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WasteServices

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November 20, 2014

East TN Permit Program
Tennessee Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

Re: Title V Permit Application
Loudon County (Matlock Bend) Landfill – Loudon, TN
Solid Waste Permit #: SNL 53-103-0203

To Whom It May Concern:

Santek Waste Services, Inc. (Santek) is pleased to submit the Title V Permit Application for the Loudon County (Matlock Bend) Landfill. The permit application and calculations were prepared by SCS Engineers, Inc. (SCS) located in Cincinnati, Ohio.

If you have any questions regarding this submittal, please give me a call at (423) 303-7101.

Sincerely,

Will Martin

Will Martin
Environmental Compliance Coordinator

Enclosures

cc: Steve Field, Chairman, LCSWDC
Gary L. Saylor, P.E., Project Manager, SCS
Robert D. Burnette, P.E., Executive V.P. of Engineering, Santek
Matt Dillard, Executive V.P. of Operations, Santek
Ron E. Vail, P.E., V.P. of Engineering, Santek
Cheryl Dunson, Executive V.P. of Marketing, Santek
Levi Higdon, Facility Manager, Santek

SCS ENGINEERS

Application

TITLE V PERMIT APPLICATION

for the Loudon County (Matlock Bend) Landfill

Loudon, Tennessee

Presented to:

SANTEK WasteServices

Santek Waste Services, Inc.

Santek Waste Services, Inc.
650 25th Street, NW, Suite 100
Cleveland, TN 37311
(423) 303-7101

Presented by:

SCS ENGINEERS
2060 Reading Road, Suite 200
Cincinnati, OH
(513) 421-5353

November 2014
File No. 23213025.01

Offices Nationwide
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No.

INITIAL TITLE V PERMIT APPLICATION FOR THE LOUDON COUNTY (MATLOCK BEND) LANDFILL LOUDON, TENNESSEE

INTRODUCTION

This is a Title V permit application for the Loudon County (Matlock Bend) Landfill located near the city of Loudon in Loudon County, Tennessee. The facility is owned by the Louden County Solid Waste Disposal Commission and is operated by Santek Waste Services, Inc. The facility is a permitted municipal solid waste (MSW) disposal facility that is now required by regulation to obtain a Title V air operating permit even though it is not a major source of regulated air pollutants. The facility is located at address 21712 Highway 72, Loudon, Tennessee.

The Loudon County (Matlock Bend) Landfill facility opened in 1987. The facility now has a design capacity that exceeds the New Source Performance Standard (NSPS) threshold for MSW Landfills of 2.5 million megagrams. Although the air emissions from the facility are minor (less than 100 tons per year of any individual pollutant), by rule the site is obligated to apply for a Title V operating permit due to exceeding the NSPS capacity threshold. Greenhouse gas (GHG) emissions alone do not trigger major source status for the Title V air permitting program. The facility has two significant emission units, the MSW Landfill and Fugitive Sources of Particulates. The facility also includes various insignificant activities described in this application.

The enclosed application forms include the required information for each emission unit at the facility (see Attachment 1). Calculations are included in Attachment 2 that estimate the maximum potential to emit (PTE) in tons per year for the air pollutants expected to be emitted by the facility. Since the term of the Title V permit is for five years, the PTE has been estimated to occur in year 2020, five years following the processing of this application and expected issuance of the new permit. Coincidentally, 2020 is also the year the facility reaches its maximum emissions at its current design capacity. The PTE estimates are the maximum emissions expected during period of time that the Title V permit will be effective. The calculations also include estimates of actual emissions expected in year 2014. Estimates of MSW landfill emission rates are based on emission factors found in AP-42. The USEPA LandGEM gas generation model was used to predict future landfill gas generation rates. The estimated closure year of 2019 in the application is based on the facility consuming all the currently permitted disposal air space by that time. The actual closure year may vary depending on actual future waste receipts. Future fugitive greenhouse gas emissions are estimated based on the procedures found in the current Federal GHG reporting rule (40 CFR Part 98, Subpart HH).

The landfill at this time is not required to install a control device on the MSW Landfill unit such as a LFG flare for the combustion of methane gas and non-methane organic compounds (NMOC) emitted from the landfill. A gas collection and control system (GCCS) is not needed since the MSW landfill unit is currently not subject to the gas control rules of the Federal NSPS (40 CFR Part 60, Subpart WWW). The NESHAP MACT rules (40 CFR Part 63, Subpart AAAA) do not apply until gas control under the NSPS is required. As demonstrated by a Tier 2

test in 2014, the uncontrolled NMOC emission rate at the facility is less than 50 megagrams (Mg) per year and is expected to remain below the annual 50 Mg threshold for the next five years. Fugitive dust emission sources at the landfill are controlled by applying water to potential fugitive dust sources, primarily the paved and unpaved roadways at the landfill.

EMISSION UNITS

The Loudon County (Matlock Bend) facility includes two primary emission units, the MSW Landfill (LF01), and the site's combined Fugitive Sources of Particulates (LF02). Together or individually, these units do not qualify as a major source of air pollutant emissions. All PTE estimates are below major significance thresholds for criteria air pollutants. The calculated PTE for hazardous air pollutants (HAPs) is below the major source thresholds in 40 CFR Part 63, Subpart A. The facility is required to obtain a Title V permit only because the design capacity of the landfill exceeds the size threshold of 2.5 million Mg in 40 CFR Part 60, Subpart WWW. The facility remains below the NMOC threshold in Subpart WWW requiring installation of a NSPS compliant GCCS. Neither of the significant emission units have any stack emissions and emit only fugitive emissions. The following is a more detail description of the facility's emission sources and basis for the emission estimates.

MSW Landfill (LF01)

The Loudon County (Matlock Bend) Landfill opened in 1987 for the disposal of solid waste. The decomposition of the organic material in the waste material produces landfill gas (LFG), which is generally composed of about 50 percent methane gas, 45 percent carbon dioxide, and other trace organic compounds that include some volatile organic compounds (VOC) and hazardous air pollutants (HAP). Estimates of the fugitive emissions from the landfill unit are made using the USEPA LandGEM gas generation model to estimate the rate of LFG generation in the landfill on an annual basis from the quantity of waste disposed. Emission factors from USEPA's AP-42 are then used to estimate the actual emissions of specific compounds.

In accordance with 40 CFR Part 60, Subpart WWW, the facility performed a Tier 2 gas sampling to determine the site-specific amount of NMOC in the gas being generated in the landfill. The result of the test, 82 ppm of NMOC as hexane, was entered into the LandGEM model to estimate the potential future annual NMOC emissions from the site. The Tier 2 test confirmed that the site's NMOC emission rate is currently well below the NSPS threshold of 50 megagrams per year and will remain below that level for the next 5 years until the next Tier 2 test is required. The site is therefore not required to install a GCCS until sometime after year 2020 per NSPS. All emissions from the landfill facility over the next 5 years will be fugitive methane, VOC and HAP. With no flare needed to combust the LFG, there will be no secondary stack emissions of nitrogen oxides (NOx), sulfur dioxide (SO2), or carbon monoxide (CO). All emissions from the landfill over the next 5 years will be from a fugitive area source with no stack emissions from combustion. No emissions from the landfill will exceed major source thresholds for priority pollutants or HAPs. The facility accepts asbestos-containing material for disposal and all asbestos waste is covered with 6 inches of soil by the end of each day to prevent any airborne emission of asbestos material.

GHG emissions from the MSW Landfill consist of fugitive methane and carbon dioxide from the decomposition of the waste. GHG emission estimates were calculated according to the procedures and equations in the GHG Mandatory Reporting Rule, 40 CFR Part 98, Subpart HH. The carbon dioxide portion of the GHG emissions is considered to be biogenic in nature. The remaining methane gas portion is considered non-biogenic. The biogenic and non-biogenic portions of the GHG emissions are calculated separately in the calculations included in Attachment 2. The estimated GHG actual and PTE fugitive emissions are the combined sum of the biogenic and non-biogenic portions of the GHG and are reported in tons of carbon dioxide equivalents (CO2e).

Fugitive Sources of Particulates (LF02)

As part of the normal operations of the MSW landfill, vehicle traffic will traverse the site roadways and potentially cause fugitive dust to be released into the air. This is also true for material handling (cover soil loading/unloading) and the construction/operations heavy equipment operations needed for the spreading and compaction of the waste. The roadways and parking areas at the facility consist of both paved and unpaved surfaces. The paved roadway is primarily the site entrance and scale house area, while vehicles traveling to the landfill working face and maintenance shop are primarily unpaved (gravel). Fugitive emissions from the paved and unpaved roads are estimated using equations and emission factors found in Chapter 13 of AP-42. Actual vehicle traffic for the fiscal year July 1, 2013 to June 30, 2014 was used to estimate the actual vehicle miles travelled in the calculations. Since actual waste receipts in future years is estimated to be the same as year 2013, future vehicle miles travelled should be about the same each year. To account for future variability in traffic, vehicle miles travelled were increased by a factor of 25 percent to compute the maximum PTE emissions from the roadways and account for emissions from future construction activity.

To minimize fugitive dust emissions from the facility, the landfill does visual observations for dust and uses a 2,000-gallon capacity water truck to wet the roads for dust control. When using water for dust control on the roads, AP-42 allows for the use of control efficiency factors applied to the calculated fugitive emissions. For the purpose of estimating fugitive dust from vehicle operations, a control efficiency of 90 percent was selected for the paved roads and 75 percent for the unpaved roads. Wetting and cleaning of the paved roads is a very effective method for controlling dust on paved roads. Surface wetting is also an effective method on unpaved roads, but not generally as effective as on the paved roads yielding a lower estimated control efficiency.

Insignificant Emission Units

The insignificant units at the facility consist of miscellaneous product storage tanks and small portable internal combustion engines. All the storage tanks at the facility are 10,000-gallon capacity or less, except for one leachate tank that has a nominal storage capacity of 100,000 gallons. Calculations were performed to show that the leachate tanks at the facility have emissions below the thresholds for insignificant activity as defined in Rule 1200-3-9-.04.

There are four leachate storage tanks at the facility. As stated above, one has a capacity of 100,000 gallons while the other three are 10,000 gallons each. Leachate is a wastewater that is formed when rain water falls into the MSW landfill and contacts the waste. The landfill is

designed with a leachate collection system to remove the accumulated liquids from the above the landfill bottom liner system. The leachate is pumped to vented storage tanks and is eventually sent to a wastewater treatment plant for disposal. When in contact with the waste, various inorganic and organic compounds can dissolve into the water. This can potentially include VOCs. The VOC emissions from the leachate tanks are estimated using VOC analysis performed on samples of the leachate and assuming 100 percent of the VOCs will volatize and be released from the tanks (a very conservative assumption). Furthermore, the not detected (ND) VOCs are assumed to be present at the detection limit (assumed to be 5.0 ug/L). Annual leachate analyses we reviewed and the highest detected amount over the past 12 years was selected for computing the PTE. Assuming a maximum throughput of 10 million gallons of leachate per year, the total VOC PTE was estimated at 0.26 tons per year (520 pounds per year). The PTE for HAP compound emissions from the leachate tanks (after excluding the non-HAP VOCs) was 0.015 tons per year, or 30 pounds per year.

In addition landfill's operating requirement to pump and remove excess leachate from the waste, the landfill is designed to include leachate cleanout risers around the perimeter of the waste disposal area. These riser pipes can contain a build-up of landfill gas (LFG) and can be a source of fugitive gas emissions and odors. To control these odors, small passive LFG flares are installed on the leachate cleanout risers to combust the gas that is emitted from the risers. The flares reduce the amount of fugitive methane, VOC, and NMOC emissions from the landfill and release small amounts of secondary pollutants such as carbon monoxide (CO), nitrous oxides (NOx), and sulfur dioxide (SO2) from the combustion process. Generally, CO is the most significant secondary pollutant emission from LFG flares. The CO emissions from the passive flare are insignificant (less than 5 tons/year).

The other storage tanks in use at the facility are all exempt from permitting due to size and the type of material being stored. This includes a 2,000-gallon diesel fuel storage tank, a 500-gallon motor oil tank, a 500-gallon hydraulic oil tank, a 500-gallon transmission fluid tank, and a 250-gallon used oil tank.

The facility also operates, on an as needed basis, small portable units with internal combustion engines. This includes a portable air compressor unit and a trailer-mounted equipment pressure washer. Each of these fuel burning units has an operating capacity of less 500,000 Btu per hour and operates only about 100 to 120 hours per year. There are no stationary units at the facility with reciprocating internal combustion engines (no Stationary RICE).

