,
GP-15 Duplicate, GP-01 Duplicate

Sub Description/Location:

Final Vacuum(in Hg): 7

Sample ID: 24H1297-10

Canister ID: 063-00827::49501

Receipt Vacuum(in Hg): 3.2

Sample Matrix: Air

Canister Size: 30

Flow Controller Type: Passive

Sampled: 8/14/2024 12:23

Flow Controller ID: T32A1

Sample Type: LV

Volatile Organic Compounds by GC/FID											
Analyte	ppmv-C			Flag/Qual	EPA Method 25C			Dilution	PF	Date/Time Analyzed	Analyst
	Results	MDL	LOQ		Results	MDL	LOQ				
TNMOC as Carbon (Mean), N2 corrected	2540	170	170		423.3	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (1), N2 corrected	2560	170	170		426.7	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (2), N2 corrected	2540	170	170		423.3	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (3), N2 corrected	2520	170	170		420.0	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (Mean), O2 corrected	2540	170	170		423.3	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (1), O2 corrected	2550	170	170		425.0	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (2), O2 corrected	2530	170	170		421.7	28.3	28.3	5	1	9/3/24 16:04	NSD
TNMOC as Carbon (3), O2 corrected	2520	170	170		420.0	28.3	28.3	5	1	9/3/24 16:04	NSD

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis											
Analyte	Vol%			Flag/Qual	EPA 3C			Dilution	PF	Date/Time Analyzed	Analyst
	Result	MDL	LOQ								
Methane, as received	24.9	0.45	0.45					9	1	9/3/24 22:33	NSD
Carbon dioxide, as received	59.8	0.45	0.45					9	1	9/3/24 22:33	NSD
Oxygen (O2), as received	ND	0.45	0.45					9	1	9/3/24 22:33	NSD
Hydrogen (H2), as received	12.7	0.54	0.54					27	1	9/4/24 16:33	NSD
Nitrogen (N2), as received	ND	9.00	9.00					9	1	9/3/24 22:33	NSD
Carbon Monoxide, as received	ND	0.009	0.009					9	1	9/3/24 22:33	NSD



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Analytical Summary

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/FID			Preparation Method:	No Prep VOC GC Air	
24H1297-01	1.00 mL / 1.00 mL	EPA Method 25C	BHI0061	SHI0055	AE40152
24H1297-02	1.00 mL / 1.00 mL	EPA Method 25C	BHI0061	SHI0055	AE40152
24H1297-03	1.00 mL / 1.00 mL	EPA Method 25C	BHI0214	SHI0194	AE40152
24H1297-04	1.00 mL / 1.00 mL	EPA Method 25C	BHI0214	SHI0194	AE40152
24H1297-05	1.00 mL / 1.00 mL	EPA Method 25C	BHI0214	SHI0194	AE40152
24H1297-09	1.00 mL / 1.00 mL	EPA Method 25C	BHI0220	SHI0198	AE40152
24H1297-10	1.00 mL / 1.00 mL	EPA Method 25C	BHI0220	SHI0198	AE40152

Sample ID	Preparation Factors Initial / Final	Method	Batch ID	Sequence ID	Calibration ID
Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis			Preparation Method:	No Prep VOC GC Air	
24H1297-01	1.00 mL / 1.00 mL	EPA 3C	BHI0041	SHI0033	AG40223
24H1297-01RE1	1.00 mL / 1.00 mL	EPA 3C	BHI0041	SHI0035	AG40223
24H1297-02	1.00 mL / 1.00 mL	EPA 3C	BHI0041	SHI0033	AG40223
24H1297-03	1.00 mL / 1.00 mL	EPA 3C	BHI0092	SHI0086	AG40223
24H1297-04	1.00 mL / 1.00 mL	EPA 3C	BHI0092	SHI0086	AG40223
24H1297-05	1.00 mL / 1.00 mL	EPA 3C	BHI0092	SHI0086	AG40223
24H1297-09	1.00 mL / 1.00 mL	EPA 3C	BHI0092	SHI0086	AG40223
24H1297-10	1.00 mL / 1.00 mL	EPA 3C	BHI0092	SHI0086	AG40223
24H1297-04RE1	1.00 mL / 1.00 mL	EPA 3C	BHI0094	SHI0148	AG40223
24H1297-10RE1	1.00 mL / 1.00 mL	EPA 3C	BHI0094	SHI0148	AG40223



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Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Reporting		Spike	Source	%REC		RPD	Qual
	Result	Limit			%REC	Limits	RPD	

Batch BHI0041 - No Prep VOC GC Air

Blank (BHI0041-BLK1)

Prepared & Analyzed: 08/28/2024

Methane	<	0.05	Vol%
Carbon dioxide	<	0.05	Vol%
Oxygen (O2)	<	0.05	Vol%
Hydrogen (H2)	<	0.02	Vol%
Nitrogen (N2)	<	1.00	Vol%
Carbon Monoxide	<	0.001	Vol%

LCS (BHI0041-BS1)

Prepared & Analyzed: 08/28/2024

Methane	9970	0.05	ppmv	10000	99.7	80-120
Carbon dioxide	10000	0.05	ppmv	10000	100	80-120
Oxygen (O2)	4950	0.05	ppmv	5010	98.8	80-120
Hydrogen (H2)	535	0.02	ppmv	504	106	80-120
Nitrogen (N2)	4840	1	ppmv	5010	96.7	80-120
Carbon Monoxide	495	0.001	ppmv	502	98.5	80-120

Duplicate (BHI0041-DUP1)

Source: 24H1297-01

Prepared & Analyzed: 08/28/2024

Methane	21.5	0.45	Vol%	21.4	0.168	5
Carbon dioxide	61.2	0.45	Vol%	61.4	0.254	5
Oxygen (O2)	<	0.45	Vol%	0.55	NA	5
Nitrogen (N2)	<	9.00	Vol%	<9.00	NA	5
Hydrogen (H2)	13.0	0.18	Vol%	12.9	0.405	5
Carbon Monoxide	<	0.009	Vol%	<0.009	NA	5

Duplicate (BHI0041-DUP2)

Source: 24H1297-02

Prepared & Analyzed: 08/28/2024

Methane	52.5	0.45	Vol%	52.4	0.242	5
Carbon dioxide	42.8	0.45	Vol%	42.6	0.333	5
Oxygen (O2)	<	0.45	Vol%	<0.45	NA	5
Nitrogen (N2)	<	9.00	Vol%	<9.00	NA	5
Hydrogen (H2)	2.16	0.18	Vol%	2.11	2.59	5
Carbon Monoxide	<	0.009	Vol%	<0.009	NA	5



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Date Received: August 22, 2024 12:30
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Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Reporting			Spike Level	Source Result	%REC		RPD		Qual
	Result	Limit	Units			%REC	Limits	RPD	Limit	

Batch BHI0041 - No Prep VOC GC Air

Duplicate (BHI0041-DUP3)				Source: 24H1433-01		Prepared & Analyzed: 08/28/2024				
Methane	27.1	0.45	Vol%		27.1		0.0784		5	
Carbon dioxide	28.3	0.45	Vol%		28.6		0.877		5	
Oxygen (O2)	1.22	0.45	Vol%		1.22		0.577		5	
Hydrogen (H2)	15.2	0.18	Vol%		15.3		0.593		5	
Nitrogen (N2)	22.5	9.00	Vol%		22.5		0.00900		5	
Carbon Monoxide	0.02	0.009	Vol%		0.02		2.57		5	
Duplicate (BHI0041-DUP4)				Source: 24H1433-02		Prepared & Analyzed: 08/28/2024				
Methane	37.6	0.45	Vol%		37.5		0.212		5	
Carbon dioxide	41.1	0.45	Vol%		41.1		0.0483		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Hydrogen (H2)	14.1	0.18	Vol%		14.0		0.903		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Carbon Monoxide	0.01	0.009	Vol%		0.01		22.8		5	P
Duplicate (BHI0041-DUP5)				Source: 24H1433-03		Prepared & Analyzed: 08/28/2024				
Methane	22.1	0.45	Vol%		22.1		0.0873		5	
Carbon dioxide	26.2	0.45	Vol%		26.3		0.436		5	
Oxygen (O2)	0.95	0.45	Vol%		0.95		0.108		5	
Hydrogen (H2)	4.38	0.18	Vol%		4.21		3.92		5	
Nitrogen (N2)	39.5	9.00	Vol%		39.5		0.0167		5	
Carbon Monoxide	0.02	0.009	Vol%		0.02		0.929		5	
Duplicate (BHI0041-DUP6)				Source: 24H1433-04		Prepared & Analyzed: 08/28/2024				
Methane	35.5	0.45	Vol%		35.4		0.0190		5	
Carbon dioxide	29.8	0.45	Vol%		29.9		0.261		5	
Oxygen (O2)	1.01	0.45	Vol%		1.01		0.610		5	
Hydrogen (H2)	3.57	0.18	Vol%		3.69		3.38		5	
Nitrogen (N2)	24.1	9.00	Vol%		24.1		0.0119		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	



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Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Volatile Organic Compounds by GC/TCD - Unadjusted, as received basis - Quality Control

Enthalpy Analytical

Analyte	Reporting			Spike Level	Source Result	%REC			RPD		Qual
	Result	Limit	Units			%REC	Limits	RPD	Limit		

Batch BHI0041 - No Prep VOC GC Air

Duplicate (BHI0041-DUP7)				Source: 24H1433-05		Prepared & Analyzed: 08/28/2024				
Methane	21.6	0.45	Vol%		21.6		0.128		5	
Carbon dioxide	23.8	0.45	Vol%		23.8		0.00676		5	
Oxygen (O2)	0.70	0.45	Vol%		0.71		2.27		5	
Nitrogen (N2)	45.3	9.00	Vol%		45.3		0.0128		5	
Hydrogen (H2)	1.74	0.18	Vol%		1.78		2.45		5	
Carbon Monoxide	0.21	0.009	Vol%		0.21		0.763		5	

Duplicate (BHI0041-DUP8)				Source: 24H1433-06		Prepared & Analyzed: 08/28/2024				
Methane	35.1	0.45	Vol%		35.0		0.330		5	
Carbon dioxide	28.7	0.45	Vol%		28.7		0.0699		5	
Oxygen (O2)	1.00	0.45	Vol%		1.00		0.0253		5	
Hydrogen (H2)	1.05	0.18	Vol%		1.04		1.57		5	
Nitrogen (N2)	27.9	9.00	Vol%		27.8		0.276		5	
Carbon Monoxide	0.12	0.009	Vol%		0.12		2.16		5	

Duplicate (BHI0041-DUP9)				Source: 24H1639-01		Prepared & Analyzed: 08/30/2024				
Methane	47.1	0.45	Vol%		47.0		0.132		5	
Carbon dioxide	31.5	0.45	Vol%		31.3		0.848		5	
Oxygen (O2)	3.49	0.45	Vol%		3.57		2.42		5	
Hydrogen (H2)	<	0.18	Vol%		<0.18		NA		5	
Nitrogen (N2)	16.4	9.00	Vol%		16.6		1.34		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0041-DUPA)				Source: 24H1643-01		Prepared & Analyzed: 08/30/2024				
Methane	26.9	0.45	Vol%		26.9		0.204		5	
Carbon dioxide	24.9	0.45	Vol%		24.9		0.0179		5	
Oxygen (O2)	2.55	0.45	Vol%		2.56		0.129		5	
Nitrogen (N2)	43.3	9.00	Vol%		43.2		0.291		5	
Hydrogen (H2)	<	0.18	Vol%		<0.18		NA		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	



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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

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Batch BHI0092 - No Prep VOC GC Air

Blank (BHI0092-BLK1)

Prepared & Analyzed: 09/03/2024

Methane	<	0.05	Vol%
Carbon dioxide	<	0.05	Vol%
Oxygen (O2)	<	0.05	Vol%
Nitrogen (N2)	<	1.00	Vol%
Hydrogen (H2)	<	0.02	Vol%
Carbon Monoxide	<	0.001	Vol%

LCS (BHI0092-BS1)

Prepared & Analyzed: 09/03/2024

Methane	10100	0.05	ppmv	10000	101	80-120
Carbon dioxide	10100	0.05	ppmv	10000	101	80-120
Oxygen (O2)	5020	0.05	ppmv	5010	100	80-120
Hydrogen (H2)	496	0.02	ppmv	504	98.5	80-120
Nitrogen (N2)	4910	1	ppmv	5010	98.0	80-120
Carbon Monoxide	498	0.001	ppmv	502	99.3	80-120

Duplicate (BHI0092-DUP1)

Source: 24H1819-01

Prepared & Analyzed: 09/03/2024

Methane	35.3	0.45	Vol%	35.3	0.241	5
Carbon dioxide	31.2	0.45	Vol%	31.3	0.332	5
Oxygen (O2)	<	0.45	Vol%	0.47	NA	5
Nitrogen (N2)	28.2	9.00	Vol%	28.3	0.519	5
Hydrogen (H2)	0.99	0.18	Vol%	1.03	3.51	5
Carbon Monoxide	0.19	0.009	Vol%	0.20	0.384	5

Duplicate (BHI0092-DUP2)

Source: 24H1819-02

Prepared & Analyzed: 09/03/2024

Methane	26.8	0.45	Vol%	26.7	0.352	5
Carbon dioxide	29.9	0.45	Vol%	29.9	0.110	5
Oxygen (O2)	4.84	0.45	Vol%	4.79	0.836	5
Nitrogen (N2)	24.2	9.00	Vol%	24.0	0.676	5
Hydrogen (H2)	9.59	0.18	Vol%	9.51	0.832	5
Carbon Monoxide	0.01	0.009	Vol%	0.01	4.38	5



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Batch BHI0092 - No Prep VOC GC Air

Duplicate (BHI0092-DUP3)				Source: 24H1819-03		Prepared & Analyzed: 09/03/2024				
Methane	24.7	0.45	Vol%		24.7		0.211		5	
Carbon dioxide	28.6	0.45	Vol%		28.8		0.790		5	
Oxygen (O2)	0.84	0.45	Vol%		0.85		0.441		5	
Hydrogen (H2)	4.33	0.18	Vol%		4.22		2.53		5	
Nitrogen (N2)	36.3	9.00	Vol%		36.3		0.0868		5	
Carbon Monoxide	0.02	0.009	Vol%		0.02		6.60		5	P

Duplicate (BHI0092-DUP4)				Source: 24H1819-04		Prepared & Analyzed: 09/03/2024				
Methane	39.0	0.45	Vol%		39.0		0.129		5	
Carbon dioxide	33.0	0.45	Vol%		32.9		0.00631		5	
Oxygen (O2)	0.70	0.45	Vol%		0.71		0.723		5	
Hydrogen (H2)	3.85	0.18	Vol%		3.89		1.15		5	
Nitrogen (N2)	18.6	9.00	Vol%		18.6		0.0117		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUP5)				Source: 24H1819-05		Prepared & Analyzed: 09/03/2024				
Methane	24.0	0.45	Vol%		24.0		0.106		5	
Carbon dioxide	25.5	0.45	Vol%		25.6		0.497		5	
Oxygen (O2)	0.60	0.45	Vol%		0.60		0.288		5	
Nitrogen (N2)	41.9	9.00	Vol%		41.7		0.446		5	
Hydrogen (H2)	1.85	0.18	Vol%		1.84		0.508		5	
Carbon Monoxide	0.15	0.009	Vol%		0.15		0.528		5	

Duplicate (BHI0092-DUP6)				Source: 24H1630-01		Prepared & Analyzed: 09/03/2024				
Methane	40.4	0.45	Vol%		40.4		0.0214		5	
Carbon dioxide	37.0	0.45	Vol%		37.0		0.0873		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Hydrogen (H2)	3.51	0.18	Vol%		3.46		1.71		5	
Nitrogen (N2)	12.7	9.00	Vol%		12.7		0.0722		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	



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	Result	Limit	Units			%REC	Limits	RPD	Limit		

Batch BHI0092 - No Prep VOC GC Air

Duplicate (BHI0092-DUP7)				Source: 24H1630-02		Prepared & Analyzed: 09/03/2024				
Methane	43.3	0.45	Vol%		43.2		0.399		5	
Carbon dioxide	45.6	0.45	Vol%		45.6		0.0182		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	3.75	0.18	Vol%		3.64		2.98		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUP8)				Source: 24H1630-03		Prepared & Analyzed: 09/03/2024				
Methane	40.2	0.45	Vol%		40.3		0.195		5	
Carbon dioxide	25.7	0.45	Vol%		25.7		0.0293		5	
Oxygen (O2)	5.31	0.45	Vol%		5.32		0.259		5	
Nitrogen (N2)	22.0	9.00	Vol%		22.1		0.296		5	
Hydrogen (H2)	<	0.18	Vol%		<0.18		NA		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUP9)				Source: 24H1297-03		Prepared & Analyzed: 09/03/2024				
Methane	46.7	0.45	Vol%		46.7		0.101		5	
Carbon dioxide	49.1	0.45	Vol%		48.9		0.267		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	3.98	0.18	Vol%		3.86		2.94		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUPA)				Source: 24H1297-04		Prepared & Analyzed: 09/03/2024				
Methane	44.8	0.45	Vol%		45.0		0.235		5	
Carbon dioxide	44.7	0.45	Vol%		44.7		0.0792		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	8.25	0.18	Vol%		8.28		0.332		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	



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Batch BHI0092 - No Prep VOC GC Air

Duplicate (BHI0092-DUPB)				Source: 24H1297-05		Prepared & Analyzed: 09/03/2024				
Methane	40.0	0.45	Vol%		40.0		0.230		5	
Carbon dioxide	55.0	0.45	Vol%		54.8		0.308		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Hydrogen (H2)	3.70	0.18	Vol%		3.56		4.02		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUPC)				Source: 24H1297-09		Prepared & Analyzed: 09/03/2024				
Methane	46.8	0.45	Vol%		46.8		0.0227		5	
Carbon dioxide	44.3	0.45	Vol%		44.2		0.242		5	
Oxygen (O2)	0.59	0.45	Vol%		0.59		0.554		5	
Hydrogen (H2)	1.60	0.18	Vol%		1.64		2.43		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Duplicate (BHI0092-DUPD)				Source: 24H1297-10		Prepared & Analyzed: 09/03/2024				
Methane	24.9	0.45	Vol%		24.9		0.0180		5	
Carbon dioxide	59.8	0.45	Vol%		59.8		0.0785		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	12.7	0.18	Vol%		12.8		0.393		5	
Carbon Monoxide	<	0.009	Vol%		<0.009		NA		5	

Batch BHI0094 - No Prep VOC GC Air

Blank (BHI0094-BLK1)				Prepared & Analyzed: 09/04/2024						
Methane	<	0.05	Vol%							
Carbon dioxide	<	0.05	Vol%							
Oxygen (O2)	<	0.05	Vol%							
Nitrogen (N2)	<	1.00	Vol%							
Hydrogen (H2)	<	0.02	Vol%							
Carbon Monoxide	<	0.001	Vol%							



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Batch BHI0094 - No Prep VOC GC Air

LCS (BHI0094-BS1)

Prepared & Analyzed: 09/04/2024

Methane	10200	0.05	ppmv	10000	102	80-120
Carbon dioxide	10100	0.05	ppmv	10000	101	80-120
Oxygen (O2)	5020	0.05	ppmv	5010	100	80-120
Nitrogen (N2)	4910	1	ppmv	5010	98.0	80-120
Hydrogen (H2)	533	0.02	ppmv	504	106	80-120
Carbon Monoxide	504	0.001	ppmv	502	100	80-120

Duplicate (BHI0094-DUP1)

Source: 24H1432-01

Prepared & Analyzed: 09/04/2024

Methane	3.28	0.45	Vol%	3.27	0.483	5
Carbon dioxide	75.9	0.45	Vol%	76.0	0.166	5
Oxygen (O2)	<	0.45	Vol%	<0.45	NA	5
Nitrogen (N2)	<	9.00	Vol%	<9.00	NA	5
Hydrogen (H2)	16.8	0.18	Vol%	16.6	1.52	5
Carbon Monoxide	0.19	0.009	Vol%	0.19	0.673	5

Duplicate (BHI0094-DUP2)

Source: 24H1432-02

Prepared & Analyzed: 09/04/2024

Methane	5.09	0.45	Vol%	5.08	0.283	5
Carbon dioxide	70.3	0.45	Vol%	70.5	0.264	5
Oxygen (O2)	0.60	0.45	Vol%	0.60	0.497	5
Nitrogen (N2)	<	9.00	Vol%	<9.00	NA	5
Hydrogen (H2)	17.0	0.18	Vol%	16.9	0.177	5
Carbon Monoxide	0.15	0.009	Vol%	0.15	1.11	5

Duplicate (BHI0094-DUP3)

Source: 24H1432-03

Prepared & Analyzed: 09/04/2024

Methane	24.1	0.45	Vol%	24.2	0.498	5
Carbon dioxide	59.8	0.45	Vol%	60.3	0.889	5
Oxygen (O2)	<	0.45	Vol%	<0.45	NA	5
Hydrogen (H2)	10.7	0.18	Vol%	10.8	1.15	5
Nitrogen (N2)	<	9.00	Vol%	<9.00	NA	5
Carbon Monoxide	0.04	0.009	Vol%	0.04	1.49	5



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Batch BHI0094 - No Prep VOC GC Air

Duplicate (BHI0094-DUP4)				Source: 24H1432-04		Prepared & Analyzed: 09/04/2024				
Methane	20.5	0.45	Vol%		20.5		0.283		5	
Carbon dioxide	69.6	0.45	Vol%		69.8		0.286		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Hydrogen (H2)	7.36	0.18	Vol%		7.25		1.52		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Carbon Monoxide	0.05	0.009	Vol%		0.05		2.54		5	
Duplicate (BHI0094-DUP5)				Source: 24H1432-05		Prepared & Analyzed: 09/04/2024				
Methane	0.57	0.45	Vol%		0.57		0.842		5	
Carbon dioxide	76.3	0.45	Vol%		76.9		0.685		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	19.3	0.18	Vol%		19.3		0.0314		5	
Carbon Monoxide	0.19	0.009	Vol%		0.19		0.657		5	
Duplicate (BHI0094-DUP6)				Source: 24H1432-06		Prepared & Analyzed: 09/04/2024				
Methane	12.8	0.45	Vol%		12.8		0.106		5	
Carbon dioxide	70.6	0.45	Vol%		71.0		0.546		5	
Oxygen (O2)	<	0.45	Vol%		<0.45		NA		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	13.9	0.18	Vol%		13.9		0.0314		5	
Carbon Monoxide	0.12	0.009	Vol%		0.12		0.184		5	
Duplicate (BHI0094-DUP7)				Source: 24H1814-01		Prepared & Analyzed: 09/04/2024				
Methane	38.6	0.45	Vol%		38.5		0.195		5	
Carbon dioxide	52.2	0.45	Vol%		52.4		0.425		5	
Oxygen (O2)	0.71	0.45	Vol%		0.72		1.28		5	
Nitrogen (N2)	<	9.00	Vol%		<9.00		NA		5	
Hydrogen (H2)	2.95	0.18	Vol%		2.71		8.48		5	P
Carbon Monoxide	0.01	0.009	Vol%		0.01		3.55		5	



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	Result	Limit	Units		Result	%REC	Limits	RPD	Limit	Qual

Batch BHI0094 - No Prep VOC GC Air

Duplicate (BHI0094-DUP8)				Source: 24H1814-02		Prepared & Analyzed: 09/04/2024				
Methane	30.1	0.45	Vol%			30.1		0.00652	5	
Carbon dioxide	56.5	0.45	Vol%			56.6		0.193	5	
Oxygen (O2)	<	0.45	Vol%			<0.45		NA	5	
Nitrogen (N2)	<	9.00	Vol%			<9.00		NA	5	
Hydrogen (H2)	5.37	0.18	Vol%			5.27		1.97	5	
Carbon Monoxide	0.02	0.009	Vol%			0.02		0.134	5	
Duplicate (BHI0094-DUP9)				Source: 24H1814-03		Prepared & Analyzed: 09/04/2024				
Methane	33.3	0.45	Vol%			33.2		0.229	5	
Carbon dioxide	51.4	0.45	Vol%			51.4		0.105	5	
Oxygen (O2)	<	0.45	Vol%			<0.45		NA	5	
Nitrogen (N2)	<	9.00	Vol%			<9.00		NA	5	
Hydrogen (H2)	8.25	0.18	Vol%			8.30		0.527	5	
Carbon Monoxide	0.03	0.009	Vol%			0.03		1.81	5	



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Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Volatile Organic Compounds by GC/FID - Quality Control

Enthalpy Analytical

Analyte	Reporting			Spike Level	Source		%REC		RPD	
	Result	Limit	Units		Result	%REC	Limits	RPD	Limit	Qual

Batch BHI0061 - No Prep VOC GC Air

Blank (BHI0061-BLK1)

Prepared & Analyzed: 08/27/2024

TNMOC as Carbon (Mean), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (1), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (Mean), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (1), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), O2 corrected	<	34.0	ppmv-C

Batch BHI0214 - No Prep VOC GC Air

Blank (BHI0214-BLK1)

Prepared & Analyzed: 08/28/2024

TNMOC as Carbon (Mean), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (1), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (Mean), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (1), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), O2 corrected	<	34.0	ppmv-C

Batch BHI0220 - No Prep VOC GC Air

Blank (BHI0220-BLK1)

Prepared & Analyzed: 09/03/2024

TNMOC as Carbon (Mean), N2 corrected	<	34.0	ppmv-C
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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Volatile Organic Compounds by GC/FID - Quality Control

Enthalpy Analytical

Analyte	Reporting			Spike Level	Source		%REC		RPD	
	Result	Limit	Units		Result	%REC	Limits	RPD	Limit	Qual

Batch BHI0220 - No Prep VOC GC Air

Blank (BHI0220-BLK1)

Prepared & Analyzed: 09/03/2024

TNMOC as Carbon (1), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), N2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (Mean), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (1), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (2), O2 corrected	<	34.0	ppmv-C
TNMOC as Carbon (3), O2 corrected	<	34.0	ppmv-C

Certified Analytes included in this Report

Analyte	Certifications	Analyte	Certifications
EPA 3C in Air			
Methane	VELAP		
Oxygen (O2)	VELAP		
Nitrogen (N2)	VELAP		



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Certificate of Analysis

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8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Code	Description	Laboratory ID	Expires
MdDOE	Maryland DE Drinking Water	341	12/31/2024
NCDEQ	North Carolina DEQ	495	12/31/2024
NCDOH	North Carolina Department of Health	51714	07/31/2025
NYDOH	New York DOH Drinking Water	12069	04/01/2025
PADEP	NELAP-Pennsylvania Certificate #009	68-03503	10/31/2024
SCDHEC	South Carolina Dept of Health and Environmental	93016	09/14/2024
TXCEQ	Texas Comm on Environmental Quality #T104704	T104704576	05/31/2025
VELAP	NELAP-Virginia Certificate #12969	460021	06/14/2025
WVDEP	West Virginia DEP	350	11/30/2024

Qualifiers and Definitions

P Duplicate analysis does not meet the acceptance criteria for precision

RPD Relative Percent Difference

Qual Qualifiers

-RE Denotes sample was re-analyzed

PF Preparation Factor

MDL Method Detection Limit

LOQ Limit of Quantitation

ppbv parts per billion by volume

TIC Tentatively Identified Compounds are compounds that are identified by comparing the analyte mass spectral pattern with the NIST spectral library. A TIC spectral match is reported when the pattern is at least 75% consistent with the published pattern. Compound concentrations are estimated and are calculated using an internal standard response factor of 1.