The facility typically uses two small stockpiles of soil (about 500 cubic yards each) for use in covering disposed waste at the end of the day. Fugitive emissions from the stockpiles are negligible and are included in the emission estimates for cover loading/unloading found in Attachment 2.

IDENTIFICATION OF SOURCES IN COMPLIANCE

1. MSW Landfill – The MSW Landfill is in compliance with the requirements of 40 CFR Part 60, Subpart WWW, New Source Performance Standards for MSW Landfills. The facility has tested the generated landfill gas for the site-specific NMOC content and calculated the estimate NMOC emission rate and found the rate to be below the landfill gas control thresholds in the NSPS. The facility is obligate to test for the gas for NMOC every five years and calculate the annual NMOC emission estimate. This was performed in 2014. The MACT standards for MSW Landfills under 40 CFR Part 63, Subpart AAAA are not applicable to the facility until the NMOC emission exceed the gas control threshold. No new NSPS requirements apply to the facility until after reaching the 50 megagrams per year emission threshold. The facility complies with the requirements of 40 CFR Part 61, Subpart M regarding the disposal of asbestos-containing waste.
2. Fugitive Sources of Particulates – The facility complies with the requirements of Rule 1200-3-8 and does not allow visible fugitive dust to leave the property. Fugitive dust emissions are controlled by the application of water to the paved and unpaved roadway surfaces as needed to control visible emissions.

A map of the facility showing the location of the primary emission units and the insignificant activities can be found in Attachment 3 (Figure 2). A flow diagram for the facility emission units is also included in Attachment 3 (Figure 3).

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243
Telephone: (615) 532-0554

TITLE V PERMIT APPLICATION
INDEX OF AIR POLLUTION PERMIT APPLICATION FORMS

Section 1: Identification and Diagrams		
This application contains the following forms:	APC Form 1, Facility Identification	Yes - 1
	APC Form 2, Operations and Flow Diagrams	Yes - 1

Section 2: Emission Source Description Forms		Total number of this form
This application contains the following forms (one form for each incinerator, printing operation, fuel burning installation, etc.):	APC Form 3, Stack Identification	0
	APC Form 4, Fuel Burning Non-Process Equipment	0
	APC Form 5, Stationary Gas Turbines or Internal Combustion Engines	0
	APC Form 6, Storage Tanks	0
	APC Form 7, Incinerators	0
	APC Form 8, Printing Operations	0
	APC Form 9, Painting and Coating Operations	0
	APC Form 10, Miscellaneous Processes	2
	APC Form 33, Stage I and Stage II Vapor Recovery Equipment	0
	APC Form 34, Open Burning	0

Section 3: Air Pollution Control System Forms		Total number of this form
This application contains the following forms (one form for each control system in use at the facility):	APC Form 11, Control Equipment - Miscellaneous	1
	APC Form 13, Adsorbers	0
	APC Form 14, Catalytic or Thermal Oxidation Equipment	0
	APC Form 15, Cyclones/Settling Chambers	0
	APC Form 17, Wet Collection Systems	0
	APC Form 18, Baghouse/Fabric Filters	0

(OVER)

Section 4: Compliance Demonstration Forms		
		Total number of this form
This application contains the following forms (one form for each incinerator, printing operation, fuel burning installation, etc.):	APC Form 19, Compliance Certification - Monitoring and Reporting - Description of Methods for Determining Compliance	2
	APC Form 20, Continuous Emissions Monitoring	0
	APC Form 21, Portable Monitors	0
	APC Form 22, Control System Parameters or Operating Parameters of a Process	0
	APC Form 23, Monitoring Maintenance Procedures	0
	APC Form 24, Stack Testing	0
	APC Form 25, Fuel Sampling and Analysis	0
	APC Form 26, Record Keeping	0
	APC Form 27, Other Methods	2
	APC Form 28, Emissions from Process Emissions Sources / Fuel Burning Installations / Incinerators	2
	APC Form 29, Emissions Summary for the Facility or for the Source Contained in This Application	1
	APC Form 30, Current Emissions Requirements and Status	2
	APC Form 31, Compliance Plan and Compliance Certification	1
	APC Form 32, Air Monitoring Network	0

Section 5: Statement of Completeness and Certification of Compliance

I have reviewed this application in its entirety and to the best of my knowledge, and based on information and belief formed after reasonable inquiry, the statements and information contained in this application are true, accurate, and complete. I have provided all the information that is necessary for compliance purposes and this application consists of 15 pages and they are numbered from page 1 to 15. The status of this facility's compliance with all applicable air pollution control requirements, including the enhanced monitoring and compliance certification requirements of the Federal Clean Air Act, is reported in this application along with the methods to be used for compliance demonstration.

Name and Title of Responsible Official	Telephone Number with Area Code
Matt Dillard, Exec. VP of Operations	423-303-7101
Signature of Responsible Official	Date of Application

(For definition of responsible official, see instructions for APC Form 1)

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243
Telephone: (615) 532-0554

TITLE V PERMIT APPLICATION
FACILITY IDENTIFICATION

SITE INFORMATION			
1. Organization's legal name Santek Waste Services, Inc.			For APC Use Only: APC company point no.
2. Site name (if different from legal name) Loudon County (Matlock Bend) Landfill			For APC Use Only: APC Log/Permit no.
3. Site address (St./Rd./Hwy.) 21712 Highway 72			NAICS or SIC Code 562212
City or distance to nearest town Loudon		Zip code 37774	County name Loudon
4. Site location (in Lat./Long)	Latitude N 35.74025 degrees		Longitude W 84.41706 degrees
CONTACT INFORMATION (RESPONSIBLE OFFICIAL)			
5. Responsible official contact Matt Dillard			Phone number with area code 423-303-7101
6. Mailing address (St./Rd./Hwy.) 650 25th Street NW, Suite 100			Fax number with area code 423-479-1952
City Cleveland	State TN	Zip code 37311	Email address mdillard@santekenviro.com
CONTACT INFORMATION (TECHNICAL)			
7. Principal technical contact Will Martin			Phone number with area code 423-303-7101
8. Mailing address (St./Rd./Hwy.) 650 25th Street NW, Suite 100			Fax number with area code 423-479-1952
City Cleveland	State TN	Zip code 37311	Email address wmartin@santekenviro.com
CONTACT INFORMATION (BILLING)			
11. Billing contact Matt Dillard			Phone number with area code 423-303-7101
12. Mailing address (St./Rd./Hwy.) 650 25th Street NW, Suite 100			Fax number with area code 423-479-1952
City Cleveland	State TN	Zip code 37311	Email address mdillard@santekenviro.com
TYPE OF PERMIT REQUESTED			
13. Permit requested for:			
Initial application to operate: ✓			Minor permit modification:
Permit renewal to operate:			Significant modification:
Administrative permit amendment:			Construction permit:

(OVER)

HAZARDOUS AIR POLLUTANTS, DESIGNATIONS, AND OTHER PERMITS ASSOCIATED WITH FACILITY

14. Is this facility subject to the provisions governing prevention of accidental releases of hazardous air contaminants contained in Chapter 1200-03-32 of the Tennessee Air Pollution Control regulations?

[ ] Yes [✓] No

If the answer is Yes, are you in compliance with the provisions of Chapter 1200-03-32 of the Tennessee Air Pollution Control regulations?

[ ] Yes [ ] No

15. If facility is located in an area designated as "Non-Attainment" or "Additional Control", indicate the pollutant(s) for the designation.

No

16. List all valid Air Pollution permits issued to the sources contained in this application [identify all permits with most recent permit numbers and emission source reference numbers listed on the permit(s)].

None

17. Page number:	Revision number:	Date of revision:
1	0	November 2014

State of Tennessee
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Division of Air Pollution Control
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TITLE V PERMIT APPLICATION
OPERATIONS AND FLOW DIAGRAMS

1. Please list, identify, and describe briefly process emission sources, fuel burning installations, and incinerators that are contained in this application. Please attach a flow diagram for this application.

MSW Landfill - Closed and Active MSW landfill units that contain non-hazardous solid waste placed for disposal. The solid waste in the MSW Landfill decomposes over time and creates fugitive landfill gas (LFG) that is emitted from the facility. The LFG contains methane gas, carbon dioxide, and other trace non-methane organic compounds (NMOC). Currently the landfill is not required to install a LFG collection system and none of the LFG is collected and combusted in a flare or other fuel burning device. The landfill also accepts a small quantity of asbestos-containing waste for disposal.

Fugitive Sources of Particulates - The facility has vehicle traffic that traverse the site's paved and unpaved roads to deliver waste to the MSW Landfill. There is also general site operations traffic that uses the site's unpaved roads. Particulate Matter (TSP) is released from the roads during normal site operations. Other miscellaneous sources of PM include material handling and stockpiling of cover soils.

See attached Flow Diagram.

2. List all insignificant activities which are exempted because of size or production rate and cite the applicable regulations.

Exempt per Rule 1200-03-09-.04:
100,000 gallon Leachate Storage Tank
3 x 10,000 gallon Leachate Storage Tanks
2,000 gallon Diesel Fuel Tank
3 x 500 gallon Motor Oil, Hydraulic Oil, and Transmission Fluid Tanks
250 gallon Used Oil Tank
Portable Air Compressor
Portable Pressure Washer
6 x Small LFG passive flares that combust fugitive emissions from leachate cleanout risers

3. Are there any storage piles?

YES X NO _____ (Small soil cover piles only)

4. List the states that are within 50 miles of your facility.

North Carolina

5. Page number:	Revision Number:	Date of Revision:
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State of Tennessee
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TITLE V PERMIT APPLICATION
MISCELLANEOUS PROCESSES

GENERAL IDENTIFICATION AND DESCRIPTION

1. **Facility name:**
Loudon County (Matlock Bend) Landfill

2. **Process emission source (identify):**
MSW Landfill

3. Stack ID or flow diagram point identification (s):
LF01

4. Year of construction or last modification:
1987

If the emissions are controlled for compliance, attach an appropriate Air Pollution Control system form.

5. Normal operating schedule: 24 Hrs./Day 7 Days/Wk. 365 Days/Yr.

6. Location of this process emission source in UTM coordinates: UTM Vertical: 3958938.36 UTM Horizontal: 733974.26

7. Describe this process (Please attach a flow diagram of this process) and check one of the following:

[ ] Batch [✓] Continuous

PROCESS MATERIAL INPUT AND OUTPUT

8. List the types and amounts of raw materials input to this process:

Material	Storage/Material handling process	Average usage (units)	Maximum usage (units)
Solid Waste	Unload, compact, and cover	251,518 tons/yr	251,518 tons/yr

9. List the types and amounts of primary products produced by this process:

Material	Storage/Material handling process	Average usage (units)	Maximum usage (units)
Landfill Gas	Formed by waste decomposition	1,150 scfm	1,359 scfm

10. Process fuel usage:

Type of fuel	Max heat input (10^6 BTU/Hr.)	Average usage (units)	Maximum usage (units)
N/A			

11. List any solvents, cleaners, etc., associated with this process:

N/A

If the emissions and/or operations of this process are monitored for compliance, please attach the appropriate Compliance Demonstration form.

12. Describe any fugitive emissions associated with this process, such as outdoor storage piles, open conveyors, open air sand blasting, material handling operations, etc. (please attach a separate sheet if necessary).

Landfill gas consisting of methane, carbon dioxide, and trace organic compounds.
No control device required at this time.

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Division of Air Pollution Control
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TITLE V PERMIT APPLICATION
MISCELLANEOUS PROCESSES

GENERAL IDENTIFICATION AND DESCRIPTION

1. **Facility name:** Loudon County (Matlock Bend) Landfill

2. **Process emission source (identify):** Fugitive Sources of Particulates

3. Stack ID or flow diagram point identification (s): LF02

4. Year of construction or last modification: 1987

If the emissions are controlled for compliance, attach an appropriate Air Pollution Control system form.

5. Normal operating schedule: 10 Hrs./Day 5.5 Days/Wk. 280 Days/Yr.

6. Location of this process emission source in UTM coordinates: UTM Vertical: 3958272.25 UTM Horizontal: 733624.75

7. Describe this process (Please attach a flow diagram of this process) and check one of the following:

[✓] Batch [ ] Continuous

PROCESS MATERIAL INPUT AND OUTPUT

8. List the types and amounts of raw materials input to this process:

Material	Storage/Material handling process	Average usage (units)	Maximum usage (units)
Vehicle Traffic	Vehicles delivering and handling waste	116,191 miles/yr	145,239 miles/yr

9. List the types and amounts of primary products produced by this process:

Material	Storage/Material handling process	Average usage (units)	Maximum usage (units)
N/A			

10. Process fuel usage:

Type of fuel	Max heat input (10^6 BTU/Hr.)	Average usage (units)	Maximum usage (units)
N/A			

11. List any solvents, cleaners, etc., associated with this process:

N/A

If the emissions and/or operations of this process are monitored for compliance, please attach the appropriate Compliance Demonstration form.

12. Describe any fugitive emissions associated with this process, such as outdoor storage piles, open conveyors, open air sand blasting, material handling operations, etc. (please attach a separate sheet if necessary).

Particulate Matter (TSP) from roadways and parking areas

13. Page number:	Revision Number:	Date of Revision:
4	0	November 2014

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
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Telephone: (615) 532-0554

TITLE V PERMIT APPLICATION
CONTROL EQUIPMENT - MISCELLANEOUS

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:
Loudon County (Matlock Bend) Landfill

2. Emission source (identify):
Fugitive Sources of Particulates

3. Stack ID or flow diagram point identification (s):
LF02

CONTROL EQUIPMENT DESCRIPTION

4. Describe the device in use. List the key operating parameters of this device and their normal operating range (e.g., pressure drop, gas flow rate, temperature):
2000-gallon Water Truck for wetting paved and unpaved roadways for fugitive dust control.
Roads are wetted as needed to control visible emissions of fugitive dust.

5. Manufacturer and model number (if available):
2000 Freightliner Water Truck, Eq. #7189

6. Year of installation:
N/A

7. List of pollutant (s) to be controlled by this equipment and the expected control efficiency for each pollutant.

Pollutant	Efficiency (%)	Source of data
Particulate Matter (PM)	90% or 75%	AP-42, Engineering Judgement
Particulate Matter < 10 microns (PM10)	90% or 75%	AP-42, Engineering Judgement
Particulate Matter < 2.5 microns (PM2.5)	90% or 75%	AP-42, Engineering Judgement

8. Discuss how collected material is handled for reuse or disposal.
N/A

9. If this control equipment is in series with some other control equipment, state and specify the overall efficiency.
Estimate 90% control on paved roads, 75% on unpaved roads

10. Page number: 5 | Revision Number: 0 | Date of Revision: November 2014

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Department of Environment and Conservation
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TITLE V PERMIT APPLICATION
COMPLIANCE CERTIFICATION - MONITORING AND REPORTING
DESCRIPTION OF METHODS USED FOR DETERMINING COMPLIANCE

All sources that are subject to 1200-03-09-.02(11) of the Tennessee Air Pollution Control Regulations are required to certify compliance with all applicable requirements by including a statement within the permit application of the methods used for determining compliance. This statement must include a description of the monitoring, recordkeeping, and reporting requirements and test methods. In addition, the application must include a schedule for compliance certification submittals during the permit term. These submittals must be no less frequent than annually and may need to be more frequent if specified by the underlying applicable requirement or the Technical Secretary.

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name: Loudon County (Matlock Bend) Landfill
2. Process emission source, fuel burning installation, or incinerator (identify): MSW Landfill
3. Stack ID or flowdiagram point identification(s): LF01

METHODS OF DETERMINING COMPLIANCE

4. This source as described under Item #2 of this application will use the following method(s) for determining compliance with applicable requirements (and special operating conditions from an existing permit). Check all that apply and attach the appropriate form(s)

- [ ] Continuous Emission Monitoring (CEM) - APC 20
  Pollutant(s):
- [ ] Emission Monitoring Using Portable Monitors - APC 21
  Pollutant(s):
- [ ] Monitoring Control System Parameters or Operating Parameters of a Process - APC 22
  Pollutant(s):
- [ ] Monitoring Maintenance Procedures - APC 23
  Pollutant(s):
- [ ] Stack Testing - APC 24
  Pollutant(s):
- [ ] Fuel Sampling & Analysis (FSA) - APC 25
  Pollutant(s):
- [ ] Recordkeeping - APC 26
  Pollutant(s):
- [x] Other (please describe) - APC 27
  Pollutant(s): Non-methane organic compounds (NMOC)

5. Compliance certification reports will be submitted to the Division according to the following schedule:
   Start date: Date specified in New Permit
   And every 365 days thereafter.
6. Compliance monitoring reports will be submitted to the Division according to the following schedule:
   Start date: May 2014 - 5 year Tier 2 Gas Sampling and Testing
   And every 1825 days thereafter.
7. Page number: 6 Revision number: 0 Date of revision: November 2014

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243
Telephone: (615) 532-0554

TITLE V PERMIT APPLICATION
COMPLIANCE CERTIFICATION - MONITORING AND REPORTING
DESCRIPTION OF METHODS USED FOR DETERMINING COMPLIANCE

All sources that are subject to 1200-03-09-.02(11) of the Tennessee Air Pollution Control Regulations are required to certify compliance with all applicable requirements by including a statement within the permit application of the methods used for determining compliance. This statement must include a description of the monitoring, recordkeeping, and reporting requirements and test methods. In addition, the application must include a schedule for compliance certification submittals during the permit term. These submittals must be no less frequent than annually and may need to be more frequent if specified by the underlying applicable requirement or the Technical Secretary.

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name: Loudon County (Matlock Bend) Landfill
2. Process emission source, fuel burning installation, or incinerator (identify): Fugitive Emission Sources
3. Stack ID or flowdiagram point identification(s): LF02

METHODS OF DETERMINING COMPLIANCE

4. This source as described under Item #2 of this application will use the following method(s) for determining compliance with applicable requirements (and special operating conditions from an existing permit). Check all that apply and attach the appropriate form(s)

- [ ] Continuous Emission Monitoring (CEM) - APC 20
  Pollutant(s):
- [ ] Emission Monitoring Using Portable Monitors - APC 21
  Pollutant(s):
- [ ] Monitoring Control System Parameters or Operating Parameters of a Process - APC 22
  Pollutant(s):
- [ ] Monitoring Maintenance Procedures - APC 23
  Pollutant(s):
- [ ] Stack Testing - APC 24
  Pollutant(s):
- [ ] Fuel Sampling & Analysis (FSA) - APC 25
  Pollutant(s):
- [ ] Recordkeeping - APC 26
  Pollutant(s):
- [✓] Other (please describe) - APC 27
  Pollutant(s): Particulate Matter (TSP), PM10

5. Compliance certification reports will be submitted to the Division according to the following schedule:
   Start date: Date specified in New Permit
   And every 365 days thereafter.
6. Compliance monitoring reports will be submitted to the Division according to the following schedule:
   Start date: Date specified in New Permit
   And every 180 days thereafter.
7. Page number: 7 Revision number: 0 Date of revision: November 2014

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
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TITLE V PERMIT APPLICATION
COMPLIANCE DEMONSTRATION BY OTHER METHOD(S)

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:
Loudon County (Matlock Bend) Landfill

2. Stack ID or flowdiagram point identification(s):
LF01

3. Emission source (identify):
MSW Landfill

MONITORING DESCRIPTION

4. Pollutant(s) or parameter being monitored:
NMOC

5. Description of the method of monitoring:
As required by 40 CFR Part 60, Subpart WWW, the facility will sample and test the landfill gas once every five years to determine the site-specific NMOC content of the landfill gas being generated. The site-specific NMOC annual emission rate will be calculated for each year of the 5-year period to demonstrate the facility emission rate is below the threshold of 50 megagrams per year of NMOC as hexane. A Tier 2 test was performed in 2014 and submitted to TDEC for review. The results show the facility emissions will be below the 50 Mg/yr threshold for the next 5 years. The next test is due in May 2019.

6. Compliance demonstration frequency (specify the frequency with which compliance will be demonstrated):
Annually based on a 5-year Tier 2 test.

7. Page number:	Revision number:	Date of revision:
8	0	November 2014

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TITLE V PERMIT APPLICATION
COMPLIANCE DEMONSTRATION BY OTHER METHOD(S)

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:
Loudon County (Matlock Bend) Landfill

2. Stack ID or flow diagram point identification(s):
LF02

3. Emission source (identify):
Fugitive Sources of Particulates

MONITORING DESCRIPTION

4. Pollutant(s) or parameter being monitored:
TSP, PM10

5. Description of the method of monitoring:
The facility will visually observe the roadways on operating days of potential fugitive dust emissions and apply water to the roads to control visible emissions to meet the requirements of Rule 1200-03-08-.01. Records will be maintained at the facility of the results of the observations and the number of water loads added to the roads to control dust.

6. Compliance demonstration frequency (specify the frequency with which compliance will be demonstrated):
Each operating day when conditions allow fugitive dust to be emitted from the roads.

7. Page number:	Revision number:	Date of revision:
9	0	November 2014

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Division of Air Pollution Control
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TITLE V PERMIT APPLICATION
EMISSIONS FROM PROCESS EMISSION SOURCE / FUEL BURNING INSTALLATION / INCINERATOR

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name: Loudon County (Matlock Bend) Landfill

2. Stack ID or flowdiagram point identification(s): LF01

3. Process emission source / Fuel burning installation / Incinerator (identify): MSW Landfill

EMISSIONS SUMMARY TABLE – CRITERIA AND FUGITIVE EMISSIONS

4. Complete the following emissions summary for regulated air pollutants. Fugitive emissions shall be included. Attach calculations and emission factor references.

Air Pollutant	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Particulate Matter (TSP)	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Sulfur Dioxide	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Volatile Organic Compounds	All fugitive		All fugitive	
(Fugitive Emissions)	2.56		1.72	
Carbon Monoxide	All fugitive		All fugitive	
(Fugitive Emissions)	3.64		2.44	
Lead	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Nitrogen Oxides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Total Reduced Sulfur	All fugitive		All fugitive	
(Fugitive Emissions)	2.79		1.87	
Mercury	0.00		0.00	
(Fugitive Emissions)	0.00		0.00	

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AIR POLLUTANT	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Asbestos	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Beryllium	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Vinyl Chloride	All fugitive		All fugitive	
(Fugitive Emissions)	0.42		0.28	
Fluorides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Gaseous Fluorides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Greenhouse Gases (Fugitive) in CO_2 Equivalents	234,109		159,630	
Fugitive NMOC	6.55		4.40	

EMISSIONS SUMMARY TABLE – FUGITIVE HAZARDOUS AIR POLLUTANTS

5. Complete the following emissions summary for regulated air pollutants that are hazardous air pollutant(s). Fugitive emissions shall be included. Attach calculations and emission factor references.

Air Pollutant & CAS	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Total HAP	9.24		6.21	
Toluene (108-88-3) (Highest HAP)	3.30		2.22	
Xylenes (1330-20-7)	1.17		0.79	
Methylene Chloride (75-09-2)	1.11		0.74	
See attached calculations				
for other individual HAPs				

6. Page number: 10 | Revision number: 0 | Date of revision: November 2014

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TITLE V PERMIT APPLICATION
EMISSIONS FROM PROCESS EMISSION SOURCE / FUEL BURNING INSTALLATION / INCINERATOR

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name: Loudon County (Matlock Bend) Landfill

2. Stack ID or flowdiagram point identification(s): LF02

3. Process emission source / Fuel burning installation / Incinerator (identify): Fugitive Sources of Particulates

EMISSIONS SUMMARY TABLE – CRITERIA AND FUGITIVE EMISSIONS

4. Complete the following emissions summary for regulated air pollutants. Fugitive emissions shall be included. Attach calculations and emission factor references.

Air Pollutant	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Particulate Matter (TSP)	All fugitive		All fugitive	
(Fugitive Emissions)	85.81		68.65	
Sulfur Dioxide	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Volatile Organic Compounds	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Carbon Monoxide	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Lead	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Nitrogen Oxides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Total Reduced Sulfur	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Mercury	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	

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AIR POLLUTANT	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Asbestos	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Beryllium	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Vinyl Chloride	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Fluorides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Gaseous Fluorides	N/A		N/A	
(Fugitive Emissions)	N/A		N/A	
Greenhouse Gases (Fugitive) in CO_2 Equivalents	N/A		N/A	
Fugitive PM10	23.15		18.53	
Fugitive PM2.5	2.32		1.86	

EMISSIONS SUMMARY TABLE – FUGITIVE HAZARDOUS AIR POLLUTANTS

5. Complete the following emissions summary for regulated air pollutants that are hazardous air pollutant(s). Fugitive emissions shall be included. Attach calculations and emission factor references.