All EPA method 3C results are reported as normalized values when the sum total of all evaluated constituents is outside $\pm 10\%$ of the absolute.

AIR ANALYSIS
CHAIN OF CUSTODY

Page 1 of 1

COMPANY NAME: Burns & McDonnell - Bloomington		INVOICE TO:	PROJECT NAME/Quote #: Grand Forks Tier II LFG Sampling
CONTACT: Bryan Weldon		INVOICE CONTACT:	SITE NAME:
ADDRESS:		INVOICE ADDRESS:	PROJECT NUMBER:
PHONE #: 307-941-0251		INVOICE PHONE #:	P.O. #: 237440
FAX #:	EMAIL: bweldon@burnsmcd.com; behoffman@burnsmcd.com		Pretreatment Program:
Is sample for compliance reporting? YES NO	Regulatory State:	Is sample from a chlorinated supply? YES NO	PWS LD. #:
SAMPLER NAME (PRINT): Aaron Kemnitz		SAMPLER SIGNATURE: <i>Aaron Kemnitz</i>	
		Turn Around Time: Circle: 10 Days	

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill Vent Gas OT=Other

063-24G-0022

WO:

CLIENT SAMPLE ID.	Regulator Info		Canister Information				Sampling Start Information				Sampling Stop Information				ANALYSIS			
	Flow Controller ID	Cal Flow (mL/min)	Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg/psia)	LAB Receiving Canister Vacuum (in Hg)	Barometric Pres. (in Hg):			Barometric Pres. (in Hg):							
								Start Date	Start Time (24hr clock)	Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Stop Date	Stop Time (24hr clock)	Final Canister Vacuum (in Hg)		Ending Sample Temp °F		
1) 6P-15 6P-10 6P-04 6P-18	T32A1	500	41431	6	BC240802	30	9.0	8/13/24	16:09	28		8/14/24	10:35	6		LV	x	x
2) 6P-24 6P-21 6P-16 6P-13	T32A1	500	41490	6	BC240802	30	8.2	8/13/24	14:12	28		8/14/24	10:56	6		LV	x	x
3) 6P-25 6P-26 6P-27 6P-12	T32A1	500	42728	6	BC240802	30	8.2	8/13/24	08:43	30		8/14/24	11:15	6		LV	x	x
4) 6P-22 6P-20 6P-23 6P-07	T32A1	500	44055	6	BC240802	30	8.2	8/13/24	11:26	30		8/14/24	11:32	6		LV	x	x

RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	QC Data Package	1x Sample Train
M. Knutson; CPS, Ltd.	08/16/2024	<i>RedExG</i>		Level I	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	Level II	
<i>RedExG</i>		<i>10/11/24</i>	<i>8/22/24</i>	Level III	
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	Level IV	

24H1297

Burns & McDonnell 24H1297
2024 Grand Forks Tier II LFG Sam
Recd: 08/22/2024 Due: 09/06/2024

v130325002

Observed Temp °C: 19.5

Correction Factor °C: 0.2

Corrected Temp °C: 19.7

310
note
normal

063-24G-0022.xls

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Equipment Must be Returned By: 9/3/24

1941 REYMET ROAD
RICHMOND, VIRGINIA 23237
(804) 358-8295 PHONE
(804) 358-8297 FAX

AIR ANALYSIS
CHAIN OF CUSTODY

Page 1 of 1

COMPANY NAME: Burns & McDonnell - Bloomington	INVOICE TO:	PROJECT NAME/Quote #: Grand Forks Tier II LFG Sam
CONTACT: Bryan Weldon	INVOICE CONTACT:	SITE NAME:
ADDRESS:	INVOICE ADDRESS:	PROJECT NUMBER:
PHONE #: 307-941-0251	INVOICE PHONE #:	P.O. #: 237440
FAX #:	EMAIL: bweldon@burnsmcd.com; behoffman@burnsmcd.com	Pretreatment Program:
Is sample for compliance reporting? YES NO	Regulatory State:	Is sample from a chlorinated supply? YES NO
SAMPLER NAME (PRINT): Aaron Kramelt 2		SAMPLER SIGNATURE: <i>Aaron Kramelt</i>
Turn Around Time: Circle: 10 Days		
Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other		

CLIENT SAMPLE I.D.	Regulator Info		Canister Information					Sampling Start Information				Sampling Stop Information				Matrix (see notes)	ANALYSIS			
	Flow Controller ID	Cal Flow (ml/min)	Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Barometric Pres. (in Hg):		Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Barometric Pres. (in Hg):		Final Canister Vacuum (in Hg)	Ending Sample Temp °F		SO	25C		
								Start Date	Start Time (24hr clock)			Stop Date	Stop Time (24hr clock)							
1) 6P-07 6P-11 6P-14 6P-17	T32A1	500	44231	8	BC240731	30	8.6	8/14/24	08:15	29		8/14/24	10:01	7		LV	x	x		
2)			48083	8	BC240802	30				30				11*		LV	x	x		
3) 6P-03 6P-02 6P-05 6P-06	T32A1	500	48101	8	BC240731	30	8.8	8/13/24	17:57	30		8/14/24	08:02	7		LV	x	x		
4)			49325	8	BC240731	30				30				20*		LV	x	x		

RELINQUISHED: M. Knutson; CPS, Ltd.	DATE / TIME: 08/16/2024	RECEIVED: <i>RedExG</i>	DATE / TIME: 8/22/24 1230	QC Data Package: Level I ☐	1x Sample Train
RELINQUISHED: <i>RedExG</i>	DATE / TIME:	RECEIVED: <i>RedExG</i>	DATE / TIME:	Level II ☐	* Final canister vacuum estimated based on sample at same location with working gauge. 48083 did not come equipped with working gauge, gauge did not move for 10 minutes. Sample should be disregarded and not used
RELINQUISHED:	DATE / TIME:	RECEIVED:	DATE / TIME:	Level III ☐	
				Level IV ☐	

24H1297

Burns & McDonnell 24H1297
2024 Grand Forks Tier II LFG Sam
Recd: 08/22/2024 Due: 09/06/2024

v130326002

Observed Temp °C: 19.5
Correction Factor °C: 10.2
Corrected Temp °C: 19.7

canister 49325 was unused, no samples taken
310 voice
vcdan

063-24G-0022.xls

**AIR ANALYSIS
CHAIN OF CUSTODY**

Page 1 of 1

COMPANY NAME: Burns & McDonnell - Bloomington		INVOICE TO:		PROJECT NAME/Quote #: Grand Forks Tier II LFG Sam	
CONTACT: Bryan Weldon		INVOICE CONTACT:		SITE NAME:	
ADDRESS:		INVOICE ADDRESS:		PROJECT NUMBER:	
PHONE #: 307-941-0251		INVOICE PHONE #:		P.O. #: 237440	
FAX #:		EMAIL: bweldon@burnsmcd.com; behoffman@burnsmcd.com		Pretreatment Program:	
Is sample for compliance reporting? YES NO		Regulatory State:		Is sample from a chlorinated supply? YES NO	
PWS I.D. #:		SAMPLER NAME (PRINT): Aaron Kowitz		SAMPLER SIGNATURE: <i>Aaron Kowitz</i>	
Turn Around Time: Circle: 10 Days					

Matrix Codes: AA=Indoor/Ambient Air SG=Soil Gas LV=Landfill/Vent Gas OT=Other

063-24G-0022

WO:

CLIENT SAMPLE I.D.	Regulator Info		Canister Information					Sampling Start Information				Sampling Stop Information				ANALYSIS			
	Flow Controller ID	Gal Flow (mL/min)	Canister ID	Size (L)	Cleaning Batch ID	LAB Outgoing Canister Vacuum (in Hg)	LAB Receiving Canister Vacuum (in Hg)	Barometric Pres. (in Hg)		Initial Canister Vacuum (in Hg)	Starting Sample Temp °F	Barometric Pres. (in Hg)		Final Canister Vacuum (in Hg)	Ending Sample Temp °F	Matrix (See Code)		3C	25C
								Start Date	Start Time (24hr clock)			Stop Date	Stop Time (24hr clock)						
1) 6P-09 Duplicate 6P-14 Duplicate 6P-06 6P-01	T32A1	500	49347	6	BC240731	30	24.4	8/11/24	08:35	30		8/11/24	12:07	5*		LV	x	x	
2) 6P-01 Duplicate 6P-20 Duplicate 6P-15 Duplicate 6P-01 Duplicate	T32A1	500	49501	6	BC240802	30	3.2	8/13/24		30		8/14/24	12:23	7*		LV			HOLD
3)			49509	6	BC240802	30				30				30*					
4)																			

RELINQUISHED: M. Knutson; CPS, Ltd.	DATE / TIME 08/16/2024	RECEIVED: <i>RedExG</i>	DATE / TIME 08/16/2024	QC Data Package Level I ☐	1x Sample Train
RELINQUISHED: <i>RedExG</i>	DATE / TIME	RECEIVED: <i>RedExG</i>	DATE / TIME	Level II ☐	* Final canister vacuum was estimated based on previous testing. These are not for use in the field. Canisters do not come equipped with a working gauge.
RELINQUISHED:	DATE / TIME	RECEIVED:	DATE / TIME	Level III ☐	Sample Train returned with this shipment
				Level IV ☐	

Burns & McDonnell 24H1297
2024 Grand Forks Tier II LFG Sam

Recd: 08/22/2024 Due: 09/06/2024

v130326002

Observed Temp °C: 19.5

Correction Factor °C: 10.2

Corrected Temp °C: 19.7

Canister 49509 was unused, no samples taken

310
note
w/ seal

063-24G-0022.xls

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Certificate of Analysis

Final Report

Laboratory Order ID 24H1297

Client Name: Burns & McDonnell - Bloomington, MN
8201 Norman Center Dr, Suite 500

Date Received: August 22, 2024 12:30
Date Issued: September 6, 2024 15:22

Bloomington, MN 54437

Submitted To: Bryan Weldon

Project Number: 237440

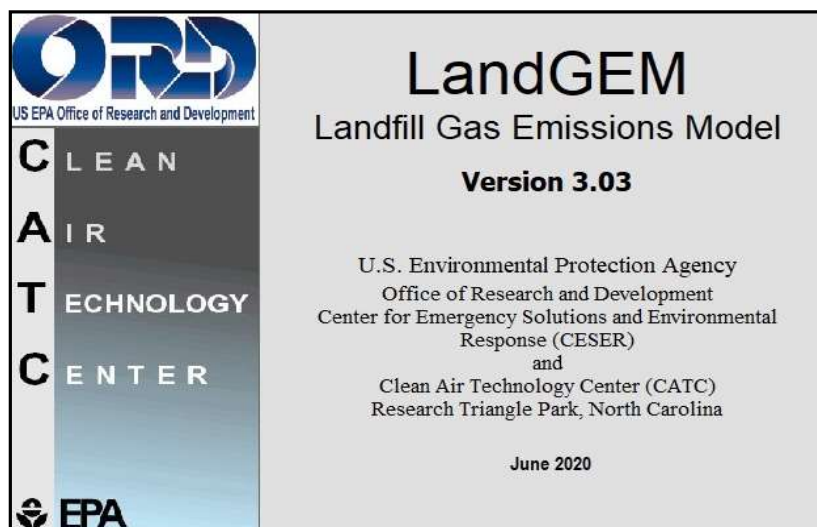
Client Site I.D.: Grand Forks Tier II LFG Sampling

Purchase Order:

Sample Conditions Checklist

Samples Received at:	19.70°C
How were samples received?	FedEx Ground
Were Custody Seals used? If so, were they received intact?	No
Are the custody papers filled out completely and correctly?	Yes
Do all bottle labels agree with custody papers?	Yes
Is the temperature blank or representative sample within acceptable limits or received on ice, and recently taken?	Yes
Are all samples within holding time for requested laboratory tests?	Yes
Is a sufficient amount of sample provided to perform the tests included?	Yes
Are all samples in appropriate containers for the analyses requested?	Yes
Were volatile organic containers received?	Yes
Are all volatile organic and TOX containers free of headspace?	Yes
Is a trip blank provided for each VOC sample set? VOC sample sets include EPA8011, EPA504, EPA8260, EPA624, EPA8015 GRO, EPA8021, EPA524, and RSK-175.	Yes
Are all samples received appropriately preserved? Note that metals containers do not require field preservation but lab preservation may delay analysis. In addition, field parameters are always received outside holding time and will be marked accordingly.	Yes

ATTACHMENT 4 - LANDGEM EMISSIONS CALCULATIONS



Summary Report

Landfill Name or Identifier: Grand Forks MSWLF Permit 0347

Date: Tuesday, October 8, 2024

Description/Comments:

Methane Generation Rate (k) based on 30-year normal precipitation data (<25 inches / year). Site-specific Tier II NMOC concentration of 242.6 entered into LandGEM. Includes actual disposal quantities for 2009-2022, 2023-2028 disposal projections include 1% growth rate from 2022 disposal quantity.

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^n \sum_{j=0.1}^1 k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH_4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (decimal years, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at <http://www.epa.gov/ttnatw01/landfill/landflpg.html>.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for conventional landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	2009	
Landfill Closure Year (with 80-year limit)	2029	
Actual Closure Year (without limit)	2029	
Have Model Calculate Closure Year?	No	
Waste Design Capacity		<i>short tons</i>

MODEL PARAMETERS

Methane Generation Rate, k	0.020	<i>year⁻¹</i>
Potential Methane Generation Capacity, L ₀	170	<i>m³/Mg</i>
NMOC Concentration	243	<i>ppmv as hexane</i>
Methane Content	50	<i>% by volume</i>

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	Total landfill gas
Gas / Pollutant #2:	Methane
Gas / Pollutant #3:	Carbon dioxide
Gas / Pollutant #4:	NMOC

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2009	13,332	14,665	0	0
2010	52,394	57,633	13,332	14,665
2011	61,385	67,523	65,726	72,298
2012	63,327	69,660	127,110	139,821
2013	64,409	70,849	190,438	209,481
2014	67,673	74,440	254,846	280,331
2015	73,774	81,151	322,519	354,771
2016	68,376	75,214	396,292	435,922
2017	68,369	75,206	464,669	511,136
2018	67,850	74,635	533,038	586,342
2019	68,737	75,611	600,888	660,977
2020	65,246	71,770	669,625	736,588
2021	58,777	64,655	734,871	808,358
2022	61,624	67,786	793,648	873,013
2023	62,239	68,463	855,271	940,799
2024	62,862	69,148	917,511	1,009,262
2025	63,491	69,840	980,372	1,078,410
2026	64,125	70,538	1,043,863	1,148,250
2027	64,766	71,243	1,107,989	1,218,788
2028	65,415	71,956	1,172,755	1,290,031
2029	66,068	72,675	1,238,170	1,361,987
2030	0	0	1,304,238	1,434,662
2031	0	0	1,304,238	1,434,662
2032	0	0	1,304,238	1,434,662
2033	0	0	1,304,238	1,434,662
2034	0	0	1,304,238	1,434,662
2035	0	0	1,304,238	1,434,662
2036	0	0	1,304,238	1,434,662
2037	0	0	1,304,238	1,434,662
2038	0	0	1,304,238	1,434,662
2039	0	0	1,304,238	1,434,662
2040	0	0	1,304,238	1,434,662
2041	0	0	1,304,238	1,434,662
2042	0	0	1,304,238	1,434,662
2043	0	0	1,304,238	1,434,662
2044	0	0	1,304,238	1,434,662
2045	0	0	1,304,238	1,434,662
2046	0	0	1,304,238	1,434,662
2047	0	0	1,304,238	1,434,662
2048	0	0	1,304,238	1,434,662

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2049	0	0	1,304,238	1,434,662
2050	0	0	1,304,238	1,434,662
2051	0	0	1,304,238	1,434,662
2052	0	0	1,304,238	1,434,662
2053	0	0	1,304,238	1,434,662
2054	0	0	1,304,238	1,434,662
2055	0	0	1,304,238	1,434,662
2056	0	0	1,304,238	1,434,662
2057	0	0	1,304,238	1,434,662
2058	0	0	1,304,238	1,434,662
2059	0	0	1,304,238	1,434,662
2060	0	0	1,304,238	1,434,662
2061	0	0	1,304,238	1,434,662
2062	0	0	1,304,238	1,434,662
2063	0	0	1,304,238	1,434,662
2064	0	0	1,304,238	1,434,662
2065	0	0	1,304,238	1,434,662
2066	0	0	1,304,238	1,434,662
2067	0	0	1,304,238	1,434,662
2068	0	0	1,304,238	1,434,662
2069	0	0	1,304,238	1,434,662
2070	0	0	1,304,238	1,434,662
2071	0	0	1,304,238	1,434,662
2072	0	0	1,304,238	1,434,662
2073	0	0	1,304,238	1,434,662
2074	0	0	1,304,238	1,434,662
2075	0	0	1,304,238	1,434,662
2076	0	0	1,304,238	1,434,662
2077	0	0	1,304,238	1,434,662
2078	0	0	1,304,238	1,434,662
2079	0	0	1,304,238	1,434,662
2080	0	0	1,304,238	1,434,662
2081	0	0	1,304,238	1,434,662
2082	0	0	1,304,238	1,434,662
2083	0	0	1,304,238	1,434,662
2084	0	0	1,304,238	1,434,662
2085	0	0	1,304,238	1,434,662
2086	0	0	1,304,238	1,434,662
2087	0	0	1,304,238	1,434,662
2088	0	0	1,304,238	1,434,662

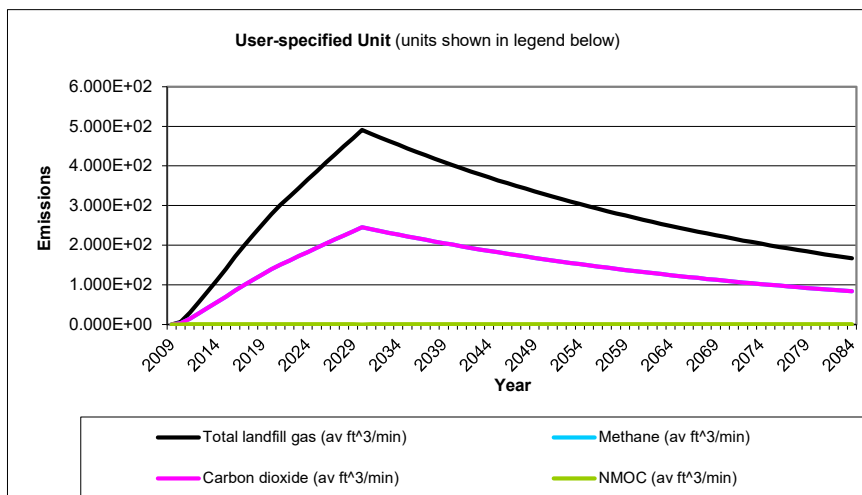
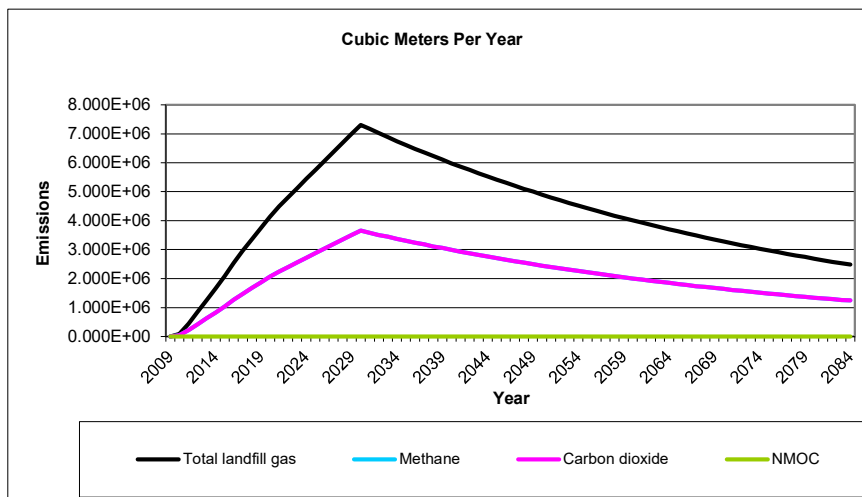
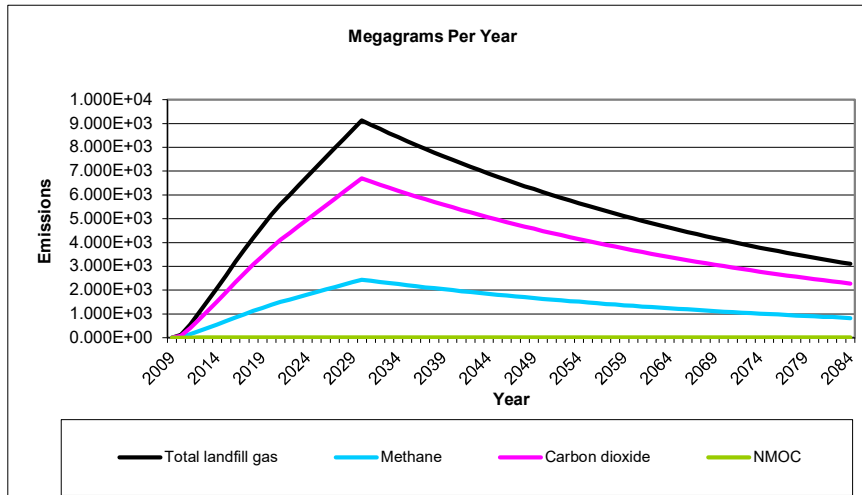
Pollutant Parameters