Air Pollutant & CAS	Maximum Allowable Emissions		Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour - Item 7, APC 30)	Tons per Year	Reserved for State use (Pounds per Hour- Item 8, APC 30)
Total HAP	0		0	

6. Page number: 11 | Revision number: 0 | Date of revision: November 2014

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TITLE V PERMIT APPLICATION
EMISSION SUMMARY FOR THE FACILITY OR FOR THE SOURCES CONTAINED IN THIS APPLICATION

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name: Loudon County (Matlock Bend) Landfill

EMISSIONS SUMMARY TABLE – CRITERIA AND SELECTED POLLUTANTS

2. Complete the following emissions summary for regulated air pollutants at this facility or for the sources contained in this application.

Air Pollutant	Summary of Maximum Allowable Emissions		Summary of Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour- Item 4, APC 28)	Tons per Year	Reserved for State use (Pounds per Hour- Item 4, APC 28)
Particulate Matter (TSP)	85.81		68.65	
Sulfur Dioxide	N/A		N/A	
Volatile Organic Compounds	2.56		1.72	
Carbon Monoxide	3.64		2.44	
Lead	N/A		N/A	
Nitrogen Oxides	N/A		N/A	
Total Reduced Sulfur	2.79		1.87	
Mercury	0.00		0.00	
Asbestos	N/A		N/A	
Beryllium	N/A		N/A	
Vinyl Chlorides	0.42		0.28	
Fluorides	N/A		N/A	
Gaseous Fluorides	N/A		N/A	
Greenhouse Gases in CO_2 Equivalents	234,109		159,630	
PM10	23.15		18.53	
PM2.5	2.32		1.86	
NMOC	6.55		4.40	

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EMISSIONS SUMMARY TABLE – HAZARDOUS AIR POLLUTANTS

3. Complete the following emissions summary for regulated air pollutants that are hazardous air pollutant(s) at this facility or for the sources contained in this application.

Air Pollutant & CAS	Summary of Maximum Allowable Emissions		Summary of Actual Emissions	
	Tons per Year	Reserved for State use (Pounds per Hour- Item 5, APC 28)	Tons per Year	Reserved for State use (Pounds per Hour- Item 5, APC 28)
Total HAP	9.24		6.21	
Toluene (108-88-3)	3.30		2.22	
Xylenes (1330-20-7)	1.17		0.79	
Methylene Chloride (75-09-2)	1.11		0.74	
See attached calculations				
for additional HAPs				
(all < 1.0 tpy)				

4. Page number: 12 | Revision number: 0 | Date of revision: November 2014

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
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TITLE V PERMIT APPLICATION
CURRENT EMISSIONS REQUIREMENTS AND STATUS

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:	2. Emission source number
Loudon County (Matlock Bend) Landfill	LF01

3. Describe the process emission source / fuel burning installation / incinerator.

MSW Landfill - Fugitive emissions of non-methane organic compounds (NMOC)

EMISSIONS AND REQUIREMENTS

4. Identify if only a part of the source is subject to this requirement	5. Pollutant	6. Applicable requirement(s): TN Air Pollution Control Regulations, 40 CFR, permit restrictions, air quality based standards	7. Limitation	8. Maximum actual emissions	9. Compliance status (In/Out)
All	NMOC	40 CFR Part 60, Subpart WWW	50 Mg/yr	6.55 tpy	In

10. Other applicable requirements (new requirements that apply to this source during the term of this permit)

11. Page number:	Revision number:	Date of revision:LL
13	0	November 2014

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TITLE V PERMIT APPLICATION
CURRENT EMISSIONS REQUIREMENTS AND STATUS

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:	2. Emission source number
Loudon County (Matlock Bend) Landfill	LF02

3. Describe the process emission source / fuel burning installation / incinerator.

Fugitive Sources of Particulates - Fugitive emissions of particulate matter (TSP) from paved and unpaved roads

EMISSIONS AND REQUIREMENTS

4. Identify if only a part of the source is subject to this requirement	5. Pollutant	6. Applicable requirement(s): TN Air Pollution Control Regulations, 40 CFR, permit restrictions, air quality based standards	7. Limitation	8. Maximum actual emissions	9. Compliance status (In/Out)
All	TSP	Rule 1200-3-8-.01 (2)	No visible dust beyond property line	85.81 tpy	In

10. Other applicable requirements (new requirements that apply to this source during the term of this permit)

11. Page number:	Revision number:	Date of revision:
14	0	November 2014

State of Tennessee
Department of Environment and Conservation
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TITLE V PERMIT APPLICATION
COMPLIANCE PLAN AND COMPLIANCE CERTIFICATION

GENERAL IDENTIFICATION AND DESCRIPTION

1. Facility name:
Loudon County (Matlock Bend) Landfill

2. List all the process emission source(s) or fuel burning installation(s) or incinerator(s) that are part of this application.

MSW Landfill (LF01)
Fugitive Sources of Particulates (LF02)

COMPLIANCE PLAN AND CERTIFICATION

3. Indicate that source(s) which are contained in this application are presently in compliance with all applicable requirements, by checking the following:

X A. Attached is a statement of identification of the source(s) currently in compliance. We will continue to operate and maintain the source(s) to assure compliance with all the applicable requirements for the duration of the permit.

N/A B APC 30 form(s) includes new requirements that apply or will apply to the source(s) during the term of the permit. We will meet such requirements on a timely basis.

4. Indicate that there are source(s) that are contained in this application which are not presently in full compliance, by checking both of the following:

N/A A. Attached is a statement of identification of the source(s) not in compliance, non-complying requirement(s), brief description of the problem, and the proposed solution.

N/A B. We will achieve compliance according to the following schedule:

Action	Deadline
N/A	

Progress reports will be submitted:

Start date: N/A and every 180 days thereafter until compliance is achieved.

5. State the compliance status with any applicable compliance assurance monitoring and compliance certification requirements that have been promulgated under section 114(a)(3) of the Clean Air Act as of the date of submittal of this APC 31.

N/A

6. Page number: 15 Revision number: 0 Date of revision: November 2014

SUMMARY OF POTENTIAL AIR POLLUTANT EMISSIONS

Loudon County (Matlock Bend) Landfill
Loudon, Tennessee

Emission Point		Regulated Air Pollutant	Air Pollutant Emission Rates Actual (2014)		Air Pollutant Emission Rates PTE*	
Number	Name		pounds/hour	tons/year	pounds/hour	tons/year
Unit LF02	Paved Roadways	Particulate Matter < 10 Microns	0.01	0.05	0.01	0.06
		Particulate Matter < 2.5 Microns	0.00	0.01	0.00	0.01
		Total Particulate Matter	0.05	0.24	0.07	0.30
Unit LF02	Unpaved Roadways	Particulate Matter < 10 Microns	2.14	9.38	2.68	11.72
		Particulate Matter < 2.5 Microns	0.21	0.94	0.27	1.17
		Total Particulate Matter	7.93	34.74	9.91	43.42
Unit LF02	Loading/Unloading Operations	Particulate Matter < 10 Microns	0.00	0.019	0.00	0.019
		Particulate Matter < 2.5 Microns	0.00	0.003	0.00	0.003
		Particulate Matter	0.01	0.040	0.01	0.040
Unit LF02	Construction and Operations	Particulate Matter < 10 Microns	2.07	9.08	2.59	11.35
		Particulate Matter < 2.5 Microns	0.21	0.91	0.26	1.14
		Total Particulate Matter	7.68	33.64	9.60	42.05
Unit LF01	Landfill Emissions	Particulate Matter < 10 Microns	0.00	0.00	0.00	0.00
		Volatile Organic Compounds	0.39	1.72	0.58	2.56
		Nitrogen Oxide Compounds	0.00	0.00	0.00	0.00
		Total Sulfur Compounds	0.43	1.87	0.64	2.79
		Carbon Monoxide	0.56	2.44	0.83	3.64
		Total Hazardous Air Pollutants	1.42	6.21	2.11	9.24
		Non-Methane Organic Compounds	1.00	4.40	1.50	6.55
		Fugitive Methane (GHG)**	1,285	5,628	1,870	8,189
Combined LF01 + LF02	Total From All Emission Points	Particulate Matter < 10 Microns	4.23	18.53	5.29	23.15
		Total Particulate Matter	15.67	68.65	19.59	85.81
		Volatile Organic Compounds	0.39	1.72	0.58	2.56
		Nitrogen Oxide Compounds	0.00	0.00	0.00	0.00
		Total Sulfur Compounds	0.43	1.87	0.64	2.79
		Carbon Monoxide	0.56	2.44	0.83	3.64
		Total Hazardous Air Pollutants	1.42	6.21	2.11	9.24
		Toluene (Single Highest HAP)	0.51	2.22	0.75	3.30
		Non-Methane Organic Compounds	1.00	4.40	1.50	6.55
		Fugitive Methane (GHG)**	1,285	5,628	1,870	8,255

PTE Basis:

Vehicle Miles Traveled*:	Landfill Roadways =	83,694	miles per year
	Construction and Operations Eq. =	61,545	miles per year
Landfill Gas Generation:	Future MSW Disposal Rate*** =	251,518	tons per year

*MSW Landfill PTE is based on maximum emissions at projected end of current permitted capacity (in year 2020).
For PTE of PM emissions, assume potential 25% increase in vehicle miles in any given year over actual.
**See Tables 2A, 2B, and 2C for GHG emission estimates per Federal GHG Reporting Rule.
*** Based on Actual Disposal Rate for year 2013.

Loudon County (Matlock Bend) Landfill
Loudon, Tennessee

Emission Sources:
Landfill Gas Fugitives

Emission Point Number:
Unit LF01

Pollutant	Molecular Weight (g/Mol)	Average Concentration Found In LFG (ppmv) (2)	ACTUAL ESTIMATES (2014) LFG Generation (tons/yr) (3)	LFG to Flare (tons/yr) (4)	Flare Control Efficiency (5)	LFG Emissions from Flare (tons/yr) (6)	Fugitive Emissions from Landfill (tons/yr) (7)	Total LFG Emissions from Flare and Landfill (tons/yr)
Hazardous Air Pollutants (HAPs) (1)								
1,1,1-Trichloroethane (methyl chloroform)	133.42	0.480	0.039	0.00	98.0%	0.000	0.039	0.039
1,1,2,2-Tetrachloroethane	167.85	1.110	0.114	0.00	98.0%	0.000	0.114	0.114
1,1-Dichloroethane (ethylidene dichloride)	98.95	2.350	0.142	0.00	98.0%	0.000	0.142	0.142
1,1-Dichloroethene (vinylidene chloride)	96.94	0.200	0.012	0.00	98.0%	0.000	0.012	0.012
1,2-Dichloroethane (ethylene dichloride)	98.96	0.410	0.025	0.00	98.0%	0.000	0.025	0.025
1,2-Dichloropropane (propylene dichloride)	112.98	0.180	0.012	0.00	98.0%	0.000	0.012	0.012
Acrylonitrile	53.06	6.330	0.206	0.00	98.0%	0.000	0.206	0.206
Benzene	78.11	1.910	0.091	0.00	98.0%	0.000	0.091	0.091
Carbon disulfide	76.13	0.580	0.027	0.00	98.0%	0.000	0.027	0.027
Carbon tetrachloride	153.84	0.004	0.000	0.00	98.0%	0.000	0.000	0.000
Carbonyl sulfide	60.07	0.490	0.018	0.00	98.0%	0.000	0.018	0.018
Chlorobenzene	112.56	0.250	0.017	0.00	98.0%	0.000	0.017	0.017
Chloroethane (ethyl chloride)	64.52	1.250	0.049	0.00	98.0%	0.000	0.049	0.049
Chloroform	119.39	0.030	0.002	0.00	98.0%	0.000	0.002	0.002
Chloromethane (methyl chloride)	50.49	1.210	0.037	0.00	98.0%	0.000	0.037	0.037
Dichlorobenzene (1,4-Dichlorobenzene)	147.00	0.210	0.019	0.00	98.0%	0.000	0.019	0.019
Dichloromethane (Methylene Chloride)	84.94	14.300	0.744	0.00	98.0%	0.000	0.744	0.744
Ethylbenzene	106.16	4.610	0.300	0.00	98.0%	0.000	0.300	0.300
Ethylene dibromide (1,2-Dibromoethane)	187.88	0.001	0.000	0.00	98.0%	0.000	0.000	0.000
Hexane	86.18	6.570	0.347	0.00	98.0%	0.000	0.347	0.347
Mercury (total)	200.61	0.0003	0.000	0.00	98.0%	0.000	0.000	0.000
Methyl ethyl ketone (8)	72.11	7.090	0.313	0.00	98.0%	0.000	0.313	0.313
Methyl isobutyl ketone	100.16	1.870	0.115	0.00	98.0%	0.000	0.115	0.115
Perchloroethylene (tetrachloroethylene)	165.83	3.730	0.379	0.00	98.0%	0.000	0.379	0.379
Toluene	92.13	39.300	2.218	0.00	98.0%	0.000	2.218	2.218
Trichloroethylene (trichloroethene)	131.38	2.820	0.227	0.00	98.0%	0.000	0.227	0.227
Vinyl chloride	62.50	7.340	0.281	0.00	98.0%	0.000	0.281	0.281
Xylenes	106.16	12.100	0.787	0.00	98.0%	0.000	0.787	0.787
			-	0.00		0.000	-	
Total HAPs			6.210	0.00		0.000	6.210	6.21
Criteria Air Pollutants								
VOCs (10)	86.18	32.0	1.72	0.00	98.0%	0.000	1.72	1.72
Sulfur Dioxide (SO_2)/Total Sulfur (9)	64.1	46.9	1.87	0.00	-	-	1.87	1.871
Carbon Monoxide from Flare (CO) (11)	-	-	-	-	-	0.000	-	0.000
Fugitive Carbon Monoxide (CO) (12)	140.0	28.01	2.44	0.00	-	-	2.44	2.44
Nitrogen Oxides (NO_x) (11)	-	-	-	-	-	0.000	-	0.000
Particulates (PM) (11)	-	-	-	-	-	0.000	-	0.000
Particulates (PM_{10}) (11)	-	-	-	-	-	0.000	-	0.000
Other Regulated Air Pollutants								
NMOCs as Hexane (13)	86.18	82.0	4.40	0.000	98.0%	0.00	4.40	4.40

NOTES:

(1) Listed Hazardous Air Pollutants (HAPs) are among compounds commonly found in landfill gas (LFG), as presented in AP-42 (9/97), Tables 2.4-1and 2.4-2

(2) Average concentrations of pollutants in LFG based on AP-42 (9/97), Tables 2.4-1 and 2.4-2.