Gas / Pollutant Default Parameters:				User-specified Pollutant Parameters:	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

[illegible]

Graphs



Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	1.122E+02	8.984E+04	6.037E+00	2.997E+01	4.492E+04	3.018E+00
2011	5.509E+02	4.412E+05	2.964E+01	1.472E+02	2.206E+05	1.482E+01
2012	1.057E+03	8.461E+05	5.685E+01	2.822E+02	4.231E+05	2.842E+01
2013	1.569E+03	1.256E+06	8.440E+01	4.190E+02	6.281E+05	4.220E+01
2014	2.080E+03	1.665E+06	1.119E+02	5.555E+02	8.327E+05	5.595E+01
2015	2.608E+03	2.088E+06	1.403E+02	6.966E+02	1.044E+06	7.016E+01
2016	3.177E+03	2.544E+06	1.709E+02	8.487E+02	1.272E+06	8.547E+01
2017	3.690E+03	2.955E+06	1.985E+02	9.856E+02	1.477E+06	9.926E+01
2018	4.192E+03	3.357E+06	2.255E+02	1.120E+03	1.678E+06	1.128E+02
2019	4.680E+03	3.748E+06	2.518E+02	1.250E+03	1.874E+06	1.259E+02
2020	5.166E+03	4.137E+06	2.779E+02	1.380E+03	2.068E+06	1.390E+02
2021	5.613E+03	4.494E+06	3.020E+02	1.499E+03	2.247E+06	1.510E+02
2022	5.996E+03	4.802E+06	3.226E+02	1.602E+03	2.401E+06	1.613E+02
2023	6.396E+03	5.122E+06	3.441E+02	1.709E+03	2.561E+06	1.721E+02
2024	6.793E+03	5.440E+06	3.655E+02	1.815E+03	2.720E+06	1.828E+02
2025	7.188E+03	5.756E+06	3.867E+02	1.920E+03	2.878E+06	1.934E+02
2026	7.580E+03	6.070E+06	4.078E+02	2.025E+03	3.035E+06	2.039E+02
2027	7.970E+03	6.382E+06	4.288E+02	2.129E+03	3.191E+06	2.144E+02
2028	8.357E+03	6.692E+06	4.496E+02	2.232E+03	3.346E+06	2.248E+02
2029	8.742E+03	7.000E+06	4.703E+02	2.335E+03	3.500E+06	2.352E+02
2030	9.125E+03	7.307E+06	4.909E+02	2.437E+03	3.653E+06	2.455E+02
2031	8.944E+03	7.162E+06	4.812E+02	2.389E+03	3.581E+06	2.406E+02
2032	8.767E+03	7.020E+06	4.717E+02	2.342E+03	3.510E+06	2.358E+02
2033	8.593E+03	6.881E+06	4.623E+02	2.295E+03	3.441E+06	2.312E+02
2034	8.423E+03	6.745E+06	4.532E+02	2.250E+03	3.372E+06	2.266E+02
2035	8.256E+03	6.611E+06	4.442E+02	2.205E+03	3.306E+06	2.221E+02
2036	8.093E+03	6.480E+06	4.354E+02	2.162E+03	3.240E+06	2.177E+02
2037	7.933E+03	6.352E+06	4.268E+02	2.119E+03	3.176E+06	2.134E+02
2038	7.776E+03	6.226E+06	4.183E+02	2.077E+03	3.113E+06	2.092E+02
2039	7.622E+03	6.103E+06	4.101E+02	2.036E+03	3.052E+06	2.050E+02
2040	7.471E+03	5.982E+06	4.019E+02	1.996E+03	2.991E+06	2.010E+02
2041	7.323E+03	5.864E+06	3.940E+02	1.956E+03	2.932E+06	1.970E+02
2042	7.178E+03	5.748E+06	3.862E+02	1.917E+03	2.874E+06	1.931E+02
2043	7.036E+03	5.634E+06	3.785E+02	1.879E+03	2.817E+06	1.893E+02
2044	6.896E+03	5.522E+06	3.710E+02	1.842E+03	2.761E+06	1.855E+02
2045	6.760E+03	5.413E+06	3.637E+02	1.806E+03	2.706E+06	1.818E+02
2046	6.626E+03	5.306E+06	3.565E+02	1.770E+03	2.653E+06	1.782E+02
2047	6.495E+03	5.201E+06	3.494E+02	1.735E+03	2.600E+06	1.747E+02
2048	6.366E+03	5.098E+06	3.425E+02	1.700E+03	2.549E+06	1.713E+02
2049	6.240E+03	4.997E+06	3.357E+02	1.667E+03	2.498E+06	1.679E+02
2050	6.117E+03	4.898E+06	3.291E+02	1.634E+03	2.449E+06	1.645E+02
2051	5.995E+03	4.801E+06	3.226E+02	1.601E+03	2.400E+06	1.613E+02
2052	5.877E+03	4.706E+06	3.162E+02	1.570E+03	2.353E+06	1.581E+02
2053	5.760E+03	4.613E+06	3.099E+02	1.539E+03	2.306E+06	1.550E+02
2054	5.646E+03	4.521E+06	3.038E+02	1.508E+03	2.261E+06	1.519E+02
2055	5.534E+03	4.432E+06	2.978E+02	1.478E+03	2.216E+06	1.489E+02
2056	5.425E+03	4.344E+06	2.919E+02	1.449E+03	2.172E+06	1.459E+02
2057	5.317E+03	4.258E+06	2.861E+02	1.420E+03	2.129E+06	1.430E+02
2058	5.212E+03	4.174E+06	2.804E+02	1.392E+03	2.087E+06	1.402E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	5.109E+03	4.091E+06	2.749E+02	1.365E+03	2.046E+06	1.374E+02
2060	5.008E+03	4.010E+06	2.694E+02	1.338E+03	2.005E+06	1.347E+02
2061	4.909E+03	3.931E+06	2.641E+02	1.311E+03	1.965E+06	1.320E+02
2062	4.811E+03	3.853E+06	2.589E+02	1.285E+03	1.926E+06	1.294E+02
2063	4.716E+03	3.776E+06	2.537E+02	1.260E+03	1.888E+06	1.269E+02
2064	4.623E+03	3.702E+06	2.487E+02	1.235E+03	1.851E+06	1.244E+02
2065	4.531E+03	3.628E+06	2.438E+02	1.210E+03	1.814E+06	1.219E+02
2066	4.442E+03	3.557E+06	2.390E+02	1.186E+03	1.778E+06	1.195E+02
2067	4.354E+03	3.486E+06	2.342E+02	1.163E+03	1.743E+06	1.171E+02
2068	4.267E+03	3.417E+06	2.296E+02	1.140E+03	1.709E+06	1.148E+02
2069	4.183E+03	3.349E+06	2.250E+02	1.117E+03	1.675E+06	1.125E+02
2070	4.100E+03	3.283E+06	2.206E+02	1.095E+03	1.642E+06	1.103E+02
2071	4.019E+03	3.218E+06	2.162E+02	1.073E+03	1.609E+06	1.081E+02
2072	3.939E+03	3.154E+06	2.119E+02	1.052E+03	1.577E+06	1.060E+02
2073	3.861E+03	3.092E+06	2.077E+02	1.031E+03	1.546E+06	1.039E+02
2074	3.785E+03	3.031E+06	2.036E+02	1.011E+03	1.515E+06	1.018E+02
2075	3.710E+03	2.971E+06	1.996E+02	9.909E+02	1.485E+06	9.980E+01
2076	3.636E+03	2.912E+06	1.956E+02	9.713E+02	1.456E+06	9.782E+01
2077	3.564E+03	2.854E+06	1.918E+02	9.521E+02	1.427E+06	9.589E+01
2078	3.494E+03	2.798E+06	1.880E+02	9.332E+02	1.399E+06	9.399E+01
2079	3.425E+03	2.742E+06	1.843E+02	9.148E+02	1.371E+06	9.213E+01
2080	3.357E+03	2.688E+06	1.806E+02	8.966E+02	1.344E+06	9.030E+01
2081	3.290E+03	2.635E+06	1.770E+02	8.789E+02	1.317E+06	8.851E+01
2082	3.225E+03	2.583E+06	1.735E+02	8.615E+02	1.291E+06	8.676E+01
2083	3.161E+03	2.531E+06	1.701E+02	8.444E+02	1.266E+06	8.504E+01
2084	3.099E+03	2.481E+06	1.667E+02	8.277E+02	1.241E+06	8.336E+01
2085	3.037E+03	2.432E+06	1.634E+02	8.113E+02	1.216E+06	8.171E+01
2086	2.977E+03	2.384E+06	1.602E+02	7.953E+02	1.192E+06	8.009E+01
2087	2.918E+03	2.337E+06	1.570E+02	7.795E+02	1.168E+06	7.851E+01
2088	2.860E+03	2.291E+06	1.539E+02	7.641E+02	1.145E+06	7.695E+01
2089	2.804E+03	2.245E+06	1.509E+02	7.489E+02	1.123E+06	7.543E+01
2090	2.748E+03	2.201E+06	1.479E+02	7.341E+02	1.100E+06	7.393E+01
2091	2.694E+03	2.157E+06	1.449E+02	7.196E+02	1.079E+06	7.247E+01
2092	2.641E+03	2.114E+06	1.421E+02	7.053E+02	1.057E+06	7.103E+01
2093	2.588E+03	2.073E+06	1.393E+02	6.914E+02	1.036E+06	6.963E+01
2094	2.537E+03	2.032E+06	1.365E+02	6.777E+02	1.016E+06	6.825E+01
2095	2.487E+03	1.991E+06	1.338E+02	6.642E+02	9.957E+05	6.690E+01
2096	2.438E+03	1.952E+06	1.311E+02	6.511E+02	9.759E+05	6.557E+01
2097	2.389E+03	1.913E+06	1.285E+02	6.382E+02	9.566E+05	6.427E+01
2098	2.342E+03	1.875E+06	1.260E+02	6.256E+02	9.377E+05	6.300E+01
2099	2.296E+03	1.838E+06	1.235E+02	6.132E+02	9.191E+05	6.175E+01
2100	2.250E+03	1.802E+06	1.211E+02	6.010E+02	9.009E+05	6.053E+01
2101	2.206E+03	1.766E+06	1.187E+02	5.891E+02	8.831E+05	5.933E+01
2102	2.162E+03	1.731E+06	1.163E+02	5.775E+02	8.656E+05	5.816E+01
2103	2.119E+03	1.697E+06	1.140E+02	5.660E+02	8.484E+05	5.701E+01
2104	2.077E+03	1.663E+06	1.118E+02	5.548E+02	8.316E+05	5.588E+01
2105	2.036E+03	1.630E+06	1.095E+02	5.438E+02	8.152E+05	5.477E+01
2106	1.996E+03	1.598E+06	1.074E+02	5.331E+02	7.990E+05	5.369E+01
2107	1.956E+03	1.566E+06	1.052E+02	5.225E+02	7.832E+05	5.262E+01
2108	1.917E+03	1.535E+06	1.032E+02	5.122E+02	7.677E+05	5.158E+01
2109	1.879E+03	1.505E+06	1.011E+02	5.020E+02	7.525E+05	5.056E+01

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.842E+03	1.475E+06	9.912E+01	4.921E+02	7.376E+05	4.956E+01
2111	1.806E+03	1.446E+06	9.716E+01	4.823E+02	7.230E+05	4.858E+01
2112	1.770E+03	1.417E+06	9.523E+01	4.728E+02	7.087E+05	4.762E+01
2113	1.735E+03	1.389E+06	9.335E+01	4.634E+02	6.946E+05	4.667E+01
2114	1.701E+03	1.362E+06	9.150E+01	4.543E+02	6.809E+05	4.575E+01
2115	1.667E+03	1.335E+06	8.969E+01	4.453E+02	6.674E+05	4.484E+01
2116	1.634E+03	1.308E+06	8.791E+01	4.364E+02	6.542E+05	4.396E+01
2117	1.602E+03	1.282E+06	8.617E+01	4.278E+02	6.412E+05	4.308E+01
2118	1.570E+03	1.257E+06	8.446E+01	4.193E+02	6.285E+05	4.223E+01
2119	1.539E+03	1.232E+06	8.279E+01	4.110E+02	6.161E+05	4.140E+01
2120	1.508E+03	1.208E+06	8.115E+01	4.029E+02	6.039E+05	4.058E+01
2121	1.478E+03	1.184E+06	7.954E+01	3.949E+02	5.919E+05	3.977E+01
2122	1.449E+03	1.160E+06	7.797E+01	3.871E+02	5.802E+05	3.898E+01
2123	1.420E+03	1.137E+06	7.643E+01	3.794E+02	5.687E+05	3.821E+01
2124	1.392E+03	1.115E+06	7.491E+01	3.719E+02	5.575E+05	3.746E+01
2125	1.365E+03	1.093E+06	7.343E+01	3.645E+02	5.464E+05	3.671E+01
2126	1.338E+03	1.071E+06	7.197E+01	3.573E+02	5.356E+05	3.599E+01
2127	1.311E+03	1.050E+06	7.055E+01	3.503E+02	5.250E+05	3.527E+01
2128	1.285E+03	1.029E+06	6.915E+01	3.433E+02	5.146E+05	3.458E+01
2129	1.260E+03	1.009E+06	6.778E+01	3.365E+02	5.044E+05	3.389E+01
2130	1.235E+03	9.889E+05	6.644E+01	3.299E+02	4.944E+05	3.322E+01
2131	1.210E+03	9.693E+05	6.513E+01	3.233E+02	4.846E+05	3.256E+01
2132	1.186E+03	9.501E+05	6.384E+01	3.169E+02	4.750E+05	3.192E+01
2133	1.163E+03	9.313E+05	6.257E+01	3.106E+02	4.656E+05	3.129E+01
2134	1.140E+03	9.128E+05	6.133E+01	3.045E+02	4.564E+05	3.067E+01
2135	1.117E+03	8.948E+05	6.012E+01	2.985E+02	4.474E+05	3.006E+01
2136	1.095E+03	8.770E+05	5.893E+01	2.926E+02	4.385E+05	2.946E+01
2137	1.074E+03	8.597E+05	5.776E+01	2.868E+02	4.298E+05	2.888E+01
2138	1.052E+03	8.426E+05	5.662E+01	2.811E+02	4.213E+05	2.831E+01
2139	1.031E+03	8.260E+05	5.550E+01	2.755E+02	4.130E+05	2.775E+01
2140	1.011E+03	8.096E+05	5.440E+01	2.701E+02	4.048E+05	2.720E+01
2141	9.910E+02	7.936E+05	5.332E+01	2.647E+02	3.968E+05	2.666E+01
2142	9.714E+02	7.779E+05	5.226E+01	2.595E+02	3.889E+05	2.613E+01
2143	9.522E+02	7.625E+05	5.123E+01	2.543E+02	3.812E+05	2.561E+01
2144	9.333E+02	7.474E+05	5.022E+01	2.493E+02	3.737E+05	2.511E+01
2145	9.148E+02	7.326E+05	4.922E+01	2.444E+02	3.663E+05	2.461E+01
2146	8.967E+02	7.181E+05	4.825E+01	2.395E+02	3.590E+05	2.412E+01
2147	8.790E+02	7.038E+05	4.729E+01	2.348E+02	3.519E+05	2.365E+01
2148	8.616E+02	6.899E+05	4.635E+01	2.301E+02	3.450E+05	2.318E+01
2149	8.445E+02	6.762E+05	4.544E+01	2.256E+02	3.381E+05	2.272E+01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	8.223E+01	4.492E+04	3.018E+00	7.813E-02	2.180E+01	1.464E-03
2011	4.038E+02	2.206E+05	1.482E+01	3.836E-01	1.070E+02	7.191E-03
2012	7.744E+02	4.231E+05	2.842E+01	7.358E-01	2.053E+02	1.379E-02
2013	1.150E+03	6.281E+05	4.220E+01	1.092E+00	3.047E+02	2.048E-02
2014	1.524E+03	8.327E+05	5.595E+01	1.448E+00	4.040E+02	2.715E-02
2015	1.911E+03	1.044E+06	7.016E+01	1.816E+00	5.066E+02	3.404E-02
2016	2.329E+03	1.272E+06	8.547E+01	2.212E+00	6.172E+02	4.147E-02
2017	2.704E+03	1.477E+06	9.926E+01	2.569E+00	7.168E+02	4.816E-02
2018	3.072E+03	1.678E+06	1.128E+02	2.919E+00	8.144E+02	5.472E-02
2019	3.430E+03	1.874E+06	1.259E+02	3.259E+00	9.092E+02	6.109E-02
2020	3.786E+03	2.068E+06	1.390E+02	3.597E+00	1.004E+03	6.743E-02
2021	4.114E+03	2.247E+06	1.510E+02	3.908E+00	1.090E+03	7.326E-02
2022	4.395E+03	2.401E+06	1.613E+02	4.175E+00	1.165E+03	7.827E-02
2023	4.688E+03	2.561E+06	1.721E+02	4.454E+00	1.243E+03	8.349E-02
2024	4.979E+03	2.720E+06	1.828E+02	4.730E+00	1.320E+03	8.867E-02
2025	5.268E+03	2.878E+06	1.934E+02	5.005E+00	1.396E+03	9.382E-02
2026	5.555E+03	3.035E+06	2.039E+02	5.278E+00	1.472E+03	9.894E-02
2027	5.841E+03	3.191E+06	2.144E+02	5.549E+00	1.548E+03	1.040E-01
2028	6.125E+03	3.346E+06	2.248E+02	5.819E+00	1.623E+03	1.091E-01
2029	6.407E+03	3.500E+06	2.352E+02	6.087E+00	1.698E+03	1.141E-01
2030	6.687E+03	3.653E+06	2.455E+02	6.354E+00	1.773E+03	1.191E-01
2031	6.555E+03	3.581E+06	2.406E+02	6.228E+00	1.738E+03	1.167E-01
2032	6.425E+03	3.510E+06	2.358E+02	6.105E+00	1.703E+03	1.144E-01
2033	6.298E+03	3.441E+06	2.312E+02	5.984E+00	1.669E+03	1.122E-01
2034	6.173E+03	3.372E+06	2.266E+02	5.865E+00	1.636E+03	1.099E-01
2035	6.051E+03	3.306E+06	2.221E+02	5.749E+00	1.604E+03	1.078E-01
2036	5.931E+03	3.240E+06	2.177E+02	5.635E+00	1.572E+03	1.056E-01
2037	5.814E+03	3.176E+06	2.134E+02	5.524E+00	1.541E+03	1.035E-01
2038	5.699E+03	3.113E+06	2.092E+02	5.414E+00	1.511E+03	1.015E-01
2039	5.586E+03	3.052E+06	2.050E+02	5.307E+00	1.481E+03	9.948E-02
2040	5.475E+03	2.991E+06	2.010E+02	5.202E+00	1.451E+03	9.751E-02
2041	5.367E+03	2.932E+06	1.970E+02	5.099E+00	1.423E+03	9.558E-02
2042	5.261E+03	2.874E+06	1.931E+02	4.998E+00	1.394E+03	9.369E-02
2043	5.156E+03	2.817E+06	1.893E+02	4.899E+00	1.367E+03	9.183E-02
2044	5.054E+03	2.761E+06	1.855E+02	4.802E+00	1.340E+03	9.001E-02
2045	4.954E+03	2.706E+06	1.818E+02	4.707E+00	1.313E+03	8.823E-02
2046	4.856E+03	2.653E+06	1.782E+02	4.614E+00	1.287E+03	8.649E-02
2047	4.760E+03	2.600E+06	1.747E+02	4.522E+00	1.262E+03	8.477E-02
2048	4.666E+03	2.549E+06	1.713E+02	4.433E+00	1.237E+03	8.309E-02
2049	4.573E+03	2.498E+06	1.679E+02	4.345E+00	1.212E+03	8.145E-02
2050	4.483E+03	2.449E+06	1.645E+02	4.259E+00	1.188E+03	7.984E-02
2051	4.394E+03	2.400E+06	1.613E+02	4.175E+00	1.165E+03	7.826E-02
2052	4.307E+03	2.353E+06	1.581E+02	4.092E+00	1.142E+03	7.671E-02
2053	4.222E+03	2.306E+06	1.550E+02	4.011E+00	1.119E+03	7.519E-02
2054	4.138E+03	2.261E+06	1.519E+02	3.932E+00	1.097E+03	7.370E-02
2055	4.056E+03	2.216E+06	1.489E+02	3.854E+00	1.075E+03	7.224E-02
2056	3.976E+03	2.172E+06	1.459E+02	3.777E+00	1.054E+03	7.081E-02
2057	3.897E+03	2.129E+06	1.430E+02	3.703E+00	1.033E+03	6.941E-02
2058	3.820E+03	2.087E+06	1.402E+02	3.629E+00	1.013E+03	6.803E-02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	3.744E+03	2.046E+06	1.374E+02	3.558E+00	9.925E+02	6.668E-02
2060	3.670E+03	2.005E+06	1.347E+02	3.487E+00	9.728E+02	6.536E-02
2061	3.597E+03	1.965E+06	1.320E+02	3.418E+00	9.536E+02	6.407E-02
2062	3.526E+03	1.926E+06	1.294E+02	3.350E+00	9.347E+02	6.280E-02
2063	3.456E+03	1.888E+06	1.269E+02	3.284E+00	9.162E+02	6.156E-02
2064	3.388E+03	1.851E+06	1.244E+02	3.219E+00	8.980E+02	6.034E-02
2065	3.321E+03	1.814E+06	1.219E+02	3.155E+00	8.803E+02	5.914E-02
2066	3.255E+03	1.778E+06	1.195E+02	3.093E+00	8.628E+02	5.797E-02
2067	3.191E+03	1.743E+06	1.171E+02	3.032E+00	8.457E+02	5.682E-02
2068	3.128E+03	1.709E+06	1.148E+02	2.971E+00	8.290E+02	5.570E-02
2069	3.066E+03	1.675E+06	1.125E+02	2.913E+00	8.126E+02	5.460E-02
2070	3.005E+03	1.642E+06	1.103E+02	2.855E+00	7.965E+02	5.352E-02
2071	2.945E+03	1.609E+06	1.081E+02	2.798E+00	7.807E+02	5.246E-02
2072	2.887E+03	1.577E+06	1.060E+02	2.743E+00	7.653E+02	5.142E-02
2073	2.830E+03	1.546E+06	1.039E+02	2.689E+00	7.501E+02	5.040E-02
2074	2.774E+03	1.515E+06	1.018E+02	2.635E+00	7.352E+02	4.940E-02
2075	2.719E+03	1.485E+06	9.980E+01	2.583E+00	7.207E+02	4.842E-02
2076	2.665E+03	1.456E+06	9.782E+01	2.532E+00	7.064E+02	4.746E-02
2077	2.612E+03	1.427E+06	9.589E+01	2.482E+00	6.924E+02	4.652E-02
2078	2.561E+03	1.399E+06	9.399E+01	2.433E+00	6.787E+02	4.560E-02
2079	2.510E+03	1.371E+06	9.213E+01	2.385E+00	6.653E+02	4.470E-02
2080	2.460E+03	1.344E+06	9.030E+01	2.337E+00	6.521E+02	4.381E-02
2081	2.411E+03	1.317E+06	8.851E+01	2.291E+00	6.392E+02	4.295E-02
2082	2.364E+03	1.291E+06	8.676E+01	2.246E+00	6.265E+02	4.210E-02
2083	2.317E+03	1.266E+06	8.504E+01	2.201E+00	6.141E+02	4.126E-02
2084	2.271E+03	1.241E+06	8.336E+01	2.158E+00	6.020E+02	4.045E-02
2085	2.226E+03	1.216E+06	8.171E+01	2.115E+00	5.900E+02	3.965E-02
2086	2.182E+03	1.192E+06	8.009E+01	2.073E+00	5.784E+02	3.886E-02
2087	2.139E+03	1.168E+06	7.851E+01	2.032E+00	5.669E+02	3.809E-02
2088	2.096E+03	1.145E+06	7.695E+01	1.992E+00	5.557E+02	3.734E-02
2089	2.055E+03	1.123E+06	7.543E+01	1.952E+00	5.447E+02	3.660E-02
2090	2.014E+03	1.100E+06	7.393E+01	1.914E+00	5.339E+02	3.587E-02
2091	1.974E+03	1.079E+06	7.247E+01	1.876E+00	5.233E+02	3.516E-02
2092	1.935E+03	1.057E+06	7.103E+01	1.839E+00	5.130E+02	3.447E-02
2093	1.897E+03	1.036E+06	6.963E+01	1.802E+00	5.028E+02	3.378E-02
2094	1.859E+03	1.016E+06	6.825E+01	1.767E+00	4.929E+02	3.311E-02
2095	1.823E+03	9.957E+05	6.690E+01	1.732E+00	4.831E+02	3.246E-02
2096	1.786E+03	9.759E+05	6.557E+01	1.697E+00	4.735E+02	3.182E-02
2097	1.751E+03	9.566E+05	6.427E+01	1.664E+00	4.641E+02	3.119E-02
2098	1.716E+03	9.377E+05	6.300E+01	1.631E+00	4.550E+02	3.057E-02
2099	1.682E+03	9.191E+05	6.175E+01	1.598E+00	4.459E+02	2.996E-02
2100	1.649E+03	9.009E+05	6.053E+01	1.567E+00	4.371E+02	2.937E-02
2101	1.616E+03	8.831E+05	5.933E+01	1.536E+00	4.285E+02	2.879E-02
2102	1.584E+03	8.656E+05	5.816E+01	1.505E+00	4.200E+02	2.822E-02
2103	1.553E+03	8.484E+05	5.701E+01	1.476E+00	4.117E+02	2.766E-02
2104	1.522E+03	8.316E+05	5.588E+01	1.446E+00	4.035E+02	2.711E-02
2105	1.492E+03	8.152E+05	5.477E+01	1.418E+00	3.955E+02	2.658E-02
2106	1.463E+03	7.990E+05	5.369E+01	1.390E+00	3.877E+02	2.605E-02
2107	1.434E+03	7.832E+05	5.262E+01	1.362E+00	3.800E+02	2.553E-02
2108	1.405E+03	7.677E+05	5.158E+01	1.335E+00	3.725E+02	2.503E-02
2109	1.377E+03	7.525E+05	5.056E+01	1.309E+00	3.651E+02	2.453E-02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.350E+03	7.376E+05	4.956E+01	1.283E+00	3.579E+02	2.405E-02
2111	1.323E+03	7.230E+05	4.858E+01	1.257E+00	3.508E+02	2.357E-02
2112	1.297E+03	7.087E+05	4.762E+01	1.233E+00	3.439E+02	2.310E-02
2113	1.272E+03	6.946E+05	4.667E+01	1.208E+00	3.370E+02	2.265E-02
2114	1.246E+03	6.809E+05	4.575E+01	1.184E+00	3.304E+02	2.220E-02
2115	1.222E+03	6.674E+05	4.484E+01	1.161E+00	3.238E+02	2.176E-02
2116	1.197E+03	6.542E+05	4.396E+01	1.138E+00	3.174E+02	2.133E-02
2117	1.174E+03	6.412E+05	4.308E+01	1.115E+00	3.111E+02	2.090E-02
2118	1.151E+03	6.285E+05	4.223E+01	1.093E+00	3.050E+02	2.049E-02
2119	1.128E+03	6.161E+05	4.140E+01	1.072E+00	2.989E+02	2.009E-02
2120	1.105E+03	6.039E+05	4.058E+01	1.050E+00	2.930E+02	1.969E-02
2121	1.084E+03	5.919E+05	3.977E+01	1.029E+00	2.872E+02	1.930E-02
2122	1.062E+03	5.802E+05	3.898E+01	1.009E+00	2.815E+02	1.892E-02
2123	1.041E+03	5.687E+05	3.821E+01	9.891E-01	2.759E+02	1.854E-02
2124	1.020E+03	5.575E+05	3.746E+01	9.695E-01	2.705E+02	1.817E-02
2125	1.000E+03	5.464E+05	3.671E+01	9.503E-01	2.651E+02	1.781E-02
2126	9.804E+02	5.356E+05	3.599E+01	9.315E-01	2.599E+02	1.746E-02
2127	9.610E+02	5.250E+05	3.527E+01	9.131E-01	2.547E+02	1.712E-02
2128	9.420E+02	5.146E+05	3.458E+01	8.950E-01	2.497E+02	1.678E-02
2129	9.233E+02	5.044E+05	3.389E+01	8.773E-01	2.447E+02	1.644E-02
2130	9.050E+02	4.944E+05	3.322E+01	8.599E-01	2.399E+02	1.612E-02
2131	8.871E+02	4.846E+05	3.256E+01	8.429E-01	2.351E+02	1.580E-02
2132	8.696E+02	4.750E+05	3.192E+01	8.262E-01	2.305E+02	1.549E-02
2133	8.523E+02	4.656E+05	3.129E+01	8.098E-01	2.259E+02	1.518E-02
2134	8.355E+02	4.564E+05	3.067E+01	7.938E-01	2.215E+02	1.488E-02
2135	8.189E+02	4.474E+05	3.006E+01	7.781E-01	2.171E+02	1.458E-02
2136	8.027E+02	4.385E+05	2.946E+01	7.627E-01	2.128E+02	1.430E-02
2137	7.868E+02	4.298E+05	2.888E+01	7.476E-01	2.086E+02	1.401E-02
2138	7.712E+02	4.213E+05	2.831E+01	7.328E-01	2.044E+02	1.374E-02
2139	7.560E+02	4.130E+05	2.775E+01	7.182E-01	2.004E+02	1.346E-02
2140	7.410E+02	4.048E+05	2.720E+01	7.040E-01	1.964E+02	1.320E-02
2141	7.263E+02	3.968E+05	2.666E+01	6.901E-01	1.925E+02	1.294E-02
2142	7.119E+02	3.889E+05	2.613E+01	6.764E-01	1.887E+02	1.268E-02
2143	6.978E+02	3.812E+05	2.561E+01	6.630E-01	1.850E+02	1.243E-02
2144	6.840E+02	3.737E+05	2.511E+01	6.499E-01	1.813E+02	1.218E-02
2145	6.705E+02	3.663E+05	2.461E+01	6.370E-01	1.777E+02	1.194E-02
2146	6.572E+02	3.590E+05	2.412E+01	6.244E-01	1.742E+02	1.170E-02
2147	6.442E+02	3.519E+05	2.365E+01	6.121E-01	1.708E+02	1.147E-02
2148	6.314E+02	3.450E+05	2.318E+01	5.999E-01	1.674E+02	1.125E-02
2149	6.189E+02	3.381E+05	2.272E+01	5.881E-01	1.641E+02	1.102E-02