(3) Based on average concentrations of compounds found in LFG, and an estimated current LFG generation of **913** **scfm (2014),** based on USEPA's LandGEM estimates using region-specific k (=0.040) and L_o (= 100 m3/Mg) input parameters (See attached Table 1).

(4) The percentage of LFG generated that is collected and routed to flare.

(5) Minimum typical control efficiency, as found in AP-42 (9/97), Table 2.4-3.

(6) (LFG to flare) * (1-control efficiency) = LFG emissions from flare.

(7) LFG that is not collected or controlled.

(8) Discontinued as a HAP in 2005. Not included in Total HAPs.

(9) Concentration of Total Sulfur from AP-42 (9/97), Section 2.4.4. When gas is not combusted, no SO2 is formed and all sulfur emissions are fugitive.

(10) According to AP-42 (9/97), Table 2.4-2, Note C, VOC content at MSW sites with unknown concentrations equals 39% by weight of total NMOC concentration.

(11) Emission factors for NO_2, CO, and PM_{10} (as CH_4) are from AP-42 (9/97), Table 2.4-5. All PM/PT assumed less than 1 micron (PM=PM10=PM2.5) for flares.

(12) Based on LandGEM model estimate of CO generated in LFG

(13) NMOC concentration modified in accordance with the results of the Tier 2 test performed at the site in 2014.

MODEL INPUT VARIABLES: (Actual)

Estimated Methane Content of LFG	50.00%	
Methane Generation from Landfill	6,793,121	m3/yr in 2014, based on USEPA LandGEM estimates
LFG Generation from Landfill	479,793,644	ft3/yr in 2014, based on USEPA LandGEM estimates
Collection Efficiency (4)	0.0%	
Total LFG Collected	0.0	cu ft (collection system not required)
Landfill Gas Generation Rate (3)	912.8	scfm
Average Landfill Gas Flow To Flare	0.0	scfm (no gas sent to flare until after 2019)

FLARE EMISSION FACTORS:

Pollutant	Emission factor (12)		
CO	0.37	lbs/mmBtu	(from vendor/AP-42)
NO_x	0.068	lbs/mmBtu	(from vendor/AP-42)
PM=PM10=PM2.5	17	lb/million cf CH4	(from AP-42, 11/98)

EXAMPLE CALCULATIONS

Hours of Operations for 2014 = 8,760.00 hrs (estimated)
525,600 mins

(HAPs, VOCs, NMOCs)

Landfill Gas Generation Rate [scfm] = (Methane Generation From Landfill [m3/yr])*(1/Estimated Methane Content of Landfill)*(35.3147 cf/m3)/(525,600 min/year)

LFG Generation [tons/year] = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Generation Rate [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

LFG To Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

LFG Emissions From Flare = (LFG To Flare [tons/yr])*(1 - Control Efficiency).

Fugitive Emissions From Landfill = (LFG Generation [tons/year]) - (LFG To Flare [tons/year] - (LFG To Engine Plant [tons/year])

Total LFG Emissions From Flare and Landfill = (Fugitive Emissions From Landfill) + (LFG Emissions from Flare).

(SO_2)

LFG Emissions from Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

(HCl)

LFG Emissions from Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf)*(Control Eff/100).

(CO, NO_x)

LFG Emissions from Flare = (Total LFG Collected by Flare [cf])*(1012 [BTU/cf] * %CH4)*(Emission Factor)/(1,000,000).

(PM)

LFG Emissions from Flare = (Methane Flow to Flare [cf CH4])*1012 Btu/cf*(Emission Factor) or (Methane Flow Rate to Flare [cfm])*(Emission Factor).

Loudon County (Matlock Bend) Landfill
Loudon, Tennessee

Emission Sources:
Landfill Gas Fugitives

Emission Point Number:
Unit LF01

Pollutant	Molecular Weight (g/Mol)	Average Concentration Found In LFG (ppmv) (2)	PTE ESTIMATES					
			LFG Generation (tons/yr) (3)	LFG to Flare (tons/yr) (4)	Flare Control Efficiency (5)	LFG Emissions from Flare (tons/yr) (6)	Fugitive Emissions from Landfill (tons/yr) (7)	Total LFG Emissions from Flare and Landfill (tons/yr)
Hazardous Air Pollutants (HAPs) (1)								
1,1,1-Trichloroethane (methyl chloroform)	133.42	0.480	0.058	0.00	98.0%	0.000	0.058	0.058
1,1,2,2-Tetrachloroethane	167.85	1.110	0.170	0.00	98.0%	0.000	0.170	0.170
1,1-Dichloroethane (ethylidene dichloride)	98.95	2.350	0.212	0.00	98.0%	0.000	0.212	0.212
1,1-Dichloroethene (vinylidene chloride)	96.94	0.200	0.018	0.00	98.0%	0.000	0.018	0.018
1,2-Dichloroethane (ethylene dichloride)	98.96	0.410	0.037	0.00	98.0%	0.000	0.037	0.037
1,2-Dichloropropane (propylene dichloride)	112.98	0.180	0.019	0.00	98.0%	0.000	0.019	0.019
Acrylonitrile	53.06	6.330	0.306	0.00	98.0%	0.000	0.306	0.306
Benzene	78.11	1.910	0.136	0.00	98.0%	0.000	0.136	0.136
Carbon disulfide	76.13	0.580	0.040	0.00	98.0%	0.000	0.040	0.040
Carbon tetrachloride	153.84	0.004	0.001	0.00	98.0%	0.000	0.001	0.001
Carbonyl sulfide	60.07	0.490	0.027	0.00	98.0%	0.000	0.027	0.027
Chlorobenzene	112.56	0.250	0.026	0.00	98.0%	0.000	0.026	0.026
Chloroethane (ethyl chloride)	64.52	1.250	0.074	0.00	98.0%	0.000	0.074	0.074
Chloroform	119.39	0.030	0.003	0.00	98.0%	0.000	0.003	0.003
Chloromethane (methyl chloride)	50.49	1.210	0.056	0.00	98.0%	0.000	0.056	0.056
Dichlorobenzene (1,4-Dichlorobenzene)	147.00	0.210	0.028	0.00	98.0%	0.000	0.028	0.028
Dichloromethane (Methylene Chloride)	84.94	14.300	1.107	0.00	98.0%	0.000	1.107	1.107
Ethylbenzene	106.16	4.610	0.446	0.00	98.0%	0.000	0.446	0.446
Ethylene dibromide (1,2-Dibromoethane)	187.88	0.001	0.000	0.00	98.0%	0.000	0.000	0.000
Hexane	86.18	6.570	0.516	0.00	98.0%	0.000	0.516	0.516
Mercury (total)	200.61	0.0003	0.000	0.00	98.0%	0.000	0.000	0.000
Methyl ethyl ketone (8)	72.11	7.090	0.466	0.00	98.0%	0.000	0.466	0.466
Methyl isobutyl ketone	100.16	1.870	0.171	0.00	98.0%	0.000	0.171	0.171
Perchloroethylene (tetrachloroethylene)	165.83	3.730	0.564	0.00	98.0%	0.000	0.564	0.564
Toluene	92.13	39.300	3.301	0.00	98.0%	0.000	3.301	3.301
Trichloroethylene (trichloroethene)	131.38	2.820	0.338	0.00	98.0%	0.000	0.338	0.338
Vinyl chloride	62.50	7.340	0.418	0.00	98.0%	0.000	0.418	0.418
Xylenes	106.16	12.100	1.171	0.00	98.0%	0.000	1.171	1.171
			-	0.00		0.000	-	
Total HAPs			9.243	0.00		0.000	9.243	9.24
Criteria Air Pollutants								
VOCs (10)	86.18	32.0	2.56	0.00	98.0%	0.000	2.56	2.555
Sulfur Dioxide (SO_2)/Total Sulfur (9)	64.1	46.9	2.79	0.00	-	-	2.79	2.785
Carbon Monoxide from Flare (CO) (11)	-	-	-	-	-	0.000	-	0.000
Fugitive Carbon Monoxide (CO) (12)	140.0	28.01	3.64	0.00	-	-	3.64	3.64
Nitrogen Oxides (NO_x) (11)	-	-	-	-	-	0.000	-	0.000
Particulates (PM) (11)	-	-	-	-	-	0.000	-	0.000
Particulates (PM_{10}) (11)	-	-	-	-	-	0.000	-	0.000
Other Regulated Air Pollutants								
NMOCs as Hexane (13)	86.18	82.0	6.55	0.000	98.0%	0.00	6.55	6.55

NOTES:

(1) Listed Hazardous Air Pollutants (HAPs) are among compounds commonly found in landfill gas (LFG), as presented in AP-42 (9/97), Tables 2.4-1and 2.4-2
(2) Average concentrations of pollutants in LFG based on AP-42 (9/97), Tables 2.4-1 and 2.4-2.
(3) Based on average concentrations of compounds found in LFG, and an estimated current LFG generation of **1,359** **scfm (2020),** based on USEPA's LandGEM estimates using region-specific k (=0.040) and L_0 (= 100 m3/Mg) input parameters (See attached Table 1).
(4) The percentage of LFG generated that is collected and routed to flare.
(5) Minimum typical control efficiency, as found in AP-42 (9/97), Table 2.4-3.
(6) (LFG to flare) * (1-control efficiency) = LFG emissions from flare.
(7) LFG that is not collected or controlled.
(8) Discontinued as a HAP in 2005. Not included in Total HAPs.
(9) Concentration of Total Sulfur from AP-42 (9/97), Section 2.4.4. When gas is not combusted, no SO2 is formed and all sulfur emissions are fugitive.
(10) According to AP-42 (9/97), Table 2.4-2, Note C, VOC content at MSW sites with unknown concentrations equals 39% by weight of total NMOC concentration.
(11) Emission factors for NO_2, CO, and PM_{10} (as CH_4) are from AP-42 (9/97), Table 2.4-5. All PM/PT assumed less than 1 micron (PM=PM10=PM2.5) for flares.
(12) Based on LandGEM model estimate of CO generated in LFG
(13) NMOC concentration modified in accordance with the results of the Tier 2 test performed at the site in 2014.