APPENDIX D – CERIS APPLICATION FORM



Type of Unit or Process (rotary dryer, cupola furnace, crusher, pelletizer, engine, etc.)	Emission Unit Number:	Emission Point Number:
Municipal Solid Waste Landfill Gas Fugitive Emissions	EU-01	
Make	Model	Installation or manufacture date
N/A	N/A	
Capacity (manufacturer's or designer's guaranteed maximum)	Operating Capacity (specific units)	
N/A	MSW Landfill capacity of 14,650,000 cy	
Brief description of operation of unit or process: The emission source is a municipal solid waste landfill, the primary regulated emissions source is landfill gas (LFG), which contains greenhouse gases (GHGs), non-methane organic compounds (NMOCs), volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) generated by the microbial breakdown of buried waste. See the submitted application report for further details.		
Brief description of alternative operating scenario (see Section M1 & M2 to elaborate):	Alternative Emission Point:	
N/A	N/A	

Are you agreeing to a limit on the operating schedule for this unit? ☐ Yes ☒ No				
Hours Per Day	Days Per Week	Weeks Per Year	Peak Production Season (if any)	Dates of Annual Shutdown
8	6	52		

Are you agreeing to a limit on the production for this unit? ☐ Yes ☒ No (If No, show normal operating schedule.)				
Material	Process Time Frame			Specify Units (tons, Btu, Gal., etc)
	Hour	Week	Year	
N/A				

[illegible]

SECTION D2 – IDENTIFICATION OF AIR CONTAMINANTS

Has emission unit testing been done at the facility? ☒ Yes ☐ No			
Emission Unit ID	Last Date when a Testing Program was Completed	If Program is Continuous, Give Approximate Testing Frequency	Regulation requiring frequency (NSPS, MACT, Permit Requirement-list permit number)
EUI-01	AUGUST 2024	CONTINUOUS, 5-YR	NSPS XXX NMOC EMISSION RATE DETERMINATION; TIER 2

Add additional pages if necessary

SECTION E – PRODUCTS OF UNIT OR PROCESS

Include all, even those not usable because they do not meet specifications					
Material	Hourly Process Weight (Pounds Per Hour)			Average Annual (Specify Units)	Intermittent Operation Only (Average Hours Per Week)
	Average	Maximum	Minimum		
N/A	N/A	N/A	N/A	N/A	N/A

SECTION F – FUELS USED

Coal (Tons/Yr)	% Sulfur	% Ash	Oil (Gal/Yr)	% Sulfur	Grade No.
Natural Gas (Thousand CF/Yr)	LP Gas (Gal/Yr)		Other (Specify)		

SECTION G – STACK PARAMETERS

List each pollutant separately.					
Pollutant (use CAS for HAPs)	Stack Height (ft)	Stack Diameter (ft at top)	Gas Volume (ACFM)	Exit Temp (°F)	Gas Velocity (fps)
N/A NO STACK					
Stack Base UTM Coordinate X:			Stack Base UTM Coordinate Y:		

SECTION H – ALTERNATIVE STACK PARAMETERS

List each pollutant separately.					
Pollutant (use CAS for HAPs)	Stack Height (ft)	Stack Diameter (ft at top)	Gas Volume (ACFM)	Exit Temp (°F)	Gas Velocity (fps)
40 CFR 60.762(b)					
Stack Base UTM Coordinate X:			Stack Base UTM Coordinate Y:		

SECTION I – AIR CONTAMINANTS EMITTED

Known or Suspected - Use emission rates after control equipment.			
Pollutant (use CAS for HAPs)	Amount		Basis of Estimate (AP-42, testing, engineering estimate, etc)
	Pounds/Hr	Tons/Yr	
Refer to Appendix C- Potential Emission calculations			

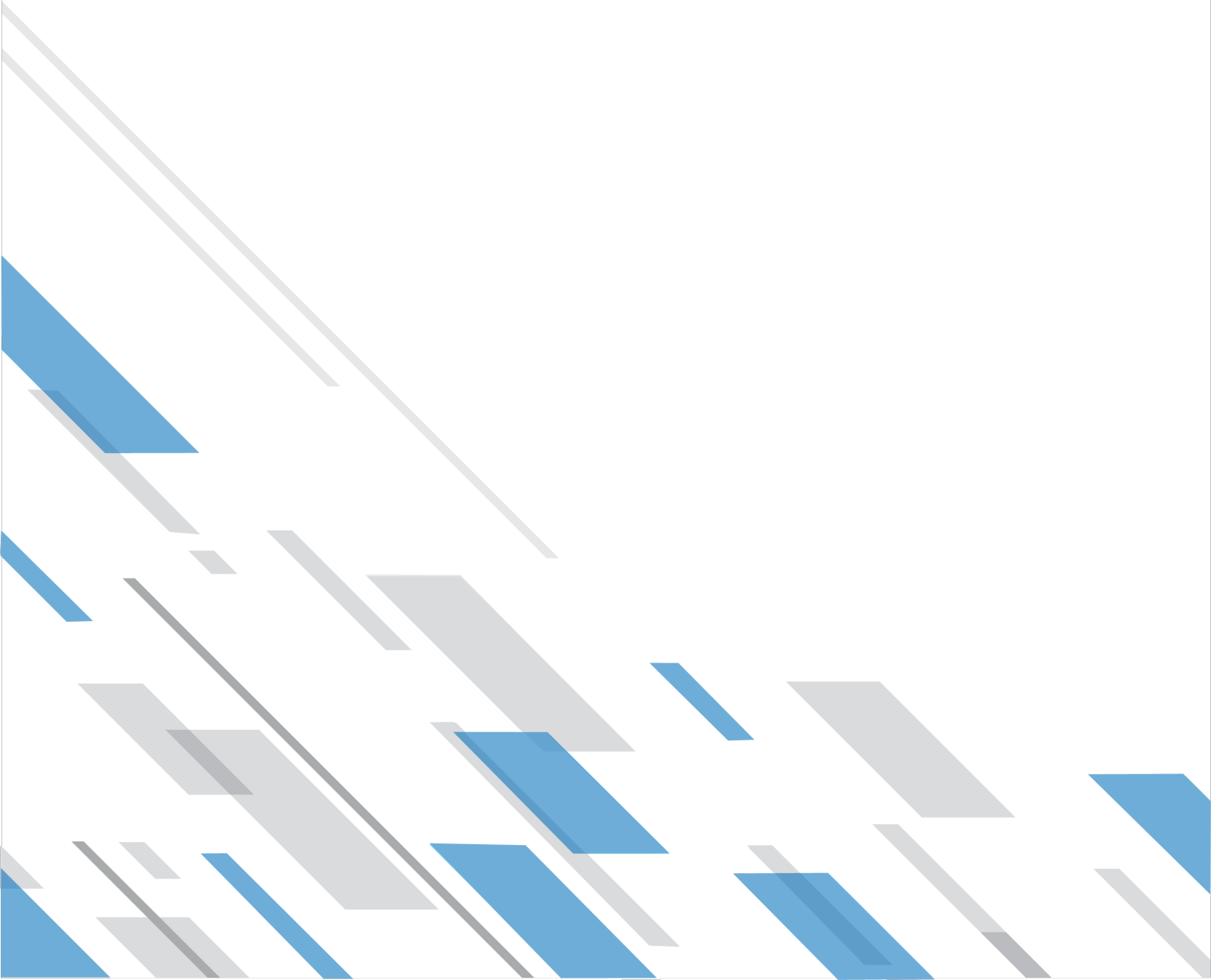
SECTION J1 – AIR POLLUTION CONTROL EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator ☐ Wet Scrubber ☐ Spray Dryer ☒ None ☐ Other – Specify: _____				
Name of Manufacturer		Model Number		Date to Be Installed
Application: ☐ Boiler ☐ Kiln ☐ Engine ☐ Other – Specify: _____				
Pollutants Removed				
Design Efficiency (%)				

Operating Efficiency (%)				
Describe method used to determine operating efficiency:				

SECTION J2 – GAS CONDITIONS

Gas Conditions	Inlet		Outlet	
Gas Volume (SCFM; 68°F; 14.7 psia)				
Gas Temperature (°F)				
Gas Pressure (in. H ₂ O)				
Gas Velocity (ft/sec)				
Pollutant Concentration (Specify pollutant and unit of concentration)	Pollutant	Unit of Concentration	Inlet	Outlet
Pressure drop through gas cleaning device (in. H ₂ O)				



**City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal**

Summary Table			
Emission point → Pollutant ↓	Fugitive Landfill Gas- EU-01 (tpy)	Propane Heaters- Insignificant activity (tpy)	Total Facility Emissions (tpy)
PM	-	0.02	0.02
PM10	-	0.02	0.02
PM2.5	-	0.02	0.02
NOx	-	0.39	0.39
SO2	-	0.05	0.05
CO	1.01	0.23	1.23
VOC	4.79	0.03	4.82
NMOC	6.84	-	6.84
Total HAPs	3.87	-	3.87
CO2 (anthropogenic)	0.00	377.61	377.61
CO2 (biogenic)	74,069.35	0.00	74,069.35
CH4	2,362.43	0.02	2,362.45
N2O	-	0.00	0.00
GHG CO2e	74,069.35	379.07	74,448.41

*See Tables 1-2 for further details and LangGEM model report

City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal

Table 1: EU-01 Fugitive Landfill Gas

Landfill Gas Constituents	CAS No.	Molecular Weight	AP-42 Default Concentration ^A (ppmv)	Fugitive Emission Rate (lb/hr) ^B	Annual Fugitive Emissions (TPY)	VOC
1,1,1-Trichloroethane (methyl chloroform)	71-55-6	133.41	0.48	0.0048	0.0210	HAP
1,1,2,2-Tetrachloroethane	79-34-5	167.85	1.1	0.0138	0.0604	HAP/VOC
1,1-Dichloroethane (ethylidene dichloride)	75-34-3	98.97	2.4	0.0177	0.0777	HAP/VOC
1,1-Dichloroethene (vinylidene chloride)	75-35-4	96.94	0.20	0.0014	0.0063	HAP/VOC
1,2-Dichloroethane (ethylene dichloride)	107-06-2	98.96	0.41	0.0030	0.0133	HAP/VOC
1,2-Dichloropropane (propylene dichloride)	78-87-5	112.99	0.18	0.0015	0.0067	HAP/VOC
2-Propanol (isopropyl alcohol)	67-63-0	60.11	50	0.2246	0.9836	VOC
Acetone	67-64-1	58.08	7.0	0.0304	0.1330	not regulated
Acrylonitrile	107-13-1	53.06	6.3	0.0250	0.1094	HAP/VOC
Bromodichloromethane	75-27-4	163.83	3.1	0.0379	0.1662	VOC
Butane	106-97-8	58.12	5.0	0.0217	0.0951	VOC
Carbon disulfide	75-15-0	76.13	0.58	0.0033	0.0145	HAP/VOC
Carbon monoxide	630-08-0	28.01	110	0.2302	1.0083	N/A
Carbon tetrachloride	56-23-5	153.84	4.00E-03	0.0000	0.0002	HAP/VOC
Carbonyl sulfide	463-58-1	60.07	0.49	0.0022	0.0096	HAP/VOC
Chlorobenzene	108-90-7	112.56	0.25	0.0021	0.0092	HAP/VOC
Chlorodifluoromethane	75-45-6	86.47	1.3	0.0084	0.0368	Non-HAP
Chloroethane (ethyl chloride)	75-00-3	64.52	1.3	0.0063	0.0274	HAP/VOC
Chloroform	67-66-3	119.39	3.00E-02	0.0003	0.0012	HAP/VOC
Chloromethane	74-87-3	50.49	1.2	0.0045	0.0198	HAP/VOC
Dichlorobenzene	95-50-1	147	0.21	0.0023	0.0101	HAP/VOC
Dichlorodifluoromethane	75-71-8	120.91	16	0.1445	0.6331	Non-HAP
Dichlorofluoromethane	75-43-4	102.92	2.6	0.0200	0.0876	VOC
Dichloromethane (methylene chloride)	75-09-2	84.94	14	0.0888	0.3892	HAP
Dimethyl sulfide (methyl sulfide)	75-18-3	62.13	7.8	0.0362	0.1586	VOC
Ethane	74-84-0	30.07	890	1.9996	8.7581	Non-HAP
Ethanol	64-17-5	46.08	27	0.0930	0.4072	VOC
Ethyl mercaptan (ethanethiol)	75-08-1	62.13	2.3	0.0107	0.0468	VOC
Ethylbenzene	100-41-4	106.16	4.6	0.0365	0.1598	HAP/VOC
Ethylene dibromide	106-93-4	187.88	1.00E-03	0.0000	0.0001	HAP/VOC
Fluorotrichloromethane	75-69-4	137.38	0.76	0.0078	0.0342	VOC
Hexane	110-54-3	86.18	6.6	0.0425	0.1861	HAP/VOC
Hydrogen sulfide	7783-06-4	34.08	36	0.0917	0.4015	HAP
Mercury (total)	7439-97-6	200.61	2.90E-04	0.0000	0.0000	HAP
Methyl ethyl ketone	78-93-3	72.11	7.1	0.0383	0.1675	HAP/VOC
Methyl isobutyl ketone	108-10-1	100.16	1.9	0.0142	0.0623	HAP/VOC
Methyl mercaptan	74-93-1	48.11	2.5	0.0090	0.0394	VOC
Pentane	109-66-0	72.15	3.3	0.0178	0.0779	VOC
Perchloroethylene (tetrachloroethylene)	127-18-4	165.83	3.7	0.0458	0.2008	HAP
Propane	74-98-6	44.09	11	0.0362	0.1587	VOC
t-1,2-dichloroethene	156-60-5	96.94	2.8	0.0203	0.0888	VOC
Trichloroethylene (trichloroethene)	79-01-6	131.4	2.8	0.0275	0.1204	HAP/VOC
Vinyl chloride	75-01-4	62.5	7.3	0.0341	0.1493	HAP/VOC
Xylenes	1330-20-7	106.16	12	0.0952	0.4169	HAP/VOC
Benzene	71-43-2	78.11	1.9	0.0111	0.0486	HAP/VOC
Toluene		92.12	39	0.2684	1.1757	HAP
Toluene	Max Individual HAP	-	-	0.2684	1.1757	-
Total HAPS				0.882	3.865	-

Pollutant	Molecular Weight	Concentration in landfill (ppmv)	Fugitive Emissions (lb/hr)	Fugitive Emissions (TPY)	Notes
NMOC ^C	86.18	242.60	1.56	6.84	
VOC	-	-	1.09	4.79	Sum of VOC pollutants from AP 42 default concentrations
Methane	16.04	500,000.00	539.37	2,362.43	Methane assumed as 50%, 10% default methane oxidation due to soil cover assumed
CO2 (Biogenic, from LFG)	44.01	500,000.00	1644.09	7,201.12	CO2 generated in landfill, assumed 1-methane fraction, 0.5
CO2 (Biogenic, from methane oxidation)	-	-	-	720.07	CO2 in LFG from methane oxidation
Total CO2B	-	-	-	7,921.19	Sum of CO2 in LFG and from methane Oxidation
GHG CO2e	-	-	-	74,069.35	CO2 & COGWP + CH4 X GWP

Notes:

(A) Pollutant type, molecular weight and concentration from AP 42Table 2.4-1. DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS (8/2024)

(B) Fugitive emissions calculated based on ideal gas law and estiamted landfill gas generation from LandGEM Model Vesion 3.02 in 2030

Landfill gas generation rate 487.96 scfm, per LandGEM Version 3.02 in 2030
(C) 2024 Tier 2 NMOC Concentration (ppmv as hexane) 242.6

(D) A 10% default methane oxidation is assumed to occur due to soil cover

Tons of methane generated 2,624.93 tons
Tons of methane assumed to be oxidized by soil cover (10% oxidation) 262.49 tons (methane generated x 10% oxidation rate)
Biogenic CO2 generated from CH4 oxidation 720.07 tons CO2 (mass of methane oxidized) x (MW CO2/MW CH4); assume 100% conversion to CO2)

**City of Grand Forks, ND - MSWLF
Title V Air Quality Permit Renewal**

Table 2: Insignificant Emission Units- Propane Heaters

Heating Units	Capacity	Units
IRH-1	66,000	Btu/h
IRH-2	100,000	Btu/h
IRH-3	100,000	Btu/h
IRH-4	100,000	Btu/h
IRH-5	100,000	Btu/h
UH-1	80,000	Btu/h
HWH-1	76,000	Btu/h
Total	622,000	Btu/h

Input Parameter	Value	Units
Heat Content	90,500	btu/gal
Max Fuel Input	0.007	10 ³ gal/hr
Hours of operations	8760	hrs

Pollutants	Emission Factor ^A B,C,D	Units	Emissions (lb/hr)	Emissions (tpy)	Insignificant Emissions Threshold (tpy)
PM	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
PM10	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
PM 2.5	0.70	(lb/ per 10 ³ gallons)	0.005	0.021	2
SO ₂	<u>1.50</u>	(lb/ per 10 ³ gallons)	0.010	0.045	2
NO _x	13.00	(lb/ per 10 ³ gallons)	0.089	0.391	2
CO	7.50	(lb/ per 10 ³ gallons)	0.052	0.226	2
TOC/VOC	1.00	(lb/ per 10 ³ gallons)	0.007	0.030	2
CO ₂	62.87	(kg CO2/mmBtu)	86.212	377.608	2
N ₂ O	0.0006	(kg CH ₄ /mmBtu	0.001	0.004	2
CH ₄	0.0030	(kg N ₂ O/mmBtu)	0.004	0.018	NA
CO2e	-	-	-	379.068	NA

Notes

(A):Propane Emission Factors taken from AP 42 Section 1.5: Liquefied Petroleum Gas Combustion (Version 2008)

(B) The Gas Processors Association ("GPA") provides product specifications for liquefied petroleum gases. These specifications may be found in Figure 2-1 (GPA Liquefied Petroleum Gas Specifications - GPA Standard 2140-92) of the Engineering Data Book (10th Edition, 1994) published by the Gas Processors Suppliers Association. Total sulfur standards are provided in units of ppmw. For commercial propane, the standard is 185 ppmw as S (**254 ppmv as S**, 239 ppmv as H₂S).