MODEL INPUT VARIABLES: (Actual)

Estimated Methane Content of LFG	50.00%	
Methane Generation from Landfill	10,110,276	m3/yr in 2020, based on USEPA LandGEM estimates
LFG Generation from Landfill	714,082,107	ft3/yr in 2020, based on USEPA LandGEM estimates
Collection Efficiency (4)	0.0%	
Total LFG Collected	0.0	cu ft (collection system not required)
Landfill Gas Generation Rate (3)	1,358.6	scfm
Average Landfill Gas Flow To Flare	0.0	scfm (no gas sent to flare until after 2019)

FLARE EMISSION FACTORS:

Pollutant	Emission factor (12)		
CO	0.37	lbs/mmBtu	(from vendor/AP-42)
NO_x	0.068	lbs/mmBtu	(from vendor/AP-42)
PM=PM10=PM2.5	17	lb/million cf CH4	(from AP-42, 11/98)

EXAMPLE CALCULATIONS

Hours of Operations for 2020 = 8,760.00 hrs (estimated)
525,600 mins

(HAPs, VOCs, NMOCs)
Landfill Gas Generation Rate [scfm] = (Methane Generation From Landfill [m3/yr])*(1/Estimated Methane Content of Landfill)*(35.3147 cf/m3)/(525,600 min/year)

LFG Generation [tons/year] = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Generation Rate [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

LFG To Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

LFG Emissions From Flare = (LFG To Flare [tons/yr])*(1 - Control Efficiency).

Fugitive Emissions From Landfill = (LFG Generation [tons/year]) - (LFG To Flare [tons/year] - (LFG To Engine Plant [tons/year])

Total LFG Emissions From Flare and Landfill = (Fugitive Emissions From Landfill) + (LFG Emissions from Flare).

(SO_2)
LFG Emissions from Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf).

(HCl)
LFG Emissions from Flare = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG to Flare [cfm])
(525,600 min/yr)(1ton/2,000lb)*(1lb/453.6g)*(1mol/24.45L @ STP)*(28.32L/1cf)*(Control Eff/100).

(CO, NO_x)
LFG Emissions from Flare = (Total LFG Collected by Flare [cf])*(1012 [BTU/cf] * %CH4)*(Emission Factor)/(1,000,000).

(PM)
LFG Emissions from Flare = (Methane Flow to Flare [cf CH4])*1012 Btu/cf*(Emission Factor) or (Methane Flow Rate to Flare [cfm])*(Emission Factor).

Loudon County (Matlock Bend) Landfill
Paved Roadways Emissions

Unit LF02

Type of Vehicle	Avg. Weight (tons)	Avg. Vehicles per yr	Roundtrip distance (feet)	Roundtrip distance (miles)	Vehicle Miles Traveled	Percent of Total Miles Traveled	Wt. Avg. Weight (tons)
6-axle Transfer Trucks	45.0	4500	750	0.14	639	14.91%	6.7
Front/Side Loader & Packer Trucks	28.1	4054	750	0.14	576	13.43%	3.8
5-axle Tractor Trailer Trucks	40.0	1450	750	0.14	206	4.80%	1.9
Roll Off Trucks	20.3	4053	750	0.14	576	13.42%	2.7
Lightweight Selfhaul Trucks	3.5	16133	750	0.14	2,292	53.44%	1.9
Total		30190			4,288	100%	17.0

Average number of waste vehicles per year = 30,190
One way length of Paved Roads = 375 feet = 0.07 miles
Total Vehicle Miles Traveled (VMT) per year = 4,288 miles
Max. VMT @ 25% Increase (for PTE) = 5,360 miles

Operation days per year = 280

Weighted average vehicle weight = 17.00 tons

Methodologies:
AP-42, Section 13.2.1.3, Equation (2), for Paved Roads, January 2011 Edition

$$E = [k(sL)^{0.91} * (W)^{1.02}] * (1-P/4N)$$

- E = Emission factor in pounds per vehicle mile traveled (lb/VMT)
- k = Particle size multiplier (lb/VMT)
- sL = Road surface silt loading factor (g/m^2)
- W = Average Vehicle weight in tons
- P = Number of days with rain > 0.01 inches (from Figure 13.2.1-2)
- N = Averaging period (365 for annual; 91 for seasonal; 30 for monthly)

Variables:	k factor[1]	Silt loading[2] (sL)	W	P	N (Long Term)
Pollutant	lb/VMT	g/m^2	Tons	days	days
PM-10	0.0022	7.4	17.00	130	365
PM-2.5	0.00054	7.4	17.00	130	365
PM (TSP)	0.011	7.4	17.00	130	365

[1] from AP-42, Table 13.2.1-1, January 2011 Edition
[2] Mean value for MSW Landfills from Table 13.2.1-3, January 2011 Edition

Assume control efficiency (CE) as 90% for routine watering and washing of paved roads

Actual PM Emissions = E*VMT*(1-CE)

Summary of PM Emissions From Paved Roadway

Pollutant	Emission Factor lb/VMT (daily)	Actual Emissions lbs/day	Actual Emissions tons/yr	PTE Emissions lbs/day	PTE Emissions tons/yr
PM-10	0.22	0.34	0.05	0.43	0.06
PM-2.5	0.05	0.08	0.01	0.10	0.01
PM (TSP)	1.11	1.71	0.24	2.13	0.30

Loudon County (Matlock Bend) Landfill
Unpaved Roadways - PM Emissions

Unit LF02

Type of Vehicle	Avg. Weight (tons)	Avg. Vehicles per yr	Roundtrip distance (feet)	Roundtrip distance (miles)	Vehicle Miles Traveled	Percent of Total Miles Traveled	Wt. Avg. Weight (tons)
6-axle Transfer Trucks	45.0	4500	10960	2.08	9,341	14.91%	6.7
Front/Side Loader & Packer Trucks	28.1	4054	10960	2.08	8,415	13.43%	3.8
5-axle Tractor Trailer Trucks	40.0	1450	10960	2.08	3,010	4.80%	1.9
Roll Off Trucks	20.3	4053	10960	2.08	8,413	13.42%	2.7
Lightweight Selfhaul Trucks	3.5	16133	10960	2.08	33,488	53.44%	1.9
Total		30,190			62,667		17.0

Total number of waste vehicles per year =	30,190			
One way length of Unpaved Roads =	5480	feet =	1.04	miles
Total Vehicle Miles Traveled (VMT) per year =			62,667	miles
Max. VMT @ 25% Increase (for PTE) =			78,334	miles

Operation days per year = 280

Weighted average vehicle weight = 17.00 tons (Actual) (See Note 1)

Methodologies:
AP-42, Section 13.2.2.2, Equations (1a) and (2), for Unpaved Roads at Industrial Sites, November 2006 Edition.

$$E = k(s/12)^a * (W/3)^b * [(365-P)/365]$$

- E = Emission factor in pounds per vehicle mile traveled (lb/VMT)
- k = Particle size multiplier (lb/VMT)
- a = Emprical Constant from Table 13.2.2-2
- b = Emprical Constant from Table 13.2.2-2
- s = Surface material silt content (%)
- W = Average Vehicle weight in tons
- P = Number of days with rain > 0.01 inches (from Figure 13.2.2-1)

Variables:	k factor[1]	a	b	Surface Silt Content[2] (%)	W (average)	P
Pollutant	lb/VMT			(%)	Tons	days
PM-10	1.5	0.9	0.45	6.4	17.00	130
PM-2.5	0.15	0.9	0.45	6.4	17.00	130
PM (TSP)	4.9	0.7	0.45	6.4	17.00	130

[1] from AP-42, Section 13.2.2.2, November 2006 Edition

[2] Mean value for MSW Landfills from Table 13.2.2-1, November 2006 Edition

Assume control efficiency (CE) as 75% for routine watering of roads as needed (See Figure 13.2.2-2 in AP-42)

Actual PM Emissions = E*VMT*(1-CE)

Summary of PM Emissions From Unpaved Roadway - Actual

Pollutant	Emission Factor - E lb/VMT	Actual Emissions lbs/day	Actual Emissions tons/yr	PTE Emissions lbs/day	PTE Emissions tons/yr
PM-10	1.20	66.98	9.38	83.73	11.72
PM-2.5	0.12	6.70	0.94	8.37	1.17
PM (TSP)	4.43	248.12	34.74	310.15	43.42

Loudon County (Matlock Bend) Landfill
Loudon, Tennessee

Emission Source:
Construction Vehicles on Haul Roads and Landfill Surface
Equipment types are listed equivalent CAT vehicles
Emission Point Number:
Unit LF02

Vehicle Miles Traveled

Number of Vehicles	Type of Construction Vehicle	Average Hrs/day	Average Vehicle Weight (tons)	Average Vehicle Speed (mph)	Vehicle Miles Traveled (VMT) Actual		Percent of Total Miles Traveled
					miles/day	miles/year	
	Compactors						
1	826H Compactor	8	40.75	2	16.0	4,480	9.10%
	Dozers						
1	D6R Dozer	8	20.00	2	16.0	4,480	9.10%
	Scrapers						
1	CAT 621 Scraper-Standard*	8	49.50	5	40.0	8,320	16.90%
	Loaders						
1	963C - Track Loader	8	24.02	1	8.0	2,240	4.55%
1	963B - Track Loader*	6	22.35	1	6.0	1,524	3.10%
	Trackhoes (Excavators)						
1	320D Trackhoe*	8	22.41	1	8.0	2,032	4.13%
	Dumps						
1	Volvo 730*	8	42.20	5	40.0	8,320	16.90%
	Misc. Trucks						
1	Water Truck*	2	24.25	5	10.0	2,540	5.16%
1	Other Truck (Service Truck)*	1	25.00	10	10.0	2,540	5.16%
	Tractor/Mower						
1	Ford FWD Tractor*	2	3.00	5	10.0	1,560	3.17%
	Pickup Trucks						
2	Pickup Trucks	2	3.00	10	40.0	11,200	22.75%
							100%
	Total Vehicle Miles Travelled (VMT) =					49,236	miles
	Max. VMT @ 25% Increase (for PTE) =					61,545	miles

Max. Days of Operation = 280 days/yr (5.5 days per week less 6 holidays per year)
* Indicates Equipment that normally operates less than the max. days or hours per year.

Assumptions:
Silt content was taken from AP-42, Table 13.2.2-1 for municipal solid waste landfills.
Mean number of days of precipitation was taken from AP-42, Unpaved Roads, Figure 13.2.2-1.
Assume number of tires (w) for all track vehicles is 18.
Assume aerodynamic particle size is less than 10 microns.

Mean Vehicle Weight (W)

Type of Construction Vehicle	Operating Weight (lbs)	Operating Weight (tons)	Soil/Water Density (lb/cf)	Capacity (cy)	Capacity (tons)	Mean Vehicle Weight (tons)
826H Compactor	81,498	40.75	-	-	-	40.75
D6R Dozer	40,000	20.00	-	-	-	20.00
CAT 621 Scraper-Standard*	66,590	33.30	120.00	20.00	32.40	49.50
963C - Track Loader	43,186	21.59	120.00	3.00	4.86	24.02
963B - Track Loader*	40,490	20.25	120.00	2.60	4.21	22.35
320D Trackhoe*	44,820	22.41	-	-	-	22.41
Volvo 730*	52,000	26.00	120.00	20.0	32.40	42.20
Water Truck*	40,000	20.00	62.40	-	8.50	24.25
Other Truck (Service Truck)*	50,000	25.00	-	-	-	25.00
Ford FWD Tractor*	6,000	3.00	-	-	-	3.00
Pickup Trucks	6,000	3.00	-	-	-	3.00

Note: Equipment weights and capacities are based on similar CATERPILLAR equipment (unless otherwise noted).

Methodologies:
AP-42, Section 13.2.2 for Unpaved Roads.

Operation days per year = 280

Weighted average vehicle weight = 27.05 tons

Methodologies:
AP-42, Section 13.2.2.2, Equations (1a) and (2), for Unpaved Roads at Industrial Sites, November 2006 Edition.

$$E = k(s/12)^{a} * (W/3)^{b} * [(365-P)/365]$$

- **E** = Emission factor in pounds per vehicle mile traveled (lb/VMT)
- **k** = Particle size multiplier (lb/VMT)
- **a** = Emprical Constant from Table 13.2.2-2
- **b** = Emprical Constant from Table 13.2.2-2
- **s** = Surface material silt content (%)
- **W** = Average Vehicle weight in tons
- **P** = Number of days with rain > 0.01 inches (from Figure 13.2.2-1)

Variables:	k factor[1]	a	b	Surface Silt Content[2] (%)	W	P
Pollutant	lb/VMT			(%)	Tons	days
PM-10	1.5	0.9	0.45	6.4	27.05	130
PM-2.5	0.15	0.9	0.45	6.4	27.05	130
PM (PE)	4.9	0.7	0.45	6.4	27.05	130

[1] from AP-42, Section 13.2.2.2, November 2006 Edition

[2] Mean value for MSW Landfills from Table 13.2.2-1, November 2006 Edition

Assume control efficiency as 75.00%

Summary of PM Emissions From Unpaved Roadway

Pollutant	Emission Factor lb/VMT	Actual Emissions		PTE Emissions	
		lbs/day	tons/yr	lbs/day	tons/yr
PM-10	1.48	64.9	9.08	81.1	11.35
PM-2.5	0.15	6.5	0.91	8.1	1.14
PM (PE)	5.47	240.3	33.64	300.3	42.05

Loudon County (Matlock Bend) Landfill
Cover Loading and Umloading Emissions

Emission Point Number:
Unit LF02

Operation days per year =	280	
Tons of Waste Disposed =	251,518	tons/yr
Cover Soil Used (20% of waste) =	50,304	tons/yr

Methodologies:
AP-42, Section 13.2.4, Equation (1), November 2006 Edition

$$E = k*(0.0032)*(U/5)^{1.3}/(M/2)^{1.4}$$

- **E** = Emission factor in pounds per ton of material handled (lb/ton)
- **k** = Particle size multiplier
- **U** = Mean wind speed (mph)
- **M** = Material moisture content (%)

Variables:	k factor[1]	U[2]	M[3]
Pollutant		mph	%
PM-10	0.35	15	12
PM-2.5	0.053	15	12
PM (TSP)	0.74	15	12

[1] from AP-42, Section 13.2.4, 11/06 Edition

[2] Maximum of range given for Eq.1 in AP-42, Section 13.2.4, 11/06 Edition

[3] Mean value for MSW landfill cover from Table 13.2.4-1, 11/06 Edition

Assume control efficiency (CE) as 0%

Actual PM Emissions = E*2*cover soil tons*(1-CE)

Summary of PM Emissions From Cover Loading/Unloading

Pollutant	Emission Factor (lb/ton)	Actual Emissions	
		lbs/day	tons/yr
PM-10	**0.0004**	**0.14**	**0.019**
PM-2.5	**0.0001**	**0.02**	**0.003**
PM (TSP)	**0.0008**	**0.29**	**0.040**

FUGITIVE EMISSIONS FROM LEACHATE COLLECTION TANKS
Loudon County (Matlock Bend) Landfill

Emission Source:
Leachate Collection and Storage

VOC Emission Summary:

Potential Total Volatile Organics (1) (ug/L)	Avg. Annual Precipitation (2) (inches)	2013 Annual Leachate Generation (3) (gal)	2013 Annual Fugitive VOC Emissions (5) (tons)	PTE Annual Leachate Generation (4) (gal)	PTE Annual Fugitive VOC Emissions (5) (tons)
6,186.0	51	7,137,077	0.184	10,000,000	0.258

HAPs Emissions:

Compound (6)	Concentration (ug/L)	Average HAP Emissions		PTE HAP Emissions	
		lbs/yr	tons/yr	lbs/yr	tons/yr
Acrylonitrile	5.0	0.298	1.49E-04	0.417	2.09E-04
Benzene	5.0	0.298	1.49E-04	0.417	2.09E-04
Bromoform	5.0	0.298	1.49E-04	0.417	2.09E-04
Bromomethane	5.0	0.298	1.49E-04	0.417	2.09E-04
2-Butanone (MEK) (7)	3800	226.306	1.13E-01	317.09	1.59E-01
Carbon Disulfide	5.0	0.298	1.49E-04	0.417	2.09E-04
Carbon Tetrachloride	5.0	0.298	1.49E-04	0.417	2.09E-04
Chlorobenzene	5.0	0.298	1.49E-04	0.417	2.09E-04
Chloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
Chloroform	5.0	0.298	1.49E-04	0.417	2.09E-04
Chloromethane	5.0	0.298	1.49E-04	0.417	2.09E-04
1,2-Dibromo-3-chloropropane (DBCP)	5.0	0.298	1.49E-04	0.417	2.09E-04
1,2-Dibromoethane (EDB)	5.0	0.298	1.49E-04	0.417	2.09E-04
1,4-Dichlorobenzene	5.0	0.298	1.49E-04	0.417	2.09E-04
1,1-Dichloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
1,2-Dichloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
1,1-Dichloroethene	5.0	0.298	1.49E-04	0.417	2.09E-04
1,2-Dichlorpropane	5.0	0.298	1.49E-04	0.417	2.09E-04
cis-1,3-Dichloropropene	5.0	0.298	1.49E-04	0.417	2.09E-04
trans-1,3-Dichlorpropene	5.0	0.298	1.49E-04	0.417	2.09E-04
Ethylbenzene	5.0	0.298	1.49E-04	0.417	2.09E-04
Hexachlorobutadiene	5.0	0.298	1.49E-04	0.417	2.09E-04
Isopropylbenzene (Cumune)	5.0	0.298	1.49E-04	0.417	2.09E-04
Methylene chloride	5.0	0.298	1.49E-04	0.417	2.09E-04
Napthalene	5.0	0.298	1.49E-04	0.417	2.09E-04
Styrene	5.0	0.298	1.49E-04	0.417	2.09E-04
1,1,2,2-Tetrachloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
Tetrachlorethylene	5.0	0.298	1.49E-04	0.417	2.09E-04
Toluene	5.0	0.298	1.49E-04	0.417	2.09E-04
1,2,4-Trichlorobenzene	5.0	0.298	1.49E-04	0.417	2.09E-04
1,1,1-Trichloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
1,1,2-Trichloroethane	5.0	0.298	1.49E-04	0.417	2.09E-04
Trichloroethene	5.0	0.298	1.49E-04	0.417	2.09E-04
Vinyl Acetate	5.0	0.298	1.49E-04	0.417	2.09E-04
Vinyl Chloride	5.0	0.298	1.49E-04	0.417	2.09E-04
Xylene	5.0	0.298	1.49E-04	0.417	2.09E-04
2-Hexanone (7)	26	1.548	7.74E-04	2.170	1.08E-03
Acetone (7)	2000	119.109	5.96E-02	166.887	8.34E-02
Iodomethane	5.0	0.298	1.49E-04	0.417	2.09E-04
4-Methyl-2-Pentanone	180	10.720	5.36E-03	15.020	7.51E-03
TOTAL VOC	6186.0	368.403	0.184	516.182	0.258
TOTAL HAP (less non-HAP VOCs)	360.00	21.44	0.011	30.04	0.015

Notes:

(1) Based on annual leachate analysis performed from 4/17/2002 to 3/25/2014.
VOC and HAP emission estimates were calculated by using detection limits for compounds listed as non-detect. Those compounds which have no data were not analyzed. The leachate was analyzed by GC/MS, EPA Method 8260B.

(2) Taken from regional rainfall data summarized by Weatherbase website (www.weatherbae.com) for Loudon, TN.

(3) Current annual leachate generation as calculated from leachate collection records for 2013.

(4) Estimated maximum annual leachate generation.

(5) Assumes that 100 percent of volatile organic compounds detected will volatilize.

(6) Used highest reported value from organic analyses from 2002 to 2014; used 5.0 ug/L for compounds reported as ND or not analyzed.

(7) VOC not counted as a HAP.

Example Calculations

Actual Annual Fugitive VOC Emissions (tons) = (Actual Annual Leachate Generation [gal]) * (3.785 L/1gal) * (1g/1,000,000ug) * (Total VOC [ug/l]) * (1lb/453.6g) * (1 ton/2000 lb)

PTE Annual Fugitive VOC Emissions (tons) = (PTE Annual Leachate Generation [gal]) * (3.785 L/1gal) * (1g/1,000,000ug) * (Total VOC [ug/l]) * (1lb/453.6g) * (1 ton/2000 lb)

TABLE 1. LandGEM GAS GENERATION PROJECTION SUMMARY
MATLOCK BEND LANDFILL - LOUDON, TN

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Generation (scfm)	(m3/min)	(MM ft3/yr)	NMOC Generation Rates (tons/yr)	NMOC Generation Rates (Mg/yr)
1987	24,276	0	0	0.0	0	0.0	0.0
1988	55,987	24,276	12	0.3	6	0.1	0.1
1989	67,753	80,263	38	1.1	20	0.2	0.2
1990	73,341	148,016	69	2.0	36	0.3	0.3
1991	106,582	221,357	102	2.9	53	0.5	0.4
1992	96,507	327,939	149	4.2	78	0.7	0.7
1993	94,782	424,446	189	5.4	99	0.9	0.8
1994	134,129	519,228	227	6.4	119	1.1	1.0
1995	59,785	653,357	283	8.0	149	1.4	1.2
1996	40,855	713,142	300	8.5	158	1.4	1.3
1997	50,213	753,997	308	8.7	162	1.5	1.3
1998	52,626	804,210	320	9.1	168	1.5	1.4
1999	59,918	856,836	333	9.4	175	1.6	1.5
2000	55,073	916,754	349	9.9	183	1.7	1.5
2001	48,077	971,827	361	10.2	190	1.7	1.6
2002	45,082	1,019,904	370	10.5	195	1.8	1.6
2003	55,023	1,064,986	377	10.7	198	1.8	1.7
2004	68,151	1,120,009	389	11.0	204	1.9	1.7
2005	79,973	1,188,160	406	11.5	214	2.0	1.8
2006	89,945	1,268,133	429	12.1	225	2.1	1.9
2007	130,972	1,358,078	455	12.9	239	2.2	2.0
2008	167,244	1,489,050	500	14.2	263	2.4	2.2
2009	154,707	1,656,294	561	15.9	295	2.7	2.5
2010	130,486	1,811,001	613	17.4	322	3.0	2.7
2011	236,247	1,941,487	652	18.5	343	3.1	2.9
2012	237,151	2,177,734	740	20.9	389	3.6	3.2
2013	251,518	2,414,885	824	23.3	433	4.0	3.6
2014	251,518	2,666,403	913	25.8	480	4.4	4.0
2015	251,518	2,917,921	998	28.3	524	4.8	4.4
2016	251,518	3,169,439	1,079	30.6	567	5.2	4.7
2017	251,518	3,420,957	1,158	32.8	609	5.6	5.1
2018	251,518	3,672,475	1,233	34.9	648	5.9	5.4
2019	217,360	3,923,993	1,305	37.0	686	6.3	5.7
2020	0	4,141,353	1,359	38.5	714	6.6	5.9
2021	0	4,141,353	1,305	37.0	686	6.3	5.7
2022	0	4,141,353	1,254	35.5	659	6.0	5.5
2023	0	4,141,353	1,205	34.1	633	5.8	5.3
2024	0	4,141,353	1,158	32.8	609	5.6	5.1
2025	0	4,141,353	1,112	31.5	585	5.4	4.9

Methane Content of LFG Adjusted to: 50%
Decay Rate Constant (k): 0.040
Ultimate Methane Recovery Rate (Lo): 100 m3/Mg = 3,204 cu ft/ton
NMOC Concentration in LFG: 82 ppmv as Hexane

TABLE 2A. GHG METHANE MODELING
LOUDON COUNTY (MATLOCK BEND) LANDFILL, LOUDON, TENNESSEE

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	Methane Production (Mg/yr)	Methane Production (ton/yr)	Base LFG Production (scfm)	Base LFG Production (scf/year)	LFG Collection (scf/year)
1987	24,276	0	0	0	0	0	0
1988	55,987	24,276	81	90	17	8,780,123	0
1989	67,753	80,263	264	291	54	28,542,981	0
1990	73,341	148,016	477	525	98	51,466,377	0
1991	106,582	221,357	696	767	143	75,140,744	0
1992	96,507	327,939	1,015	1,118	208	109,525,986	0
1993	94,782	424,446	1,282	1,413	263	138,362,165	0
1994	134,129	519,228	1,528	1,684	314	164,976,752	0
1995	59,785	653,357	1,893	2,086	389	204,347,722	0
1996	40,855	713,142	1,989	2,192	408	214,648,633	0
1997	50,213	753,997	2,015	2,221	414	217,532,226	0
1998	52,626	804,210	2,072	2,283	425	223,640,645	0
1999	59,918	856,836	2,134	2,351	438	230,283,353	0
2000	55,073	916,754	2,216	2,442	455	239,195,380	0
2001	48,077	971,827	2,278	2,510	468	245,861,292	0
2002	45,082	1,019,904	2,313	2,549	475	249,627,566	0
2003	55,023	1,064,986	2,336	2,574	480	252,101,937	0
2004	68,151	1,120,009	2,391	2,634	491	258,034,665	0
2005	79,973	1,188,160	2,487	2,740	511	268,386,809	0
2006	89,945	1,268,133	2,617	2,884	537	282,441,153	0
2007	130,972	1,358,078	2,773	3,056	569	299,323,468	0
2008	167,244	1,489,050	3,058	3,370	628	330,109,012	0
2009	154,707	1,656,294	3,449	3,801	708	372,307,679	0
2010	130,486	1,811,001	3,777	4,162	776	407,633,919	0
2011	236,247	1,941,487	4,005	4,413	822	432,242,646	0
2012	237,151	2,177,734	4,574	5,041	939	493,739,450	0
2013	251,518	2,414,885	5,116	5,637	1,051	552,155,924	0
2014	251,518	2,666,403	5,675	6,254	1,165	612,532,023	0
2015	251,518	2,917,921	6,203	6,836	1,274	669,562,928	0
2016	251,518	3,169,439	6,702	7,386	1,376	723,433,982	0
2017	251,518	3,420,957	7,174	7,906	1,473	774,320,261	0
2018	251,518	3,672,475	7,619	8,396	1,565	822,387,138	0
2019	217,360	3,923,993	8,040	8,860	1,651	867,790,825	0
2020	0	4,141,353	8,323	9,172	1,709	898,324,643	0
2021	0	4,141,353	7,862	8,664	1,614	848,552,130	0
2022	0	4,141,353	7,426	8,184	1,525	801,537,310	0
2023	0	4,141,353	7,015	7,730	1,441	757,127,389	0
2024	0	4,141,353	6,626	7,302	1,361	715,178,042	0
2025	0	4,141,353	6,259	6,897	1,285	675,552,937	0