1 grain Sulfur/100 SCF = 16.92 ppmv/ Sulfur @ 60°F & 14.73 PSI @ STP
@ 254 ppmv as Sulfur = 15.01182033 grains per 100 SCF

(C) 40 CFR Part 98 Table C-1:Propane fuel CO₂ emission =62.87 kg CO₂/MMBtu, 1 KG = 2.2.20462 lb

(D) 40 CFR Part 98 Table C-2: Propane CH₄ emission = 0.003 kg CH₄/MMBtu, N₂O = 0.0006 kg N₂O / MMBtu

(E) CO₂e = (Global Warming Potential, GWP) * (Emission). GWP from 40 CFR Part 98 Table A-1. CO₂ = 1, CH₄ = 28, N₂O = 265

INTRODUCTION

LandGEM - Landfill Gas Emissions Model, Version 3.02

U.S. Environmental Protection Agency

Model Design:

Worksheet Name	Function
<u>INTRO</u>	Contains an overview of the model and important notes about using LandGEM
<u>USER INPUTS</u>	Allows users to provide landfill characteristics, determine model parameters, select up to four gases/pollutants (total landfill gas, methane, carbon dioxide, NMOC, and 46 air pollutants), and enter waste acceptance rates
<u>POLLUTANTS</u>	Allows users to edit air pollutant concentrations and molecular weights for existing pollutants and add up to 10 new pollutants
<u>INPUT REVIEW</u>	Allows users to review and print model inputs
<u>METHANE</u>	Calculates methane emission estimates using the first-order decomposition rate equation
<u>RESULTS</u>	Shows tabular emission estimates for up to four gases/pollutants (selected in the USER INPUTS worksheet) in megagrams per year, cubic meters per year, and user's choice of a third unit of measure (average cubic feet per minute, cubic feet per year, or short tons per year)
<u>GRAPHS</u>	Shows graphical emission estimates for up to four gases/pollutants (selected in the USER INPUTS worksheet) in megagrams per year, cubic meters per year, and user's choice of a third unit of measure (selected in the RESULTS worksheet)
<u>INVENTORY</u>	Displays tabular emission estimates for all gases/pollutants for a single year specified by users
<u>REPORT</u>	Allows users to review and print model inputs and outputs in a summary report

IMPORTANT NOTES!

The following user inputs **MUST** be completed in the USER INPUTS worksheet:

- Landfill open year
- Landfill closure year or Waste design capacity
- Annual waste acceptance rates from open year to current year or closure year

Other Important Notes:

- LandGEM is based on the gas generated from anaerobic decomposition of landfilled waste which has a methane content between 40 and 60 percent.
- When using LandGEM to comply with the CAA, the methane content of the landfill gas must remain fixed at 50% by volume (the model default value).
- Default pollutant concentrations used by LandGEM have already been corrected for air infiltration, as stated in AP-42. If a user-specified value for NMOC concentration is used based on site-specific data, then it must be corrected for air infiltration.
- When comparing results from LandGEM with measurements of extracted gas collected at a site, the landfill owner/operator must adjust for air infiltration prior to any comparisons.
- One megagram is equivalent to one metric ton.

About LandGEM:

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at <http://www.epa.gov/ttnatw01/landfill/landflpg.html>.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for conventional landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

USER INPUTS

Landfill Name or Identifier: Grand Forks Active MSWLF

Clear ALL Non-Parameter
Inputs/Selections

1: PROVIDE LANDFILL CHARACTERISTICS

Landfill Open Year	2009	
Landfill Closure Year	2087	
Have Model Calculate Closure Year?	☐ Yes ☒ No	
Waste Design Capacity		

Restore Default Model
Parameters

2: DETERMINE MODEL PARAMETERS

Methane Generation Rate, k (year^{-1})	
CAA Arid Area - 0.02	
Potential Methane Generation Capacity, L_0 (m^3/Mg)	
CAA Conventional - 170	
NMOC Concentration (ppmv as hexane)	
User-specified	User-specified value: 243
Methane Content (% by volume)	
CAA - 50% by volume	

3: SELECT GASES/POLLUTANTS

Gas / Pollutant #1		Default pollutant parameters are currently being used by model.
Total landfill gas		Edit Existing or Add New Pollutant Parameters
Gas / Pollutant #2		
Methane		Restore Default Pollutant Parameters
Gas / Pollutant #3		
Carbon dioxide		
Gas / Pollutant #4		
NMOC		

Description/Comments:

Grand Forks Title V Renewal 12/2024
Methane Generation Rate (k) based on 30-year normal precipitation data (<25 inches / year)
NMOC Concentration based on Oct 2024 Tier 2 Testing- 242.6 ppmv as hexane

4: ENTER WASTE ACCEPTANCE RATES

Input Units:

Year	Input Units (short tons/year)	Calculated Units (Mg/year)
2009	14,665	13,332
2010	57,633	52,394
2011	67,523	61,385
2012	69,660	63,327
2013	70,849	64,409
2014	74,440	67,673
2015	81,151	73,774
2016	75,214	68,376
2017	75,206	68,369
2018	74,635	67,850
2019	75,611	68,737
2020	71,770	65,246
2021	64,655	58,777
2022	67,786	61,624
2023	68,464	62,240
2024	67,916	61,741
2025	68,595	62,359
2026	69,281	62,982
2027	69,974	63,612
2028	70,673	64,248
2029	71,380	64,891
2030	72,094	65,540
2031	72,815	66,195
2032		
2033		
2034		
2035		
2036		
2037		
2038		
2039		
2040		
2041		
2042		
2043		
2044		
2045		
2046		
2047		
2048		

4: ENTER WASTE ACCEPTANCE RATES

Input Units:

Year	Input Units (short tons/year)	Calculated Units (Mg/year)
2049		
2050		
2051		
2052		
2053		
2054		
2055		
2056		
2057		
2058		
2059		
2060		
2061		
2062		
2063		
2064		
2065		
2066		
2067		
2068		
2069		
2070		
2071		
2072		
2073		
2074		
2075		
2076		
2077		
2078		
2079		
2080		
2081		
2082		
2083		
2084		
2085		
2086		
2087		
2088		

POLLUTANTS

Landfill Name or Identifier: Grand Forks Active MSWLF

Enter New Pollutant
ParametersEdit Existing Pollutant
Parameters

Default parameters will be used by model unless alternate parameters are entered.

Enter User-specified Pollutant
Parameters for Existing Pollutants:

Gas / Pollutant Default Parameters:				Parameters for Existing Pollutants:		
	Compound	Concentration (ppmv)	Molecular Weight	Notes	Concentration (ppmv)	Molecular Weight
Gases	Total landfill gas		30.03			
	Methane		16.04			
	Carbon dioxide		44.01			
	NMOC	243	86.18			
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41	A		
	1,1,2,2-Tetrachloroethane - HAP/VOC	1.1	167.85	A, B		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97	A, B		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94	A, B		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96	A, B		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99	A, B		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11	B		
	Acetone	7.0	58.08			
	Acrylonitrile - HAP/VOC	6.3	53.06	A, B		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11	A, B		
	Benzene - Co-disposal - HAP/VOC	11	78.11	A, B		
	Bromodichloromethane - VOC	3.1	163.83	B		
	Butane - VOC	5.0	58.12	B		
	Carbon disulfide - HAP/VOC	0.58	76.13	A, B		
	Carbon monoxide	140	28.01			
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84	A, B		
	Carbonyl sulfide - HAP/VOC	0.49	60.07	A, B		
	Chlorobenzene - HAP/VOC	0.25	112.56	A, B		
	Chlorodifluoromethane	1.3	86.47			
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52	A, B		
	Chloroform - HAP/VOC	0.03	119.39	A, B		
	Chloromethane - VOC	1.2	50.49	B		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147	B, C		
	Dichlorodifluoromethane	16	120.91			
	Dichlorofluoromethane - VOC	2.6	102.92	B		
	Dichloromethane (methylene chloride) - HAP	14	84.94	A		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13	B		
	Ethane	890	30.07			
	Ethanol - VOC	27	46.08	B		
	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13	B		
	Ethylbenzene - HAP/VOC	4.6	106.16	A, B		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88	A, B		
	Fluorotrichloromethane - VOC	0.76	137.38	B		
	Hexane - HAP/VOC	6.6	86.18	A, B		
	Hydrogen sulfide	36	34.08			
	Mercury (total) - HAP	2.9E-04	200.61	A		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11	A, B		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16	A, B		
	Methyl mercaptan - VOC	2.5	48.11	B		
	Pentane - VOC	3.3	72.15	B		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83	A		
	Propane - VOC	11	44.09	B		
t-1,2-Dichloroethene - VOC	2.8	96.94	B			
Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13	A, B			
Toluene - Co-disposal - HAP/VOC	170	92.13	A, B			
Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40	A, B			
Vinyl chloride - HAP/VOC	7.3	62.50	A, B			
Xylenes - HAP/VOC	12	106.16	A, B			

Enter New Compound	Enter Concentration (ppmv)	Enter Molecular Weight

**Return to
USER INPUTS**

- A. Hazardous air pollutants (HAP) listed in Title III of the 1990 Clean Air Act Amendments.
B. Considered volatile organic compounds (VOC), as defined by U.S. EPA in 40 CFR 51.100(s).
C. Source tests did not indicate whether this compound was the para- or ortho- isomer. The para-isomer is a Title III-listed HAP.

Source: Tables 2.4-1 and 2.4-2 of *Compilation of Air Pollutant Emission Factors, AP-42, Volume 1: Stationary Point and Area Sources*, 5th ed., Chapter 2.4 Municipal Solid Waste Landfills. U.S. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. November 1998. <http://www.epa.gov/ttn/chief/ap42/ch02/final/c02s04.pdf>

INPUT REVIEW

Landfill Name or Identifier: Grand Forks Active MSWLF

LANDFILL CHARACTERISTICS

Landfill Open Year	2009	
Landfill Closure Year (with 80-year limit)	2087	
<i>Actual Closure Year (without limit)</i>	2087	
Have Model Calculate Closure Year?	No	
Waste Design Capacity		<i>megagrams</i>

MODEL PARAMETERS

Methane Generation Rate, k	0.020	<i>year⁻¹</i>
Potential Methane Generation Capacity, L ₀	170	<i>m³/Mg</i>
NMOC Concentration	243	<i>ppmv as hexane</i>
Methane Content	50	<i>% by volume</i>

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1:	Total landfill gas
Gas / Pollutant #2:	Methane
Gas / Pollutant #3:	Carbon dioxide
Gas / Pollutant #4:	NMOC

Description/Comments:

Grand Forks Title V Renewal 12/2024

Methane Generation Rate (k) based on 30-year normal precipitation data (<25 inches / year)

NMOC Concentration based on Oct 2024 Tier 2 Testing- 242.6 ppmv as hexane

WASTE ACCEPTANCE RATES

Year	(Mg/year)	(short tons/year)
2009	13,332	14,665
2010	52,394	57,633
2011	61,385	67,523
2012	63,327	69,660
2013	64,409	70,849
2014	67,673	74,440
2015	73,774	81,151
2016	68,376	75,214
2017	68,369	75,206
2018	67,850	74,635
2019	68,737	75,611
2020	65,246	71,770
2021	58,777	64,655
2022	61,624	67,786
2023	62,240	68,464
2024	61,741	67,916
2025	62,359	68,595
2026	62,982	69,281
2027	63,612	69,974
2028	64,248	70,673
2029	64,891	71,380
2030	65,540	72,094
2031	66,195	72,815
2032	66,195	72,815
2033	66,195	72,815
2034	66,195	72,815
2035	66,195	72,815
2036	66,195	72,815
2037	66,195	72,815
2038	66,195	72,815
2039	66,195	72,815
2040	66,195	72,815
2041	66,195	72,815
2042	66,195	72,815
2043	66,195	72,815
2044	66,195	72,815
2045	66,195	72,815
2046	66,195	72,815
2047	66,195	72,815
2048	66,195	72,815
2049	66,195	72,815
2050	66,195	72,815
2051	66,195	72,815
2052	66,195	72,815

WASTE ACCEPTANCE RATES

Year	(Mg/year)	(short tons/year)
2053	66,195	72,815
2054	66,195	72,815
2055	66,195	72,815
2056	66,195	72,815
2057	66,195	72,815
2058	66,195	72,815
2059	66,195	72,815
2060	66,195	72,815
2061	66,195	72,815
2062	66,195	72,815
2063	66,195	72,815
2064	66,195	72,815
2065	66,195	72,815
2066	66,195	72,815
2067	66,195	72,815
2068	66,195	72,815
2069	66,195	72,815
2070	66,195	72,815
2071	66,195	72,815
2072	66,195	72,815
2073	66,195	72,815
2074	66,195	72,815
2075	66,195	72,815
2076	66,195	72,815
2077	66,195	72,815
2078	66,195	72,815
2079	66,195	72,815
2080	66,195	72,815
2081	66,195	72,815
2082	66,195	72,815
2083	66,195	72,815
2084	66,195	72,815
2085	66,195	72,815
2086	66,195	72,815
2087	0	0
2088	0	0

METHANE**Landfill Name or Identifier:** Grand Forks Active MSWLF

First-Order Decomposition Rate Equation:

Where,

 Q_{CH_4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$) L_o = potential methane generation capacity (m^3/Mg)

$$Q_{CH_4} = \sum_{i=1}^n \sum_{j=0.1}^1 k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

 M_i = mass of waste accepted in the i^{th} year (Mg) t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

Model Parameters from User Inputs:

k = 0.020 $year^{-1}$ L_o = 170 m^3/Mg **When Model Calculates Closure Year...**

Final Non-Zero Acceptance Entered =	66,195 megagrams in	2031
Waste Design Capacity =	megagrams	
Closure Year (with 80-year limit) =	2087	
Actual Closure Year (without limit) =	2087	
Model Waste Acceptance Limit =	80 years	

Year	User Waste Acceptance Inputs (Mg/year)	User Waste- In-Place (Mg)	Waste Acceptance (Mg/year)	Waste-In- Place (Mg)
2009	13,332	0	13,332	0
2010	52,394	13,332	52,394	13,332
2011	61,385	65,726	61,385	65,726
2012	63,327	127,110	63,327	127,110
2013	64,409	190,438	64,409	190,438
2014	67,673	254,846	67,673	254,846
2015	73,774	322,519	73,774	322,519
2016	68,376	396,292	68,376	396,292
2017	68,369	464,669	68,369	464,669
2018	67,850	533,038	67,850	533,038
2019	68,737	600,888	68,737	600,888
2020	65,246	669,625	65,246	669,625
2021	58,777	734,871	58,777	734,871
2022	61,624	793,648	61,624	793,648
2023	62,240	855,271	62,240	855,271
2024	61,741	917,511	61,741	917,511
2025	62,359	979,253	62,359	979,253
2026	62,982	1,041,612	62,982	1,041,612
2027	63,612	1,104,594	63,612	1,104,594
2028	64,248	1,168,206	64,248	1,168,206
2029	64,891	1,232,455	64,891	1,232,455
2030	65,540	1,297,346	65,540	1,297,346
2031	66,195	1,362,886	66,195	1,362,886
2032	0	1,429,081	66,195	1,429,081
2033	0	1,429,081	66,195	1,495,276
2034	0	1,429,081	66,195	1,561,471
2035	0	1,429,081	66,195	1,627,666
2036	0	1,429,081	66,195	1,693,862
2037	0	1,429,081	66,195	1,760,057
2038	0	1,429,081	66,195	1,826,252
2039	0	1,429,081	66,195	1,892,447
2040	0	1,429,081	66,195	1,958,642
2041	0	1,429,081	66,195	2,024,838
2042	0	1,429,081	66,195	2,091,033
2043	0	1,429,081	66,195	2,157,228
2044	0	1,429,081	66,195	2,223,423
2045	0	1,429,081	66,195	2,289,618
2046	0	1,429,081	66,195	2,355,814
2047	0	1,429,081	66,195	2,422,009
2048	0	1,429,081	66,195	2,488,204
2049	0	1,429,081	66,195	2,554,399
2050	0	1,429,081	66,195	2,620,594
2051	0	1,429,081	66,195	2,686,790
2052	0	1,429,081	66,195	2,752,985
2053	0	1,429,081	66,195	2,819,180
2054	0	1,429,081	66,195	2,885,375
2055	0	1,429,081	66,195	2,951,570
2056	0	1,429,081	66,195	3,017,766
2057	0	1,429,081	66,195	3,083,961
2058	0	1,429,081	66,195	3,150,156
2059	0	1,429,081	66,195	3,216,351
2060	0	1,429,081	66,195	3,282,547
2061	0	1,429,081	66,195	3,348,742
2062	0	1,429,081	66,195	3,414,937
2063	0	1,429,081	66,195	3,481,132
2064	0	1,429,081	66,195	3,547,327
2065	0	1,429,081	66,195	3,613,523
2066	0	1,429,081	66,195	3,679,718
2067	0	1,429,081	66,195	3,745,913
2068	0	1,429,081	66,195	3,812,108

Year	User Waste Acceptance Inputs (Mg/year)	User Waste- In-Place (Mg)	Waste Acceptance (Mg/year)	Waste-In- Place (Mg)
2069	0	1,429,081	66,195	3,878,303
2070	0	1,429,081	66,195	3,944,499
2071	0	1,429,081	66,195	4,010,694
2072	0	1,429,081	66,195	4,076,889
2073	0	1,429,081	66,195	4,143,084
2074	0	1,429,081	66,195	4,209,279
2075	0	1,429,081	66,195	4,275,475
2076	0	1,429,081	66,195	4,341,670
2077	0	1,429,081	66,195	4,407,865
2078	0	1,429,081	66,195	4,474,060
2079	0	1,429,081	66,195	4,540,255
2080	0	1,429,081	66,195	4,606,451
2081	0	1,429,081	66,195	4,672,646
2082	0	1,429,081	66,195	4,738,841
2083	0	1,429,081	66,195	4,805,036
2084	0	1,429,081	66,195	4,871,231
2085	0	1,429,081	66,195	4,937,427
2086	0	1,429,081	66,195	5,003,622
2087	0	1,429,081	0	5,069,817
2088	0	1,429,081	0	5,069,817

RESULTS

Landfill Name or Identifier: Grand Forks Active MSWLF

Closure Year (with 80-year limit) = 2087
 Methane = 50 % by volume

Please choose a third unit of measure to represent all of
 the emission rates below.

User-specified Unit:

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	(short tons/year)	(Mg)	(short tons)	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	13,332	14,665	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	52,394	57,633	13,332	14,665	1.122E+02	8.984E+04	6.037E+00	2.997E+01	4.492E+04	3.018E+00	8.223E+01	4.492E+04	3.018E+00	7.813E-02	2.180E+01	1.464E+03
2011	61,385	67,523	65,726	72,298	5.509E+02	4.412E+05	2.964E+01	1.472E+02	2.206E+05	1.482E+01	4.038E+02	2.206E+05	1.482E+01	1.070E+02	7.191E-03	7.191E-03
2012	63,327	69,660	127,110	139,821	1.057E+03	8.461E+05	5.685E+01	2.822E+02	4.231E+05	2.842E+01	7.744E+02	4.231E+05	2.842E+01	7.358E-01	2.053E+02	1.379E-02
2013	64,409	70,849	190,438	209,481	1.569E+03	1.256E+06	8.440E+01	4.190E+02	6.281E+05	4.220E+01	1.150E+03	6.281E+05	4.220E+01	1.092E+00	3.047E+02	2.048E-02
2014	67,673	74,440	254,846	280,331	2.080E+03	1.665E+06	1.119E+02	5.555E+02	8.327E+05	5.595E+01	1.524E+03	8.327E+05	5.595E+01	1.448E+00	4.040E+02	2.715E-02
2015	73,774	81,151	322,519	354,771	2.608E+03	2.088E+06	1.403E+02	6.966E+02	1.044E+06	7.016E+01	1.911E+03	1.044E+06	7.016E+01	1.816E+00	5.066E+02	3.404E-02
2016	68,376	75,214	396,292	435,922	3.177E+03	2.544E+06	1.709E+02	8.487E+02	1.272E+06	8.547E+01	2.329E+03	1.272E+06	8.547E+01	2.212E+00	6.172E+02	4.147E-02
2017	68,369	75,206	464,669	511,136	3.690E+03	2.955E+06	1.985E+02	9.856E+02	1.477E+06	9.926E+01	2.704E+03	1.477E+06	9.926E+01	2.569E+00	7.168E+02	4.816E-02
2018	67,850	74,635	533,038	586,342	4.192E+03	3.357E+06	2.255E+02	1.120E+03	1.678E+06	1.128E+02	3.072E+03	1.678E+06	1.128E+02	2.919E+00	8.144E+02	5.472E-02
2019	68,737	75,611	600,888	660,977	4.680E+03	3.748E+06	2.518E+02	1.250E+03	1.874E+06	1.259E+02	3.430E+03	1.874E+06	1.259E+02	3.259E+00	9.092E+02	6.109E-02
2020	65,246	71,770	669,625	736,588	5.166E+03	4.137E+06	2.779E+02	1.380E+03	2.068E+06	1.390E+02	3.786E+03	2.068E+06	1.390E+02	3.597E+00	1.004E+03	7.436E-02
2021	58,777	64,655	734,871	808,358	5.613E+03	4.494E+06	3.020E+02	1.499E+03	2.247E+06	1.510E+02	4.114E+03	2.247E+06	1.510E+02	3.908E+00	1.090E+03	7.262E-02
2022	61,624	67,786	793,648	873,013	5.996E+03	4.802E+06	3.226E+02	1.602E+03	2.401E+06	1.613E+02	4.395E+03	2.401E+06	1.613E+02	4.175E+00	1.165E+03	7.827E-02
2023	62,240	68,464	855,271	940,799	6.396E+03	5.122E+06	3.441E+02	1.709E+03	2.561E+06	1.721E+02	4.688E+03	2.561E+06	1.721E+02	4.454E+00	1.243E+03	8.349E-02
2024	61,741	67,916	917,511	1,009,262	6.793E+03	5.440E+06	3.655E+02	1.815E+03	2.720E+06	1.828E+02	4.979E+03	2.720E+06	1.828E+02	4.730E+00	1.320E+03	8.867E-02
2025	62,359	68,595	979,253	1,077,178	7.179E+03	5.748E+06	3.862E+02	1.917E+03	2.874E+06	1.931E+02	5.261E+03	2.874E+06	1.931E+02	4.999E+00	1.395E+03	9.370E-02
2026	62,982	69,281	1,041,612	1,145,773	7.561E+03	6.055E+06	4.068E+02	2.020E+03	3.027E+06	2.034E+02	5.542E+03	3.027E+06	2.034E+02	5.265E+00	1.469E+03	9.896E-02
2027	63,612	69,974	1,104,594	1,215,054	7.942E+03	6.359E+06	4.273E+02	2.121E+03	3.180E+06	2.136E+02	5.820E+03	3.180E+06	2.136E+02	5.530E+00	1.543E+03	1.037E-01
2028	64,248	70,673	1,168,206	1,285,027	8.320E+03	6.662E+06	4.476E+02	2.222E+03	3.331E+06	2.238E+02	6.097E+03	3.331E+06	2.238E+02	5.793E+00	1.616E+03	1.086E-01
2029	64,891	71,380	1,232,455	1,355,700	8.696E+03	6.963E+06	4.678E+02	2.323E+03	3.482E+06	2.339E+02	6.373E+03	3.482E+06	2.339E+02	6.055E+00	1.689E+03	1.135E-01
2030	65,540	72,094	1,297,346	1,427,080	9.070E+03	7.262E+06	4.880E+02	2.423E+03	3.631E+06	2.440E+02	6.647E+03	3.631E+06	2.440E+02	6.315E+00	1.762E+03	1.184E-01
2031	66,195	72,815	1,362,886	1,499,174	9.442E+03	7.560E+06	5.080E+02	2.522E+03	3.780E+06	2.540E+02	6.920E+03	3.780E+06	2.540E+02	6.574E+00	1.834E+03	1.232E-01
2032	66,195	72,815	1,429,081	1,571,989	9.812E+03	7.857E+06	5.279E+02	2.621E+03	3.928E+06	2.639E+02	7.191E+03	3.928E+06	2.639E+02	6.832E+00	1.906E+03	1.281E-01
2033	66,195	72,815	1,495,276	1,644,804	1.017E+04	8.147E+06	5.474E+02	2.718E+03	4.074E+06	2.737E+02	7.457E+03	4.074E+06	2.737E+02	7.085E+00	1.977E+03	1.328E-01
2034	66,195	72,815	1,561,471	1,717,618	1.053E+04	8.432E+06	5.665E+02	2.813E+03	4.216E+06	2.833E+02	7.717E+03	4.216E+06	2.833E+02	7.332E+00	2.046E+03	1.374E-01
2035	66,195	72,815	1,627,666	1,790,433	1.088E+04	8.711E+06	5.853E+02	2.906E+03	4.356E+06	2.927E+02	7.973E+03	4.356E+06	2.927E+02	7.575E+00	2.113E+03	1.420E-01
2036	66,195	72,815	1,693,862	1,863,248	1.122E+04	8.985E+06	6.037E+02	2.997E+03	4.492E+06	3.018E+02	8.223E+03	4.492E+06	3.018E+02	7.813E+00	2.180E+03	1.465E-01
2037	66,195	72,815	1,760,057	1,936,062	1.156E+04	9.253E+06	6.217E+02	3.087E+03	4.626E+06	3.109E+02	8.469E+03	4.626E+06	3.109E+02	8.046E+00	2.245E+03	1.508E-01
2038	66,195	72,815	1,826,252	2,008,877	1.188E+04	9.516E+06	6.394E+02	3.174E+03	4.758E+06	3.197E+02	8.709E+03	4.758E+06	3.197E+02	8.275E+00	2.309E+03	1.551E-01
2039	66,195	72,815	1,892,447	2,081,692	1.221E+04	9.774E+06	6.567E+02	3.260E+03	4.887E+06	3.283E+02	8.945E+03	4.887E+06	3.283E+02	8.499E+00	2.371E+03	1.593E-01
2040	66,195	72,815	1,958,642	2,154,507	1.252E+04	1.003E+07	6.737E+02	3.344E+03	5.013E+06	3.368E+02	9.176E+03	5.013E+06	3.368E+02	8.719E+00	2.432E+03	1.634E-01
2041	66,195	72,815	2,024,838	2,227,321	1.283E+04	1.027E+07	6.903E+02	3.427E+03	5.137E+06	3.451E+02	9.403E+03	5.137E+06	3.451E+02	8.934E+00	2.492E+03	1.675E-01
2042	66,195	72,815	2,091,033	2,300,136	1.313E+04	1.052E+07	7.066E+02	3.508E+03	5.258E+06	3.533E+02	9.625E+03	5.258E+06	3.533E+02	9.145E+00	2.551E+03	1.714E-01
2043	66,195	72,815	2,157,228	2,372,951	1.343E+04	1.075E+07	7.226E+02	3.587E+03	5.377E+06	3.613E+02	9.843E+03	5.377E+06	3.613E+02	9.352E+00	2.609E+03	1.753E-01
2044	66,195	72,815	2,223,423	2,445,766	1.372E+04	1.099E+07	7.382E+02	3.665E+03	5.494E+06	3.691E+02	1.006E+04	5.494E+06	3.691E+02	9.555E+00	2.666E+03	1.791E-01
2045	66,195	72,815	2,289,618	2,518,580	1.401E+04	1.122E+07	7.536E+02	3.741E+03	5.608E+06	3.768E+02	1.027E+04	5.608E+06	3.768E+02	9.753E+00	2.721E+03	1.828E-01
2046	66,195	72,815	2,355,814	2,591,395	1.429E+04	1.144E+07	7.686E+02	3.816E+03	5.720E+06	3.843E+02	1.047E+04	5.720E+06	3.843E+02	9.944E+00	2.775E+03	1.865E-01
2047	66,195	72,815	2,422,009	2,664,210	1.456E+04	1.166E+07	7.834E+02	3.889E+03	5.830E+06	3.917E+02	1.067E+04	5.830E+06	3.917E+02	1.014E+01	2.829E+03	1.901E-01
2048	66,195	72,815	2,488,204	2,737,024	1.483E+04	1.187E+07	7.979E+02	3.961E+03	5.937E+06	3.989E+02	1.087E+04	5.937E+06	3.989E+02	1.033E+01	2.881E+03	1.936E-01
2049	66,195	72,815	2,554,399	2,809,839	1.509E+04	1.209E+07	8.120E+02	4.031E+03	6.043E+06	4.060E+02	1.106E+04	6.043E+06	4.060E+02	1.051E+01	2.932E+03	1.970E-01
2050	66,195	72,815	2,620,594	2,882,654	1.535E+04	1.229E+07	8.259E+02	4.100E+03	6.146E+06	4.130E+02	1.125E+04	6.146E+06	4.130E+02	1.069E+01	2.982E+03	2.004E-01
2051	66,195	72,815	2,686,790	2,955,469	1.560E+04	1.250E+07	8.395E+02	4.168E+03	6.248E+06	4.198E+02	1.144E+04	6.248E+06	4.198E+02	1.087E+01	3.031E+03	2.037E-01
2052	66,195	72,815	2,752,985	3,028,283	1.585E+04	1.269E+07	8.529E+02	4.234E+03	6.347							

RESULTS

Landfill Name or Identifier: Grand Forks Active MSWLF

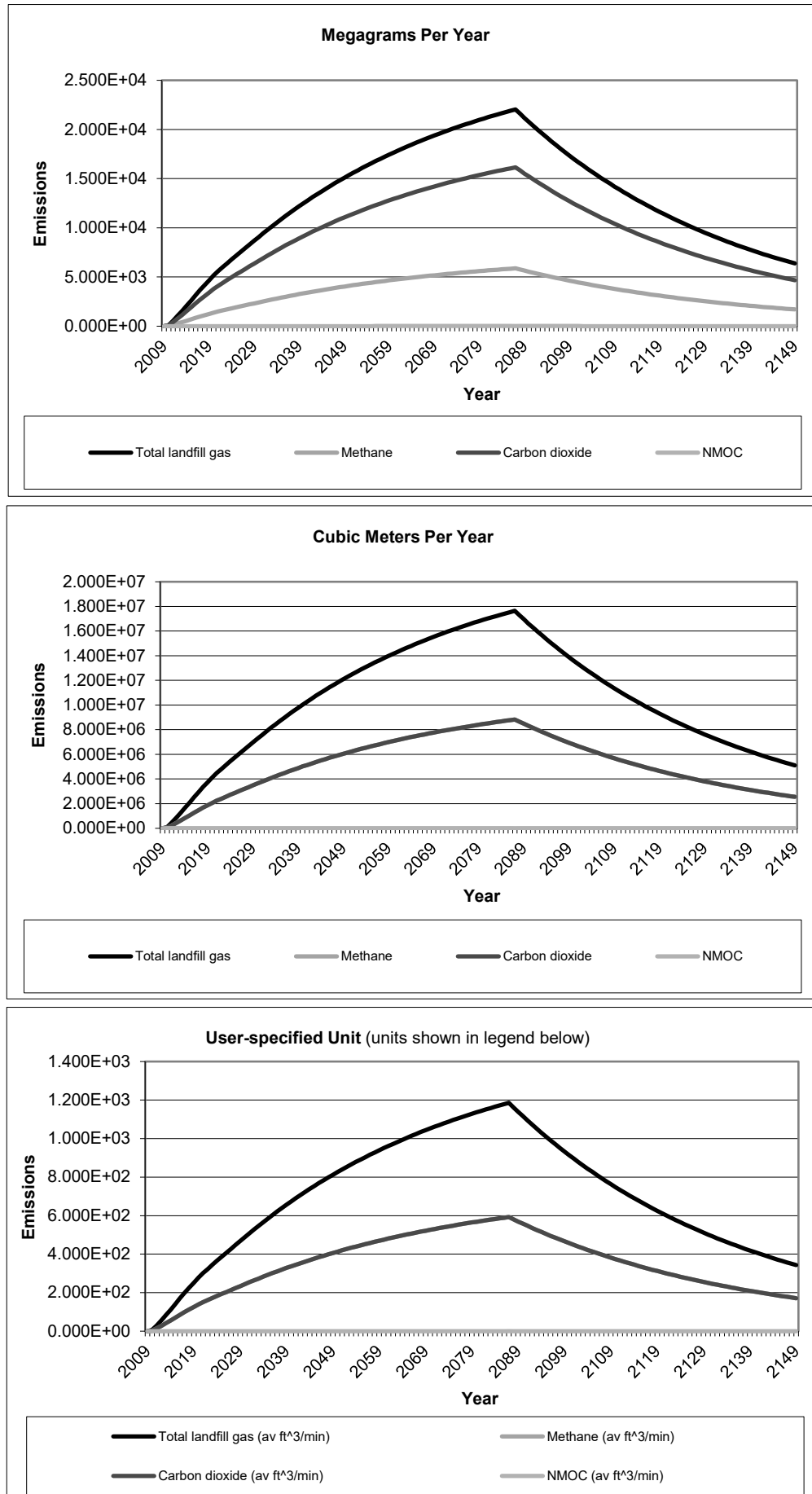
Closure Year (with 80-year limit) = 2087
 Methane = 50 % by volume

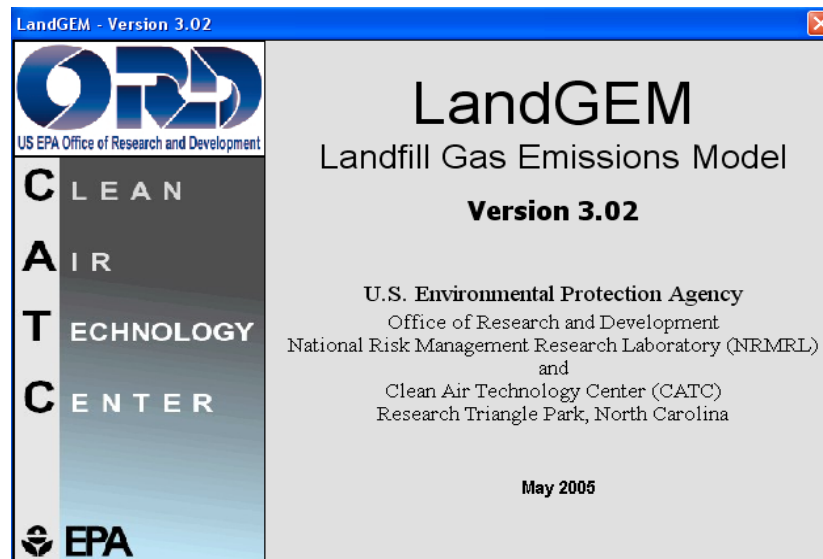
Please choose a third unit of measure to represent all of
 the emission rates below.

User-specified Unit:

Year	Waste Accepted		Waste-In-Place		Total landfill gas		Methane		Carbon dioxide		NMOC					
	(Mg/year)	(short tons/year)	(Mg)	(short tons)	(Mg/year)	(m³/year)	(av ft³/3min)	(Mg/year)	(m³/year)	(av ft³/3min)	(Mg/year)	(m³/year)	(av ft³/3min)			
2085	66,195	72,815	4,937,427	5,431,169	2.179E+04	1.745E+07	1.172E+03	5.819E+03	8.723E+06	5.861E+02	1.597E+04	8.723E+06	5.861E+02	1.517E+01	4.232E+03	2.844E-01
2086	66,195	72,815	5,003,622	5,503,984	2.191E+04	1.755E+07	1.179E+03	5.853E+03	8.773E+06	5.895E+02	1.606E+04	8.773E+06	5.895E+02	1.526E+01	4.257E+03	2.860E-01
2087	0	0	5,069,817	5,576,799	2.204E+04	1.764E+07	1.186E+03	5.886E+03	8.822E+06	5.928E+02	1.615E+04	8.822E+06	5.928E+02	1.534E+01	4.281E+03	2.876E-01
2088	0	0	5,069,817	5,576,799	2.160E+04	1.730E+07	1.162E+03	5.769E+03	8.648E+06	5.810E+02	1.583E+04	8.648E+06	5.810E+02	1.504E+01	4.196E+03	2.819E-01
2089	0	0	5,069,817	5,576,799	2.117E+04	1.695E+07	1.139E+03	5.655E+03	8.477E+06	5.695E+02	1.552E+04	8.477E+06	5.695E+02	1.474E+01	4.113E+03	2.763E-01
2090	0	0	5,069,817	5,576,799	2.075E+04	1.662E+07	1.117E+03	5.543E+03	8.309E+06	5.583E+02	1.521E+04	8.309E+06	5.583E+02	1.445E+01	4.031E+03	2.709E-01
2091	0	0	5,069,817	5,576,799	2.034E+04	1.629E+07	1.094E+03	5.433E+03	8.144E+06	5.472E+02	1.491E+04	8.144E+06	5.472E+02	1.416E+01	3.952E+03	2.655E-01
2092	0	0	5,069,817	5,576,799	1.994E+04	1.597E+07	1.073E+03	5.326E+03	7.983E+06	5.364E+02	1.461E+04	7.983E+06	5.364E+02	1.388E+01	3.873E+03	2.602E-01
2093	0	0	5,069,817	5,576,799	1.954E+04	1.565E+07	1.051E+03	5.220E+03	7.825E+06	5.257E+02	1.432E+04	7.825E+06	5.257E+02	1.361E+01	3.797E+03	2.551E-01
2094	0	0	5,069,817	5,576,799	1.916E+04	1.534E+07	1.031E+03	5.117E+03	7.670E+06	5.153E+02	1.404E+04	7.670E+06	5.153E+02	1.334E+01	3.721E+03	2.500E-01
2095	0	0	5,069,817	5,576,799	1.878E+04	1.504E+07	1.010E+03	5.016E+03	7.518E+06	5.051E+02	1.376E+04	7.518E+06	5.051E+02	1.308E+01	3.648E+03	2.451E-01
2096	0	0	5,069,817	5,576,799	1.841E+04	1.474E+07	9.903E+02	4.916E+03	7.369E+06	4.951E+02	1.349E+04	7.369E+06	4.951E+02	1.282E+01	3.576E+03	2.402E-01
2097	0	0	5,069,817	5,576,799	1.804E+04	1.445E+07	9.707E+02	4.819E+03	7.223E+06	4.853E+02	1.322E+04	7.223E+06	4.853E+02	1.256E+01	3.505E+03	2.355E-01
2098	0	0	5,069,817	5,576,799	1.768E+04	1.416E+07	9.514E+02	4.724E+03	7.080E+06	4.757E+02	1.296E+04	7.080E+06	4.757E+02	1.231E+01	3.435E+03	2.308E-01
2099	0	0	5,069,817	5,576,799	1.733E+04	1.388E+07	9.326E+02	4.630E+03	6.940E+06	4.663E+02	1.270E+04	6.940E+06	4.663E+02	1.207E+01	3.367E+03	2.262E-01
2100	0	0	5,069,817	5,576,799	1.699E+04	1.361E+07	9.141E+02	4.538E+03	6.803E+06	4.571E+02	1.245E+04	6.803E+06	4.571E+02	1.183E+01	3.301E+03	2.218E-01
2101	0	0	5,069,817	5,576,799	1.665E+04	1.334E+07	8.960E+02	4.448E+03	6.668E+06	4.480E+02	1.221E+04	6.668E+06	4.480E+02	1.160E+01	3.235E+03	2.174E-01
2102	0	0	5,069,817	5,576,799	1.632E+04	1.307E+07	8.783E+02	4.360E+03	6.536E+06	4.391E+02	1.196E+04	6.536E+06	4.391E+02	1.137E+01	3.171E+03	2.131E-01
2103	0	0	5,069,817	5,576,799	1.600E+04	1.281E+07	8.609E+02	4.274E+03	6.406E+06	4.304E+02	1.173E+04	6.406E+06	4.304E+02	1.114E+01	3.108E+03	2.089E-01
2104	0	0	5,069,817	5,576,799	1.568E+04	1.256E+07	8.438E+02	4.189E+03	6.280E+06	4.219E+02	1.149E+04	6.280E+06	4.219E+02	1.092E+01	3.047E+03	2.047E-01
2105	0	0	5,069,817	5,576,799	1.537E+04	1.231E+07	8.271E+02	4.106E+03	6.155E+06	4.136E+02	1.127E+04	6.155E+06	4.136E+02	1.071E+01	2.987E+03	2.007E-01
2106	0	0	5,069,817	5,576,799	1.507E+04	1.207E+07	8.108E+02	4.025E+03	6.033E+06	4.054E+02	1.104E+04	6.033E+06	4.054E+02	1.049E+01	2.927E+03	1.967E-01
2107	0	0	5,069,817	5,576,799	1.477E+04	1.183E+07	7.947E+02	3.945E+03	5.914E+06	3.974E+02	1.083E+04	5.914E+06	3.974E+02	1.029E+01	2.869E+03	1.928E-01
2108	0	0	5,069,817	5,576,799	1.448E+04	1.159E+07	7.790E+02	3.867E+03	5.797E+06	3.895E+02	1.061E+04	5.797E+06	3.895E+02	1.008E+01	2.813E+03	1.890E-01
2109	0	0	5,069,817	5,576,799	1.419E+04	1.136E+07	7.635E+02	3.791E+03	5.682E+06	3.818E+02	1.040E+04	5.682E+06	3.818E+02	9.882E+00	2.757E+03	1.852E-01
2110	0	0	5,069,817	5,576,799	1.391E+04	1.114E+07	7.484E+02	3.716E+03	5.569E+06	3.742E+02	1.019E+04	5.569E+06	3.742E+02	9.686E+00	2.702E+03	1.816E-01
2111	0	0	5,069,817	5,576,799	1.364E+04	1.092E+07	7.336E+02	3.642E+03	5.459E+06	3.668E+02	9.993E+03	5.459E+06	3.668E+02	9.495E+00	2.649E+03	1.780E-01
2112	0	0	5,069,817	5,576,799	1.337E+04	1.070E+07	7.191E+02	3.570E+03	5.351E+06	3.595E+02	9.795E+03	5.351E+06	3.595E+02	9.307E+00	2.596E+03	1.744E-01
2113	0	0	5,069,817	5,576,799	1.310E+04	1.049E+07	7.048E+02	3.499E+03	5.245E+06	3.524E+02	9.601E+03	5.245E+06	3.524E+02	9.122E+00	2.545E+03	1.710E-01
2114	0	0	5,069,817	5,576,799	1.284E+04	1.028E+07	6.909E+02	3.430E+03	5.141E+06	3.454E+02	9.411E+03	5.141E+06	3.454E+02	8.942E+00	2.495E+03	1.676E-01
2115	0	0	5,069,817	5,576,799	1.259E+04	1.008E+07	6.772E+02	3.362E+03	5.039E+06	3.386E+02	9.225E+03	5.039E+06	3.386E+02	8.765E+00	2.445E+03	1.643E-01
2116	0	0	5,069,817	5,576,799	1.234E+04	9.879E+06	6.638E+02	3.296E+03	4.940E+06	3.319E+02	9.042E+03	4.940E+06	3.319E+02	8.591E+00	2.397E+03	1.610E-01
2117	0	0	5,069,817	5,576,799	1.209E+04	9.684E+06	6.507E+02	3.230E+03	4.842E+06	3.253E+02	8.863E+03	4.842E+06	3.253E+02	8.421E+00	2.349E+03	1.578E-01
2118	0	0	5,069,817	5,576,799	1.185E+04	9.492E+06	6.378E+02	3.168E+03	4.746E+06	3.189E+02	8.688E+03	4.746E+06	3.189E+02	8.254E+00	2.303E+03	1.547E-01
2119	0	0	5,069,817	5,576,799	1.162E+04	9.304E+06	6.251E+02	3.104E+03	4.652E+06	3.126E+02	8.516E+03	4.652E+06	3.126E+02	8.091E+00	2.257E+03	1.517E-01
2120	0	0	5,069,817	5,576,799	1.139E+04	9.120E+06	6.128E+02	3.042E+03	4.560E+06	3.064E+02	8.347E+03	4.560E+06	3.064E+02	7.931E+00	2.212E+03	1.487E-01
2121	0	0	5,069,817	5,576,799	1.116E+04	8.939E+06	6.006E+02	2.982E+03	4.470E+06	3.003E+02	8.182E+03	4.470E+06	3.003E+02	7.773E+00	2.169E+03	1.457E-01
2122	0	0	5,069,817	5,576,799	1.094E+04	8.762E+06	5.887E+02	2.923E+03	4.381E+06	2.944E+02	8.020E+03	4.381E+06	2.944E+02	7.620E+00	2.126E+03	1.428E-01
2123	0	0	5,069,817	5,576,799	1.073E+04	8.589E+06	5.771E+02	2.865E+03	4.294E+06	2.885E+02	7.861E+03	4.294E+06	2.885E+02	7.469E+00	2.084E+03	1.400E-01
2124	0	0	5,069,817	5,576,799	1.051E+04	8.419E+06	5.656E+02	2.808E+03	4.209E+06	2.828E+02	7.705E+03	4.209E+06	2.828E+02	7.321E+00	2.042E+03	1.372E-01
2125	0	0	5,069,817	5,576,799	1.031E+04	8.252E+06	5.544E+02	2.753E+03	4.126E+06	2.772E+02	7.553E+03	4.126E+06	2.772E+02	7.176E+00	2.002E+03	1.345E-01
2126	0	0	5,069,817	5,576,799	1.010E+04	8.089E+06	5.435E+02	2.698E+03	4.044E+06	2.717E+02	7.403E+03	4.044E+06	2.717E+02	7.034E+00	1.962E+03	1.318E-01
2127	0	0	5,069,817	5,576,799	9.901E+03	7.928E+06	5.327E+02	2.645E+03	3.964E+06	2.664E+02	7.256E+03	3.964E+06	2.664E+02	6.894E+00	1.923E+03	1.292E-01
2128	0	0	5,069,817	5,576,799	9.705E+03	7.771E+06	5.222E+02	2.592E+03	3.886E+06	2.611E+02	7.113E+03	3.886E+06	2.611E+02	6.758E+00	1.885E+03	1.267E-01
2129	0	0	5,069,817	5,576,799	9.513E+03	7.618E+06	5.118E+02	2.541E+03	3.809E+06	2.559E+02	6.972E+03	3.809E+06	2.559E+02	6.624E+00	1.848E+03	1.242E-01
2130	0	0	5,069,817	5,576,799	9.325E+03	7.467E+06	5.017E+02	2.491E+03	3.733E+06	2.508E+02	6.834E+03	3.733E+06	2.508E+02	6.493E+00	1.811E+03	1.217E-01
2131	0	0	5,069,817	5,576,799	9.140E+03	7.319E+06	4.918E+02									

GRAPHS

Landfill Name or Identifier: Grand Forks Active MSWLF



Summary Report

Landfill Name or Identifier: Grand Forks Active MSWLF

Date: Tuesday, February 4, 2025

Description/Comments:

Grand Forks Title V Renewal 12/2024

Methane Generation Rate (k) based on 30-year normal precipitation data (<25 inches / year)

NMOC Concentration based on Oct 2024 Tier 2 Testing- 242.6 ppmv as hexane

About LandGEM:

First-Order Decomposition Rate Equation:

$$Q_{CH_4} = \sum_{i=1}^n \sum_{j=0.1}^1 k L_o \left(\frac{M_i}{10} \right) e^{-k t_{ij}}$$

Where,

Q_{CH_4} = annual methane generation in the year of the calculation ($m^3/year$)

i = 1-year time increment

n = (year of the calculation) - (initial year of waste acceptance)

j = 0.1-year time increment

k = methane generation rate ($year^{-1}$)

L_o = potential methane generation capacity (m^3/Mg)

M_i = mass of waste accepted in the i^{th} year (Mg)

t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (decimal years, e.g., 3.2 years)

LandGEM is based on a first-order decomposition rate equation for quantifying emissions from the decomposition of landfilled waste in municipal solid waste (MSW) landfills. The software provides a relatively simple approach to estimating landfill gas emissions. Model defaults are based on empirical data from U.S. landfills. Field test data can also be used in place of model defaults when available. Further guidance on EPA test methods, Clean Air Act (CAA) regulations, and other guidance regarding landfill gas emissions and control technology requirements can be found at <http://www.epa.gov/ttnatw01/landfill/landflpg.html>.

LandGEM is considered a screening tool — the better the input data, the better the estimates. Often, there are limitations with the available data regarding waste quantity and composition, variation in design and operating practices over time, and changes occurring over time that impact the emissions potential. Changes to landfill operation, such as operating under wet conditions through leachate recirculation or other liquid additions, will result in generating more gas at a faster rate. Defaults for estimating emissions for this type of operation are being developed to include in LandGEM along with defaults for conventional landfills (no leachate or liquid additions) for developing emission inventories and determining CAA applicability. Refer to the Web site identified above for future updates.

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year **2009**
 Landfill Closure Year (with 80-year limit) **2087**
Actual Closure Year (without limit) **2087**
 Have Model Calculate Closure Year? **No**
 Waste Design Capacity *megagrams*

MODEL PARAMETERS

Methane Generation Rate, k **0.020** *year⁻¹*
 Potential Methane Generation Capacity, L₀ **170** *m³/Mg*
 NMOC Concentration **243** *ppmv as hexane*
 Methane Content **50** *% by volume*

GASES / POLLUTANTS SELECTED

Gas / Pollutant #1: **Total landfill gas**
 Gas / Pollutant #2: **Methane**
 Gas / Pollutant #3: **Carbon dioxide**
 Gas / Pollutant #4: **NMOC**

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2009	13,332	14,665	0	0
2010	52,394	57,633	13,332	14,665
2011	61,385	67,523	65,726	72,298
2012	63,327	69,660	127,110	139,821
2013	64,409	70,849	190,438	209,481
2014	67,673	74,440	254,846	280,331
2015	73,774	81,151	322,519	354,771
2016	68,376	75,214	396,292	435,922
2017	68,369	75,206	464,669	511,136
2018	67,850	74,635	533,038	586,342
2019	68,737	75,611	600,888	660,977
2020	65,246	71,770	669,625	736,588
2021	58,777	64,655	734,871	808,358
2022	61,624	67,786	793,648	873,013
2023	62,240	68,464	855,271	940,799
2024	61,741	67,916	917,511	1,009,262
2025	62,359	68,595	979,253	1,077,178
2026	62,982	69,281	1,041,612	1,145,773
2027	63,612	69,974	1,104,594	1,215,054
2028	64,248	70,673	1,168,206	1,285,027
2029	64,891	71,380	1,232,455	1,355,700
2030	65,540	72,094	1,297,346	1,427,080
2031	66,195	72,815	1,362,886	1,499,174
2032	66,195	72,815	1,429,081	1,571,989
2033	66,195	72,815	1,495,276	1,644,804
2034	66,195	72,815	1,561,471	1,717,618
2035	66,195	72,815	1,627,666	1,790,433
2036	66,195	72,815	1,693,862	1,863,248
2037	66,195	72,815	1,760,057	1,936,062
2038	66,195	72,815	1,826,252	2,008,877
2039	66,195	72,815	1,892,447	2,081,692
2040	66,195	72,815	1,958,642	2,154,507
2041	66,195	72,815	2,024,838	2,227,321
2042	66,195	72,815	2,091,033	2,300,136
2043	66,195	72,815	2,157,228	2,372,951
2044	66,195	72,815	2,223,423	2,445,766
2045	66,195	72,815	2,289,618	2,518,580
2046	66,195	72,815	2,355,814	2,591,395
2047	66,195	72,815	2,422,009	2,664,210
2048	66,195	72,815	2,488,204	2,737,024

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2049	66,195	72,815	2,554,399	2,809,839
2050	66,195	72,815	2,620,594	2,882,654
2051	66,195	72,815	2,686,790	2,955,469
2052	66,195	72,815	2,752,985	3,028,283
2053	66,195	72,815	2,819,180	3,101,098
2054	66,195	72,815	2,885,375	3,173,913
2055	66,195	72,815	2,951,570	3,246,728
2056	66,195	72,815	3,017,766	3,319,542
2057	66,195	72,815	3,083,961	3,392,357
2058	66,195	72,815	3,150,156	3,465,172
2059	66,195	72,815	3,216,351	3,537,986
2060	66,195	72,815	3,282,547	3,610,801
2061	66,195	72,815	3,348,742	3,683,616
2062	66,195	72,815	3,414,937	3,756,431
2063	66,195	72,815	3,481,132	3,829,245
2064	66,195	72,815	3,547,327	3,902,060
2065	66,195	72,815	3,613,523	3,974,875
2066	66,195	72,815	3,679,718	4,047,690
2067	66,195	72,815	3,745,913	4,120,504
2068	66,195	72,815	3,812,108	4,193,319
2069	66,195	72,815	3,878,303	4,266,134
2070	66,195	72,815	3,944,499	4,338,948
2071	66,195	72,815	4,010,694	4,411,763
2072	66,195	72,815	4,076,889	4,484,578
2073	66,195	72,815	4,143,084	4,557,393
2074	66,195	72,815	4,209,279	4,630,207
2075	66,195	72,815	4,275,475	4,703,022
2076	66,195	72,815	4,341,670	4,775,837
2077	66,195	72,815	4,407,865	4,848,652
2078	66,195	72,815	4,474,060	4,921,466
2079	66,195	72,815	4,540,255	4,994,281
2080	66,195	72,815	4,606,451	5,067,096
2081	66,195	72,815	4,672,646	5,139,910
2082	66,195	72,815	4,738,841	5,212,725
2083	66,195	72,815	4,805,036	5,285,540
2084	66,195	72,815	4,871,231	5,358,355
2085	66,195	72,815	4,937,427	5,431,169
2086	66,195	72,815	5,003,622	5,503,984
2087	0	0	5,069,817	5,576,799
2088	0	0	5,069,817	5,576,799

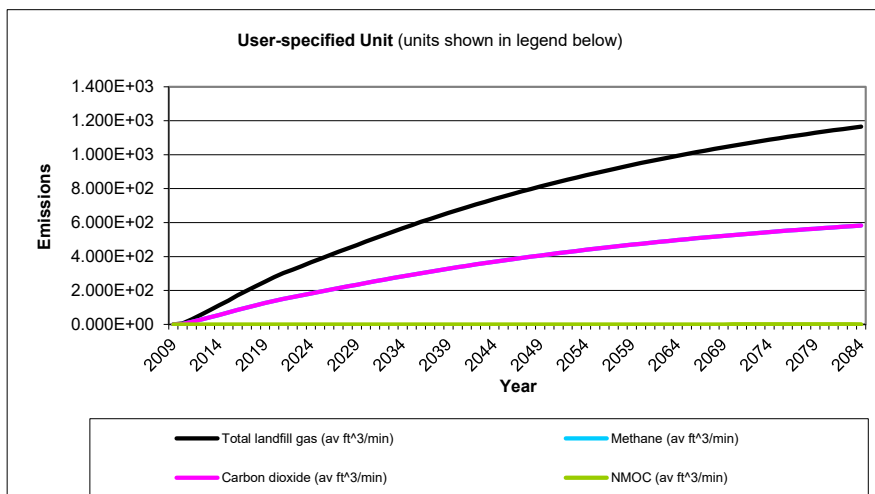
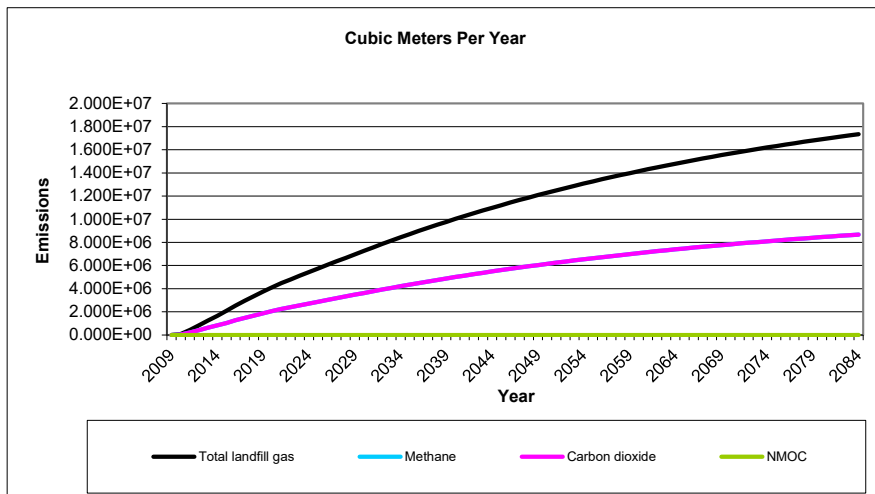
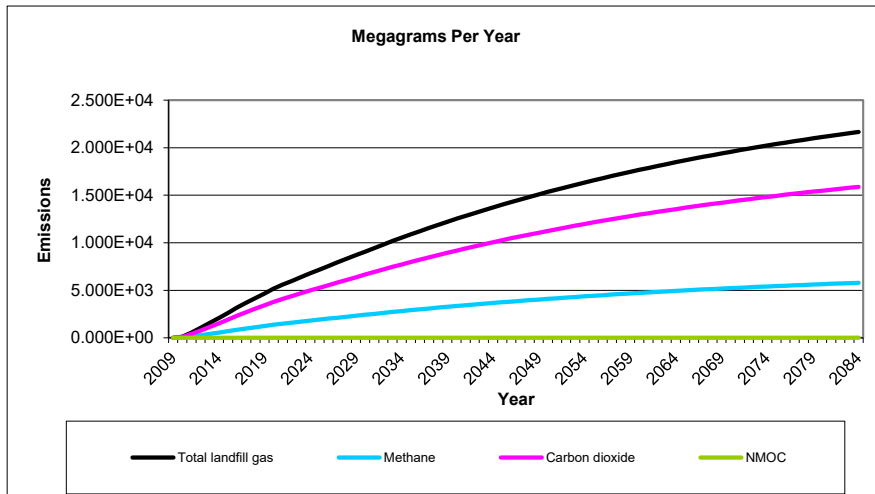
Pollutant Parameters

Gas / Pollutant Default Parameters:				User-specified Pollutant Parameters:	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC		86.18		
Pollutants	1,1,1-Trichloroethane (methyl chloroform) - HAP	0.48	133.41		
	1,1,2,2- Tetrachloroethane - HAP/VOC	1.1	167.85		
	1,1-Dichloroethane (ethylidene dichloride) - HAP/VOC	2.4	98.97		
	1,1-Dichloroethene (vinylidene chloride) - HAP/VOC	0.20	96.94		
	1,2-Dichloroethane (ethylene dichloride) - HAP/VOC	0.41	98.96		
	1,2-Dichloropropane (propylene dichloride) - HAP/VOC	0.18	112.99		
	2-Propanol (isopropyl alcohol) - VOC	50	60.11		
	Acetone	7.0	58.08		
	Acrylonitrile - HAP/VOC	6.3	53.06		
	Benzene - No or Unknown Co-disposal - HAP/VOC	1.9	78.11		
	Benzene - Co-disposal - HAP/VOC	11	78.11		
	Bromodichloromethane - VOC	3.1	163.83		
	Butane - VOC	5.0	58.12		
	Carbon disulfide - HAP/VOC	0.58	76.13		
	Carbon monoxide	140	28.01		
	Carbon tetrachloride - HAP/VOC	4.0E-03	153.84		
	Carbonyl sulfide - HAP/VOC	0.49	60.07		
	Chlorobenzene - HAP/VOC	0.25	112.56		
	Chlorodifluoromethane	1.3	86.47		
	Chloroethane (ethyl chloride) - HAP/VOC	1.3	64.52		
	Chloroform - HAP/VOC	0.03	119.39		
	Chloromethane - VOC	1.2	50.49		
	Dichlorobenzene - (HAP for para isomer/VOC)	0.21	147		
	Dichlorodifluoromethane	16	120.91		
	Dichlorofluoromethane - VOC	2.6	102.92		
	Dichloromethane (methylene chloride) - HAP	14	84.94		
	Dimethyl sulfide (methyl sulfide) - VOC	7.8	62.13		
	Ethane	890	30.07		
	Ethanol - VOC	27	46.08		

Pollutant Parameters (Continued)

<i>Gas / Pollutant Default Parameters:</i>				<i>User-specified Pollutant Parameters:</i>	
	Compound	Concentration (ppmv)	Molecular Weight	Concentration (ppmv)	Molecular Weight
Pollutants	Ethyl mercaptan (ethanethiol) - VOC	2.3	62.13		
	Ethylbenzene - HAP/VOC	4.6	106.16		
	Ethylene dibromide - HAP/VOC	1.0E-03	187.88		
	Fluorotrichloromethane - VOC	0.76	137.38		
	Hexane - HAP/VOC	6.6	86.18		
	Hydrogen sulfide	36	34.08		
	Mercury (total) - HAP	2.9E-04	200.61		
	Methyl ethyl ketone - HAP/VOC	7.1	72.11		
	Methyl isobutyl ketone - HAP/VOC	1.9	100.16		
	Methyl mercaptan - VOC	2.5	48.11		
	Pentane - VOC	3.3	72.15		
	Perchloroethylene (tetrachloroethylene) - HAP	3.7	165.83		
	Propane - VOC	11	44.09		
	t-1,2-Dichloroethene - VOC	2.8	96.94		
	Toluene - No or Unknown Co-disposal - HAP/VOC	39	92.13		
	Toluene - Co-disposal - HAP/VOC	170	92.13		
	Trichloroethylene (trichloroethene) - HAP/VOC	2.8	131.40		
	Vinyl chloride - HAP/VOC	7.3	62.50		
	Xylenes - HAP/VOC	12	106.16		

Graphs



Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	1.122E+02	8.984E+04	6.037E+00	2.997E+01	4.492E+04	3.018E+00
2011	5.509E+02	4.412E+05	2.964E+01	1.472E+02	2.206E+05	1.482E+01
2012	1.057E+03	8.461E+05	5.685E+01	2.822E+02	4.231E+05	2.842E+01
2013	1.569E+03	1.256E+06	8.440E+01	4.190E+02	6.281E+05	4.220E+01
2014	2.080E+03	1.665E+06	1.119E+02	5.555E+02	8.327E+05	5.595E+01
2015	2.608E+03	2.088E+06	1.403E+02	6.966E+02	1.044E+06	7.016E+01
2016	3.177E+03	2.544E+06	1.709E+02	8.487E+02	1.272E+06	8.547E+01
2017	3.690E+03	2.955E+06	1.985E+02	9.856E+02	1.477E+06	9.926E+01
2018	4.192E+03	3.357E+06	2.255E+02	1.120E+03	1.678E+06	1.128E+02
2019	4.680E+03	3.748E+06	2.518E+02	1.250E+03	1.874E+06	1.259E+02
2020	5.166E+03	4.137E+06	2.779E+02	1.380E+03	2.068E+06	1.390E+02
2021	5.613E+03	4.494E+06	3.020E+02	1.499E+03	2.247E+06	1.510E+02
2022	5.996E+03	4.802E+06	3.226E+02	1.602E+03	2.401E+06	1.613E+02
2023	6.396E+03	5.122E+06	3.441E+02	1.709E+03	2.561E+06	1.721E+02
2024	6.793E+03	5.440E+06	3.655E+02	1.815E+03	2.720E+06	1.828E+02
2025	7.179E+03	5.748E+06	3.862E+02	1.917E+03	2.874E+06	1.931E+02
2026	7.561E+03	6.055E+06	4.068E+02	2.020E+03	3.027E+06	2.034E+02
2027	7.942E+03	6.359E+06	4.273E+02	2.121E+03	3.180E+06	2.136E+02
2028	8.320E+03	6.662E+06	4.476E+02	2.222E+03	3.331E+06	2.238E+02
2029	8.696E+03	6.963E+06	4.678E+02	2.323E+03	3.482E+06	2.339E+02
2030	9.070E+03	7.262E+06	4.880E+02	2.423E+03	3.631E+06	2.440E+02
2031	9.442E+03	7.560E+06	5.080E+02	2.522E+03	3.780E+06	2.540E+02
2032	9.812E+03	7.857E+06	5.279E+02	2.621E+03	3.928E+06	2.639E+02
2033	1.017E+04	8.147E+06	5.474E+02	2.718E+03	4.074E+06	2.737E+02
2034	1.053E+04	8.432E+06	5.665E+02	2.813E+03	4.216E+06	2.833E+02
2035	1.088E+04	8.711E+06	5.853E+02	2.906E+03	4.356E+06	2.927E+02
2036	1.122E+04	8.985E+06	6.037E+02	2.997E+03	4.492E+06	3.018E+02
2037	1.156E+04	9.253E+06	6.217E+02	3.087E+03	4.626E+06	3.109E+02
2038	1.188E+04	9.516E+06	6.394E+02	3.174E+03	4.758E+06	3.197E+02
2039	1.221E+04	9.774E+06	6.567E+02	3.260E+03	4.887E+06	3.283E+02
2040	1.252E+04	1.003E+07	6.737E+02	3.344E+03	5.013E+06	3.368E+02
2041	1.283E+04	1.027E+07	6.903E+02	3.427E+03	5.137E+06	3.451E+02
2042	1.313E+04	1.052E+07	7.066E+02	3.508E+03	5.258E+06	3.533E+02
2043	1.343E+04	1.075E+07	7.226E+02	3.587E+03	5.377E+06	3.613E+02
2044	1.372E+04	1.099E+07	7.382E+02	3.665E+03	5.494E+06	3.691E+02
2045	1.401E+04	1.122E+07	7.536E+02	3.741E+03	5.608E+06	3.768E+02
2046	1.429E+04	1.144E+07	7.686E+02	3.816E+03	5.720E+06	3.843E+02
2047	1.456E+04	1.166E+07	7.834E+02	3.889E+03	5.830E+06	3.917E+02
2048	1.483E+04	1.187E+07	7.979E+02	3.961E+03	5.937E+06	3.989E+02
2049	1.509E+04	1.209E+07	8.120E+02	4.031E+03	6.043E+06	4.060E+02
2050	1.535E+04	1.229E+07	8.259E+02	4.100E+03	6.146E+06	4.130E+02
2051	1.560E+04	1.250E+07	8.395E+02	4.168E+03	6.248E+06	4.198E+02
2052	1.585E+04	1.269E+07	8.529E+02	4.234E+03	6.347E+06	4.264E+02
2053	1.610E+04	1.289E+07	8.660E+02	4.299E+03	6.444E+06	4.330E+02
2054	1.633E+04	1.308E+07	8.788E+02	4.363E+03	6.540E+06	4.394E+02
2055	1.657E+04	1.327E+07	8.914E+02	4.425E+03	6.633E+06	4.457E+02
2056	1.680E+04	1.345E+07	9.037E+02	4.487E+03	6.725E+06	4.519E+02
2057	1.702E+04	1.363E+07	9.158E+02	4.547E+03	6.815E+06	4.579E+02
2058	1.724E+04	1.381E+07	9.276E+02	4.605E+03	6.903E+06	4.638E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	1.746E+04	1.398E+07	9.392E+02	4.663E+03	6.989E+06	4.696E+02
2060	1.767E+04	1.415E+07	9.506E+02	4.719E+03	7.074E+06	4.753E+02
2061	1.788E+04	1.431E+07	9.618E+02	4.775E+03	7.157E+06	4.809E+02
2062	1.808E+04	1.448E+07	9.727E+02	4.829E+03	7.238E+06	4.863E+02
2063	1.828E+04	1.464E+07	9.834E+02	4.882E+03	7.318E+06	4.917E+02
2064	1.847E+04	1.479E+07	9.939E+02	4.934E+03	7.396E+06	4.969E+02
2065	1.866E+04	1.495E+07	1.004E+03	4.985E+03	7.473E+06	5.021E+02
2066	1.885E+04	1.510E+07	1.014E+03	5.036E+03	7.548E+06	5.071E+02
2067	1.904E+04	1.524E+07	1.024E+03	5.085E+03	7.621E+06	5.121E+02
2068	1.922E+04	1.539E+07	1.034E+03	5.133E+03	7.694E+06	5.169E+02
2069	1.939E+04	1.553E+07	1.043E+03	5.180E+03	7.764E+06	5.217E+02
2070	1.957E+04	1.567E+07	1.053E+03	5.226E+03	7.834E+06	5.263E+02
2071	1.974E+04	1.580E+07	1.062E+03	5.272E+03	7.902E+06	5.309E+02
2072	1.990E+04	1.594E+07	1.071E+03	5.316E+03	7.968E+06	5.354E+02
2073	2.006E+04	1.607E+07	1.080E+03	5.359E+03	8.033E+06	5.398E+02
2074	2.022E+04	1.619E+07	1.088E+03	5.402E+03	8.097E+06	5.441E+02
2075	2.038E+04	1.632E+07	1.097E+03	5.444E+03	8.160E+06	5.483E+02
2076	2.053E+04	1.644E+07	1.105E+03	5.485E+03	8.222E+06	5.524E+02
2077	2.069E+04	1.656E+07	1.113E+03	5.525E+03	8.282E+06	5.565E+02
2078	2.083E+04	1.668E+07	1.121E+03	5.565E+03	8.341E+06	5.604E+02
2079	2.098E+04	1.680E+07	1.129E+03	5.603E+03	8.399E+06	5.643E+02
2080	2.112E+04	1.691E+07	1.136E+03	5.641E+03	8.456E+06	5.681E+02
2081	2.126E+04	1.702E+07	1.144E+03	5.678E+03	8.511E+06	5.719E+02
2082	2.139E+04	1.713E+07	1.151E+03	5.715E+03	8.566E+06	5.755E+02
2083	2.153E+04	1.724E+07	1.158E+03	5.750E+03	8.619E+06	5.791E+02
2084	2.166E+04	1.734E+07	1.165E+03	5.785E+03	8.671E+06	5.826E+02
2085	2.179E+04	1.745E+07	1.172E+03	5.819E+03	8.723E+06	5.861E+02
2086	2.191E+04	1.755E+07	1.179E+03	5.853E+03	8.773E+06	5.895E+02
2087	2.204E+04	1.764E+07	1.186E+03	5.886E+03	8.822E+06	5.928E+02
2088	2.160E+04	1.730E+07	1.162E+03	5.769E+03	8.648E+06	5.810E+02
2089	2.117E+04	1.695E+07	1.139E+03	5.655E+03	8.477E+06	5.695E+02
2090	2.075E+04	1.662E+07	1.117E+03	5.543E+03	8.309E+06	5.583E+02
2091	2.034E+04	1.629E+07	1.094E+03	5.433E+03	8.144E+06	5.472E+02
2092	1.994E+04	1.597E+07	1.073E+03	5.326E+03	7.983E+06	5.364E+02
2093	1.954E+04	1.565E+07	1.051E+03	5.220E+03	7.825E+06	5.257E+02
2094	1.916E+04	1.534E+07	1.031E+03	5.117E+03	7.670E+06	5.153E+02
2095	1.878E+04	1.504E+07	1.010E+03	5.016E+03	7.518E+06	5.051E+02
2096	1.841E+04	1.474E+07	9.903E+02	4.916E+03	7.369E+06	4.951E+02
2097	1.804E+04	1.445E+07	9.707E+02	4.819E+03	7.223E+06	4.853E+02
2098	1.768E+04	1.416E+07	9.514E+02	4.724E+03	7.080E+06	4.757E+02
2099	1.733E+04	1.388E+07	9.326E+02	4.630E+03	6.940E+06	4.663E+02
2100	1.699E+04	1.361E+07	9.141E+02	4.538E+03	6.803E+06	4.571E+02
2101	1.665E+04	1.334E+07	8.960E+02	4.448E+03	6.668E+06	4.480E+02
2102	1.632E+04	1.307E+07	8.783E+02	4.360E+03	6.536E+06	4.391E+02
2103	1.600E+04	1.281E+07	8.609E+02	4.274E+03	6.406E+06	4.304E+02
2104	1.568E+04	1.256E+07	8.438E+02	4.189E+03	6.280E+06	4.219E+02
2105	1.537E+04	1.231E+07	8.271E+02	4.106E+03	6.155E+06	4.136E+02
2106	1.507E+04	1.207E+07	8.108E+02	4.025E+03	6.033E+06	4.054E+02
2107	1.477E+04	1.183E+07	7.947E+02	3.945E+03	5.914E+06	3.974E+02
2108	1.448E+04	1.159E+07	7.790E+02	3.867E+03	5.797E+06	3.895E+02
2109	1.419E+04	1.136E+07	7.635E+02	3.791E+03	5.682E+06	3.818E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.391E+04	1.114E+07	7.484E+02	3.716E+03	5.569E+06	3.742E+02
2111	1.364E+04	1.092E+07	7.336E+02	3.642E+03	5.459E+06	3.668E+02
2112	1.337E+04	1.070E+07	7.191E+02	3.570E+03	5.351E+06	3.595E+02
2113	1.310E+04	1.049E+07	7.048E+02	3.499E+03	5.245E+06	3.524E+02
2114	1.284E+04	1.028E+07	6.909E+02	3.430E+03	5.141E+06	3.454E+02
2115	1.259E+04	1.008E+07	6.772E+02	3.362E+03	5.039E+06	3.386E+02
2116	1.234E+04	9.879E+06	6.638E+02	3.296E+03	4.940E+06	3.319E+02
2117	1.209E+04	9.684E+06	6.507E+02	3.230E+03	4.842E+06	3.253E+02
2118	1.185E+04	9.492E+06	6.378E+02	3.166E+03	4.746E+06	3.189E+02
2119	1.162E+04	9.304E+06	6.251E+02	3.104E+03	4.652E+06	3.126E+02
2120	1.139E+04	9.120E+06	6.128E+02	3.042E+03	4.560E+06	3.064E+02
2121	1.116E+04	8.939E+06	6.006E+02	2.982E+03	4.470E+06	3.003E+02
2122	1.094E+04	8.762E+06	5.887E+02	2.923E+03	4.381E+06	2.944E+02
2123	1.073E+04	8.589E+06	5.771E+02	2.865E+03	4.294E+06	2.885E+02
2124	1.051E+04	8.419E+06	5.656E+02	2.808E+03	4.209E+06	2.828E+02
2125	1.031E+04	8.252E+06	5.544E+02	2.753E+03	4.126E+06	2.772E+02
2126	1.010E+04	8.089E+06	5.435E+02	2.698E+03	4.044E+06	2.717E+02
2127	9.901E+03	7.928E+06	5.327E+02	2.645E+03	3.964E+06	2.664E+02
2128	9.705E+03	7.771E+06	5.222E+02	2.592E+03	3.886E+06	2.611E+02
2129	9.513E+03	7.618E+06	5.118E+02	2.541E+03	3.809E+06	2.559E+02
2130	9.325E+03	7.467E+06	5.017E+02	2.491E+03	3.733E+06	2.508E+02
2131	9.140E+03	7.319E+06	4.918E+02	2.441E+03	3.659E+06	2.459E+02
2132	8.959E+03	7.174E+06	4.820E+02	2.393E+03	3.587E+06	2.410E+02
2133	8.782E+03	7.032E+06	4.725E+02	2.346E+03	3.516E+06	2.362E+02
2134	8.608E+03	6.893E+06	4.631E+02	2.299E+03	3.446E+06	2.316E+02
2135	8.437E+03	6.756E+06	4.539E+02	2.254E+03	3.378E+06	2.270E+02
2136	8.270E+03	6.622E+06	4.450E+02	2.209E+03	3.311E+06	2.225E+02
2137	8.106E+03	6.491E+06	4.361E+02	2.165E+03	3.246E+06	2.181E+02
2138	7.946E+03	6.363E+06	4.275E+02	2.122E+03	3.181E+06	2.138E+02
2139	7.789E+03	6.237E+06	4.190E+02	2.080E+03	3.118E+06	2.095E+02
2140	7.634E+03	6.113E+06	4.107E+02	2.039E+03	3.057E+06	2.054E+02
2141	7.483E+03	5.992E+06	4.026E+02	1.999E+03	2.996E+06	2.013E+02
2142	7.335E+03	5.873E+06	3.946E+02	1.959E+03	2.937E+06	1.973E+02
2143	7.190E+03	5.757E+06	3.868E+02	1.920E+03	2.879E+06	1.934E+02
2144	7.047E+03	5.643E+06	3.792E+02	1.882E+03	2.822E+06	1.896E+02
2145	6.908E+03	5.531E+06	3.717E+02	1.845E+03	2.766E+06	1.858E+02
2146	6.771E+03	5.422E+06	3.643E+02	1.809E+03	2.711E+06	1.821E+02
2147	6.637E+03	5.315E+06	3.571E+02	1.773E+03	2.657E+06	1.785E+02
2148	6.506E+03	5.209E+06	3.500E+02	1.738E+03	2.605E+06	1.750E+02
2149	6.377E+03	5.106E+06	3.431E+02	1.703E+03	2.553E+06	1.715E+02

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2009	0	0	0	0	0	0
2010	8.223E+01	4.492E+04	3.018E+00	7.813E-02	2.180E+01	1.464E-03
2011	4.038E+02	2.206E+05	1.482E+01	3.836E-01	1.070E+02	7.191E-03
2012	7.744E+02	4.231E+05	2.842E+01	7.358E-01	2.053E+02	1.379E-02
2013	1.150E+03	6.281E+05	4.220E+01	1.092E+00	3.047E+02	2.048E-02
2014	1.524E+03	8.327E+05	5.595E+01	1.448E+00	4.040E+02	2.715E-02
2015	1.911E+03	1.044E+06	7.016E+01	1.816E+00	5.066E+02	3.404E-02
2016	2.329E+03	1.272E+06	8.547E+01	2.212E+00	6.172E+02	4.147E-02
2017	2.704E+03	1.477E+06	9.926E+01	2.569E+00	7.168E+02	4.816E-02
2018	3.072E+03	1.678E+06	1.128E+02	2.919E+00	8.144E+02	5.472E-02
2019	3.430E+03	1.874E+06	1.259E+02	3.259E+00	9.092E+02	6.109E-02
2020	3.786E+03	2.068E+06	1.390E+02	3.597E+00	1.004E+03	6.743E-02
2021	4.114E+03	2.247E+06	1.510E+02	3.908E+00	1.090E+03	7.326E-02
2022	4.395E+03	2.401E+06	1.613E+02	4.175E+00	1.165E+03	7.827E-02
2023	4.688E+03	2.561E+06	1.721E+02	4.454E+00	1.243E+03	8.349E-02
2024	4.979E+03	2.720E+06	1.828E+02	4.730E+00	1.320E+03	8.867E-02
2025	5.261E+03	2.874E+06	1.931E+02	4.999E+00	1.395E+03	9.370E-02
2026	5.542E+03	3.027E+06	2.034E+02	5.265E+00	1.469E+03	9.869E-02
2027	5.820E+03	3.180E+06	2.136E+02	5.530E+00	1.543E+03	1.037E-01
2028	6.097E+03	3.331E+06	2.238E+02	5.793E+00	1.616E+03	1.086E-01
2029	6.373E+03	3.482E+06	2.339E+02	6.055E+00	1.689E+03	1.135E-01
2030	6.647E+03	3.631E+06	2.440E+02	6.315E+00	1.762E+03	1.184E-01
2031	6.920E+03	3.780E+06	2.540E+02	6.574E+00	1.834E+03	1.232E-01
2032	7.191E+03	3.928E+06	2.639E+02	6.832E+00	1.906E+03	1.281E-01
2033	7.457E+03	4.074E+06	2.737E+02	7.085E+00	1.977E+03	1.328E-01
2034	7.717E+03	4.216E+06	2.833E+02	7.332E+00	2.046E+03	1.374E-01
2035	7.973E+03	4.356E+06	2.927E+02	7.575E+00	2.113E+03	1.420E-01
2036	8.223E+03	4.492E+06	3.018E+02	7.813E+00	2.180E+03	1.465E-01
2037	8.469E+03	4.626E+06	3.109E+02	8.046E+00	2.245E+03	1.508E-01
2038	8.709E+03	4.758E+06	3.197E+02	8.275E+00	2.309E+03	1.551E-01
2039	8.945E+03	4.887E+06	3.283E+02	8.499E+00	2.371E+03	1.593E-01
2040	9.176E+03	5.013E+06	3.368E+02	8.719E+00	2.432E+03	1.634E-01
2041	9.403E+03	5.137E+06	3.451E+02	8.934E+00	2.492E+03	1.675E-01
2042	9.625E+03	5.258E+06	3.533E+02	9.145E+00	2.551E+03	1.714E-01
2043	9.843E+03	5.377E+06	3.613E+02	9.352E+00	2.609E+03	1.753E-01
2044	1.006E+04	5.494E+06	3.691E+02	9.555E+00	2.666E+03	1.791E-01
2045	1.027E+04	5.608E+06	3.768E+02	9.753E+00	2.721E+03	1.828E-01
2046	1.047E+04	5.720E+06	3.843E+02	9.948E+00	2.775E+03	1.865E-01
2047	1.067E+04	5.830E+06	3.917E+02	1.014E+01	2.829E+03	1.901E-01
2048	1.087E+04	5.937E+06	3.989E+02	1.033E+01	2.881E+03	1.936E-01
2049	1.106E+04	6.043E+06	4.060E+02	1.051E+01	2.932E+03	1.970E-01
2050	1.125E+04	6.146E+06	4.130E+02	1.069E+01	2.982E+03	2.004E-01
2051	1.144E+04	6.248E+06	4.198E+02	1.087E+01	3.031E+03	2.037E-01
2052	1.162E+04	6.347E+06	4.264E+02	1.104E+01	3.080E+03	2.069E-01
2053	1.180E+04	6.444E+06	4.330E+02	1.121E+01	3.127E+03	2.101E-01
2054	1.197E+04	6.540E+06	4.394E+02	1.137E+01	3.173E+03	2.132E-01
2055	1.214E+04	6.633E+06	4.457E+02	1.154E+01	3.218E+03	2.162E-01
2056	1.231E+04	6.725E+06	4.519E+02	1.170E+01	3.263E+03	2.192E-01
2057	1.247E+04	6.815E+06	4.579E+02	1.185E+01	3.307E+03	2.222E-01
2058	1.264E+04	6.903E+06	4.638E+02	1.201E+01	3.349E+03	2.250E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2059	1.279E+04	6.989E+06	4.696E+02	1.216E+01	3.391E+03	2.279E-01
2060	1.295E+04	7.074E+06	4.753E+02	1.230E+01	3.432E+03	2.306E-01
2061	1.310E+04	7.157E+06	4.809E+02	1.245E+01	3.473E+03	2.333E-01
2062	1.325E+04	7.238E+06	4.863E+02	1.259E+01	3.512E+03	2.360E-01
2063	1.340E+04	7.318E+06	4.917E+02	1.273E+01	3.551E+03	2.386E-01
2064	1.354E+04	7.396E+06	4.969E+02	1.286E+01	3.589E+03	2.411E-01
2065	1.368E+04	7.473E+06	5.021E+02	1.300E+01	3.626E+03	2.436E-01
2066	1.382E+04	7.548E+06	5.071E+02	1.313E+01	3.662E+03	2.461E-01
2067	1.395E+04	7.621E+06	5.121E+02	1.326E+01	3.698E+03	2.485E-01
2068	1.408E+04	7.694E+06	5.169E+02	1.338E+01	3.733E+03	2.508E-01
2069	1.421E+04	7.764E+06	5.217E+02	1.350E+01	3.767E+03	2.531E-01
2070	1.434E+04	7.834E+06	5.263E+02	1.362E+01	3.801E+03	2.554E-01
2071	1.446E+04	7.902E+06	5.309E+02	1.374E+01	3.834E+03	2.576E-01
2072	1.459E+04	7.968E+06	5.354E+02	1.386E+01	3.866E+03	2.598E-01
2073	1.471E+04	8.033E+06	5.398E+02	1.397E+01	3.898E+03	2.619E-01
2074	1.482E+04	8.097E+06	5.441E+02	1.408E+01	3.929E+03	2.640E-01
2075	1.494E+04	8.160E+06	5.483E+02	1.419E+01	3.959E+03	2.660E-01
2076	1.505E+04	8.222E+06	5.524E+02	1.430E+01	3.989E+03	2.680E-01
2077	1.516E+04	8.282E+06	5.565E+02	1.440E+01	4.018E+03	2.700E-01
2078	1.527E+04	8.341E+06	5.604E+02	1.451E+01	4.047E+03	2.719E-01
2079	1.537E+04	8.399E+06	5.643E+02	1.461E+01	4.075E+03	2.738E-01
2080	1.548E+04	8.456E+06	5.681E+02	1.471E+01	4.103E+03	2.757E-01
2081	1.558E+04	8.511E+06	5.719E+02	1.480E+01	4.130E+03	2.775E-01
2082	1.568E+04	8.566E+06	5.755E+02	1.490E+01	4.156E+03	2.792E-01
2083	1.578E+04	8.619E+06	5.791E+02	1.499E+01	4.182E+03	2.810E-01
2084	1.587E+04	8.671E+06	5.826E+02	1.508E+01	4.207E+03	2.827E-01
2085	1.597E+04	8.723E+06	5.861E+02	1.517E+01	4.232E+03	2.844E-01
2086	1.606E+04	8.773E+06	5.895E+02	1.526E+01	4.257E+03	2.860E-01
2087	1.615E+04	8.822E+06	5.928E+02	1.534E+01	4.281E+03	2.876E-01
2088	1.583E+04	8.648E+06	5.810E+02	1.504E+01	4.196E+03	2.819E-01
2089	1.552E+04	8.477E+06	5.695E+02	1.474E+01	4.113E+03	2.763E-01
2090	1.521E+04	8.309E+06	5.583E+02	1.445E+01	4.031E+03	2.709E-01
2091	1.491E+04	8.144E+06	5.472E+02	1.416E+01	3.952E+03	2.655E-01
2092	1.461E+04	7.983E+06	5.364E+02	1.388E+01	3.873E+03	2.602E-01
2093	1.432E+04	7.825E+06	5.257E+02	1.361E+01	3.797E+03	2.551E-01
2094	1.404E+04	7.670E+06	5.153E+02	1.334E+01	3.721E+03	2.500E-01
2095	1.376E+04	7.518E+06	5.051E+02	1.308E+01	3.648E+03	2.451E-01
2096	1.349E+04	7.369E+06	4.951E+02	1.282E+01	3.576E+03	2.402E-01
2097	1.322E+04	7.223E+06	4.853E+02	1.256E+01	3.505E+03	2.355E-01
2098	1.296E+04	7.080E+06	4.757E+02	1.231E+01	3.435E+03	2.308E-01
2099	1.270E+04	6.940E+06	4.663E+02	1.207E+01	3.367E+03	2.262E-01
2100	1.245E+04	6.803E+06	4.571E+02	1.183E+01	3.301E+03	2.218E-01
2101	1.221E+04	6.668E+06	4.480E+02	1.160E+01	3.235E+03	2.174E-01
2102	1.196E+04	6.536E+06	4.391E+02	1.137E+01	3.171E+03	2.131E-01
2103	1.173E+04	6.406E+06	4.304E+02	1.114E+01	3.108E+03	2.089E-01
2104	1.149E+04	6.280E+06	4.219E+02	1.092E+01	3.047E+03	2.047E-01
2105	1.127E+04	6.155E+06	4.136E+02	1.071E+01	2.987E+03	2.007E-01
2106	1.104E+04	6.033E+06	4.054E+02	1.049E+01	2.927E+03	1.967E-01
2107	1.083E+04	5.914E+06	3.974E+02	1.029E+01	2.869E+03	1.928E-01
2108	1.061E+04	5.797E+06	3.895E+02	1.008E+01	2.813E+03	1.890E-01
2109	1.040E+04	5.682E+06	3.818E+02	9.882E+00	2.757E+03	1.852E-01

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	(m ³ /year)	(av ft ³ /min)	(Mg/year)	(m ³ /year)	(av ft ³ /min)
2110	1.019E+04	5.569E+06	3.742E+02	9.686E+00	2.702E+03	1.816E-01
2111	9.993E+03	5.459E+06	3.668E+02	9.495E+00	2.649E+03	1.780E-01
2112	9.795E+03	5.351E+06	3.595E+02	9.307E+00	2.596E+03	1.744E-01
2113	9.601E+03	5.245E+06	3.524E+02	9.122E+00	2.545E+03	1.710E-01
2114	9.411E+03	5.141E+06	3.454E+02	8.942E+00	2.495E+03	1.676E-01
2115	9.225E+03	5.039E+06	3.386E+02	8.765E+00	2.445E+03	1.643E-01
2116	9.042E+03	4.940E+06	3.319E+02	8.591E+00	2.397E+03	1.610E-01
2117	8.863E+03	4.842E+06	3.253E+02	8.421E+00	2.349E+03	1.578E-01
2118	8.688E+03	4.746E+06	3.189E+02	8.254E+00	2.303E+03	1.547E-01
2119	8.516E+03	4.652E+06	3.126E+02	8.091E+00	2.257E+03	1.517E-01
2120	8.347E+03	4.560E+06	3.064E+02	7.931E+00	2.212E+03	1.487E-01
2121	8.182E+03	4.470E+06	3.003E+02	7.773E+00	2.169E+03	1.457E-01
2122	8.020E+03	4.381E+06	2.944E+02	7.620E+00	2.126E+03	1.428E-01
2123	7.861E+03	4.294E+06	2.885E+02	7.469E+00	2.084E+03	1.400E-01
2124	7.705E+03	4.209E+06	2.828E+02	7.321E+00	2.042E+03	1.372E-01
2125	7.553E+03	4.126E+06	2.772E+02	7.176E+00	2.002E+03	1.345E-01
2126	7.403E+03	4.044E+06	2.717E+02	7.034E+00	1.962E+03	1.318E-01
2127	7.256E+03	3.964E+06	2.664E+02	6.894E+00	1.923E+03	1.292E-01
2128	7.113E+03	3.886E+06	2.611E+02	6.758E+00	1.885E+03	1.267E-01
2129	6.972E+03	3.809E+06	2.559E+02	6.624E+00	1.848E+03	1.242E-01
2130	6.834E+03	3.733E+06	2.508E+02	6.493E+00	1.811E+03	1.217E-01
2131	6.699E+03	3.659E+06	2.459E+02	6.364E+00	1.776E+03	1.193E-01
2132	6.566E+03	3.587E+06	2.410E+02	6.238E+00	1.740E+03	1.169E-01
2133	6.436E+03	3.516E+06	2.362E+02	6.115E+00	1.706E+03	1.146E-01
2134	6.308E+03	3.446E+06	2.316E+02	5.994E+00	1.672E+03	1.124E-01
2135	6.184E+03	3.378E+06	2.270E+02	5.875E+00	1.639E+03	1.101E-01
2136	6.061E+03	3.311E+06	2.225E+02	5.759E+00	1.607E+03	1.079E-01
2137	5.941E+03	3.246E+06	2.181E+02	5.645E+00	1.575E+03	1.058E-01
2138	5.823E+03	3.181E+06	2.138E+02	5.533E+00	1.544E+03	1.037E-01
2139	5.708E+03	3.118E+06	2.095E+02	5.423E+00	1.513E+03	1.017E-01
2140	5.595E+03	3.057E+06	2.054E+02	5.316E+00	1.483E+03	9.965E-02
2141	5.484E+03	2.996E+06	2.013E+02	5.211E+00	1.454E+03	9.767E-02
2142	5.376E+03	2.937E+06	1.973E+02	5.108E+00	1.425E+03	9.574E-02
2143	5.269E+03	2.879E+06	1.934E+02	5.006E+00	1.397E+03	9.384E-02
2144	5.165E+03	2.822E+06	1.896E+02	4.907E+00	1.369E+03	9.199E-02
2145	5.063E+03	2.766E+06	1.858E+02	4.810E+00	1.342E+03	9.016E-02
2146	4.962E+03	2.711E+06	1.821E+02	4.715E+00	1.315E+03	8.838E-02
2147	4.864E+03	2.657E+06	1.785E+02	4.621E+00	1.289E+03	8.663E-02
2148	4.768E+03	2.605E+06	1.750E+02	4.530E+00	1.264E+03	8.491E-02
2149	4.673E+03	2.553E+06	1.715E+02	4.440E+00	1.239E+03	8.323E-02



Type of Unit or Process (rotary dryer, cupola furnace, crusher, pelletizer, engine, etc.)	Emission Unit Number:	Emission Point Number:
Municipal Solid Waste Landfill Gas Fugitive Emissions	EU-01	
Make	Model	Installation or manufacture date
N/A	N/A	
Capacity (manufacturer's or designer's guaranteed maximum)	Operating Capacity (specific units)	
N/A	MSW Landfill capacity of 14,650,000 cy	
Brief description of operation of unit or process: The emission source is a municipal solid waste landfill, the primary regulated emissions source is landfill gas (LFG), which contains greenhouse gases (GHGs), non-methane organic compounds (NMOCs), volatile organic compounds (VOCs), and hazardous air pollutants (HAPs) generated by the microbial breakdown of buried waste. See the submitted application report for further details.		
Brief description of alternative operating scenario (see Section M1 & M2 to elaborate):	Alternative Emission Point:	
N/A	N/A	

Are you agreeing to a limit on the operating schedule for this unit? ☐ Yes ☒ No				
Hours Per Day	Days Per Week	Weeks Per Year	Peak Production Season (if any)	Dates of Annual Shutdown
8	6	52		

Are you agreeing to a limit on the production for this unit? ☐ Yes ☒ No (If No, show normal operating schedule.)				
Material	Process Time Frame			Specify Units (tons, Btu, Gal., etc)
	Hour	Week	Year	
N/A				

[illegible]

SECTION D2 – IDENTIFICATION OF AIR CONTAMINANTS

Has emission unit testing been done at the facility? ☒ Yes ☐ No			
Emission Unit ID	Last Date when a Testing Program was Completed	If Program is Continuous, Give Approximate Testing Frequency	Regulation requiring frequency (NSPS, MACT, Permit Requirement-list permit number)
EUI-01	AUGUST 2024	CONTINUOUS, 5-YR	NSPS XXX NMOC EMISSION RATE DETERMINATION; TIER 2

Add additional pages if necessary

SECTION E – PRODUCTS OF UNIT OR PROCESS

Include all, even those not usable because they do not meet specifications					
Material	Hourly Process Weight (Pounds Per Hour)			Average Annual (Specify Units)	Intermittent Operation Only (Average Hours Per Week)
	Average	Maximum	Minimum		
N/A	N/A	N/A	N/A	N/A	N/A

SECTION F – FUELS USED

Coal (Tons/Yr)	% Sulfur	% Ash	Oil (Gal/Yr)	% Sulfur	Grade No.
Natural Gas (Thousand CF/Yr)		LP Gas (Gal/Yr)		Other (Specify)	

SECTION G – STACK PARAMETERS

List each pollutant separately.					
Pollutant (use CAS for HAPs)	Stack Height (ft)	Stack Diameter (ft at top)	Gas Volume (ACFM)	Exit Temp (°F)	Gas Velocity (fps)
N/A NO STACK					
Stack Base UTM Coordinate X:			Stack Base UTM Coordinate Y:		

SECTION H – ALTERNATIVE STACK PARAMETERS

List each pollutant separately.					
Pollutant (use CAS for HAPs)	Stack Height (ft)	Stack Diameter (ft at top)	Gas Volume (ACFM)	Exit Temp (°F)	Gas Velocity (fps)
40 CFR 60.762(b)					
Stack Base UTM Coordinate X:			Stack Base UTM Coordinate Y:		

SECTION I – AIR CONTAMINANTS EMITTED

Known or Suspected - Use emission rates after control equipment.			
Pollutant (use CAS for HAPs)	Amount		Basis of Estimate (AP-42, testing, engineering estimate, etc)
	Pounds/Hr	Tons/Yr	
Refer to Appendix C- Potential Emission calculations			

SECTION J1 – AIR POLLUTION CONTROL EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator ☐ Wet Scrubber ☐ Spray Dryer ☒ None ☐ Other – Specify: _____				
Name of Manufacturer		Model Number		Date to Be Installed
Application: ☐ Boiler ☐ Kiln ☐ Engine ☐ Other – Specify: _____				
Pollutants Removed				
Design Efficiency (%)				

Operating Efficiency (%)				
Describe method used to determine operating efficiency:				

SECTION J2 – GAS CONDITIONS

Gas Conditions	Inlet		Outlet	
Gas Volume (SCFM; 68°F; 14.7 psia)				
Gas Temperature (°F)				
Gas Pressure (in. H ₂ O)				
Gas Velocity (ft/sec)				
Pollutant Concentration (Specify pollutant and unit of concentration)	Pollutant	Unit of Concentration	Inlet	Outlet
Pressure drop through gas cleaning device (in. H ₂ O)				