ASSUMED METHANE CONTENT OF LFG: 50%
ASSUME NO LFG COLLECTION SYSTEM
SELECTED DECAY RATE CONSTANT (k): 0.057

L_0: 3,263.9 ft^3/ton
MASS EQUIVALENT L_0: 0.0667 Mg CH4/Mg waste
LFG Collection Rate: 0%

TABLE 2B. GREENHOUSE GAS EMISSIONS
LOUDON COUNTY (MATLOCK BEND) LANDFILL, LOUDON, TENNESSEE

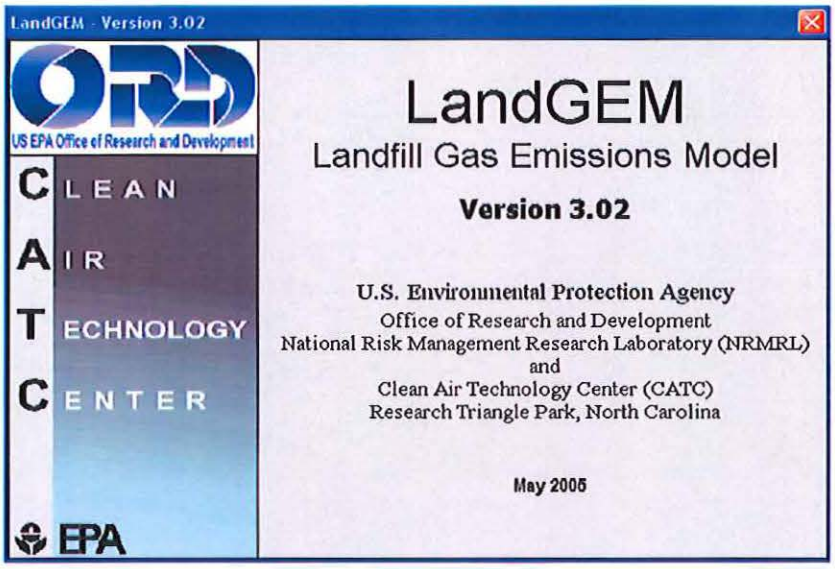
Year	LFG Collection (scf/year)	Methane Generation (ton/year)	Fugitive Methane Emitted Through Surface (ton/year)	Methane From Control Device (ton/year)	Nitrous Oxide from Methane Combustion (ton/year)	Fugitive Carbon Dioxide Emitted Through Surface (ton/year)	Carbon Dioxide from Methane Oxidation in Surface (ton/year)	Carbon Dioxide from Methane Combustion (ton/year)	Carbon Dioxide Passing Through Control Device (ton/year)
1987	0	0	0	0.0	0.0	0	0	0	0
1988	0	90	81	0.0	0.0	247	25	0	0
1989	0	291	262	0.0	0.0	801	80	0	0
1990	0	525	473	0.0	0.0	1,445	145	0	0
1991	0	767	690	0.0	0.0	2,110	211	0	0
1992	0	1,118	1,006	0.0	0.0	3,075	308	0	0
1993	0	1,413	1,271	0.0	0.0	3,885	388	0	0
1994	0	1,684	1,516	0.0	0.0	4,632	463	0	0
1995	0	2,086	1,878	0.0	0.0	5,737	574	0	0
1996	0	2,192	1,972	0.0	0.0	6,027	603	0	0
1997	0	2,221	1,999	0.0	0.0	6,108	611	0	0
1998	0	2,283	2,055	0.0	0.0	6,279	628	0	0
1999	0	2,351	2,116	0.0	0.0	6,466	647	0	0
2000	0	2,442	2,198	0.0	0.0	6,716	672	0	0
2001	0	2,510	2,259	0.0	0.0	6,903	690	0	0
2002	0	2,549	2,294	0.0	0.0	7,009	701	0	0
2003	0	2,574	2,317	0.0	0.0	7,078	708	0	0
2004	0	2,634	2,371	0.0	0.0	7,245	724	0	0
2005	0	2,740	2,466	0.0	0.0	7,536	754	0	0
2006	0	2,884	2,595	0.0	0.0	7,930	793	0	0
2007	0	3,056	2,750	0.0	0.0	8,404	840	0	0
2008	0	3,370	3,033	0.0	0.0	9,268	927	0	0
2009	0	3,801	3,421	0.0	0.0	10,453	1,045	0	0
2010	0	4,162	3,746	0.0	0.0	11,445	1,145	0	0
2011	0	4,413	3,972	0.0	0.0	12,136	1,214	0	0
2012	0	5,041	4,537	0.0	0.0	13,863	1,386	0	0
2013	0	5,637	5,074	0.0	0.0	15,503	1,550	0	0
2014	0	6,254	5,628	0.0	0.0	17,198	1,720	0	0
2015	0	6,836	6,153	0.0	0.0	18,799	1,880	0	0
2016	0	7,386	6,648	0.0	0.0	20,312	2,031	0	0
2017	0	7,906	7,115	0.0	0.0	21,741	2,174	0	0
2018	0	8,396	7,557	0.0	0.0	23,090	2,309	0	0
2019	0	8,860	7,974	0.0	0.0	24,365	2,437	0	0
2020	0	9,172	8,255	0.0	0.0	25,222	2,522	0	0
2021	0	8,664	7,797	0.0	0.0	23,825	2,382	0	0
2022	0	8,184	7,365	0.0	0.0	22,505	2,250	0	0
2023	0	7,730	6,957	0.0	0.0	21,258	2,126	0	0
2024	0	7,302	6,572	0.0	0.0	20,080	2,008	0	0
2025	0	6,897	6,208	0.0	0.0	18,968	1,897	0	0

No (0%) gas collection efficiency assumed for calculation of GHG PTE.
Used default 10% oxidation of methane in landfill surface based on EPA GHG Reporting Rule

TABLE 2C. - SUMMARY OF 2020 GHG PTE
LOUDON COUNTY (MATLOCK BEND) LANDFILL, LOUDON, TENNESSEE

Source	(tons/yr)	(tons CO_2e/yr)	Biogenic?	Fugitive?
Fugitive Methane Emissions	8,255	206,364	No	Yes
Fugitive Carbon Dioxide Emissions	27,745	27,745	Yes	Yes
Stack Carbon Dioxide	0	0	Yes	No
Methane from Combustion	0	0	No	No
Nitrous Oxide from Combustion	0	0	No	No
Total GHG Emissions (PTE)		234,109		
Total Methane (PTE)	8,255	206,364		
Total Non-Biogenic GHG (PTE)		206,364		
Total Fugitive GHG (PTE)		234,109		
Stack GHG Emissions (PTE)		0		

Note: GWP for Methane = 25 (to convert to tons CO2e) per revised GHG rule.



Summary Report

Landfill Name or Identifier: Loudon County (Matlock Bend) Landfill

Date: Tuesday, November 11, 2014

Description/Comments:
Title V estimated emissions based on AP-42 emission factors.

About LandGEM:

First-Order Decomposition Rate Equation:

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

Where,
Q_{CH4} = 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 convential 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	1987	
Landfill Closure Year (with 80-year limit)	2019	
Actual Closure Year (without limit)	*2019*	
Have Model Calculate Closure Year?	No	
Waste Design Capacity	3,764,868	*megagrams*

MODEL PARAMETERS

Methane Generation Rate, k	0.040	$year^{-1}$
Potential Methane Generation Capacity, L_o	100	m^3/Mg
NMOC Concentration	82	*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)*
1987	22,069	24,276	0	0
1988	50,897	55,987	22,069	24,276
1989	61,594	67,753	72,966	80,263
1990	66,674	73,341	134,560	148,016
1991	96,893	106,582	201,234	221,357
1992	87,734	96,507	298,126	327,939
1993	86,165	94,782	385,860	424,446
1994	121,935	134,129	472,025	519,228
1995	54,350	59,785	593,961	653,357
1996	37,141	40,855	648,311	713,142
1997	45,648	50,213	685,452	753,997
1998	47,842	52,626	731,100	804,210
1999	54,471	59,918	778,942	856,836
2000	50,066	55,073	833,413	916,754
2001	43,706	48,077	883,479	971,827
2002	40,984	45,082	927,185	1,019,904
2003	50,021	55,023	968,169	1,064,986
2004	61,955	68,151	1,018,190	1,120,009
2005	72,703	79,973	1,080,145	1,188,160
2006	81,768	89,945	1,152,848	1,268,133
2007	119,065	130,972	1,234,616	1,358,078
2008	152,040	167,244	1,353,682	1,489,050
2009	140,643	154,707	1,505,722	1,656,294
2010	118,624	130,486	1,646,365	1,811,001
2011	214,770	236,247	1,764,988	1,941,487
2012	215,592	237,151	1,979,758	2,177,734
2013	228,653	251,518	2,195,350	2,414,885
2014	228,653	251,518	2,424,003	2,666,403
2015	228,653	251,518	2,652,655	2,917,921
2016	228,653	251,518	2,881,308	3,169,439
2017	228,653	251,518	3,109,961	3,420,957
2018	228,653	251,518	3,338,614	3,672,475
2019	197,600	217,360	3,567,266	3,923,993
2020	0	0	3,764,866	4,141,353
2021	0	0	3,764,866	4,141,353
2022	0	0	3,764,866	4,141,353
2023	0	0	3,764,866	4,141,353
2024	0	0	3,764,866	4,141,353
2025	0	0	3,764,866	4,141,353
2026	0	0	3,764,866	4,141,353

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2027	0	0	3,764,866	4,141,353
2028	0	0	3,764,866	4,141,353
2029	0	0	3,764,866	4,141,353
2030	0	0	3,764,866	4,141,353
2031	0	0	3,764,866	4,141,353
2032	0	0	3,764,866	4,141,353
2033	0	0	3,764,866	4,141,353
2034	0	0	3,764,866	4,141,353
2035	0	0	3,764,866	4,141,353
2036	0	0	3,764,866	4,141,353
2037	0	0	3,764,866	4,141,353
2038	0	0	3,764,866	4,141,353
2039	0	0	3,764,866	4,141,353
2040	0	0	3,764,866	4,141,353
2041	0	0	3,764,866	4,141,353
2042	0	0	3,764,866	4,141,353
2043	0	0	3,764,866	4,141,353
2044	0	0	3,764,866	4,141,353
2045	0	0	3,764,866	4,141,353
2046	0	0	3,764,866	4,141,353
2047	0	0	3,764,866	4,141,353
2048	0	0	3,764,866	4,141,353
2049	0	0	3,764,866	4,141,353
2050	0	0	3,764,866	4,141,353
2051	0	0	3,764,866	4,141,353
2052	0	0	3,764,866	4,141,353
2053	0	0	3,764,866	4,141,353
2054	0	0	3,764,866	4,141,353
2055	0	0	3,764,866	4,141,353
2056	0	0	3,764,866	4,141,353
2057	0	0	3,764,866	4,141,353
2058	0	0	3,764,866	4,141,353
2059	0	0	3,764,866	4,141,353
2060	0	0	3,764,866	4,141,353
2061	0	0	3,764,866	4,141,353
2062	0	0	3,764,866	4,141,353
2063	0	0	3,764,866	4,141,353
2064	0	0	3,764,866	4,141,353
2065	0	0	3,764,866	4,141,353
2066	0	0	3,764,866	4,141,353

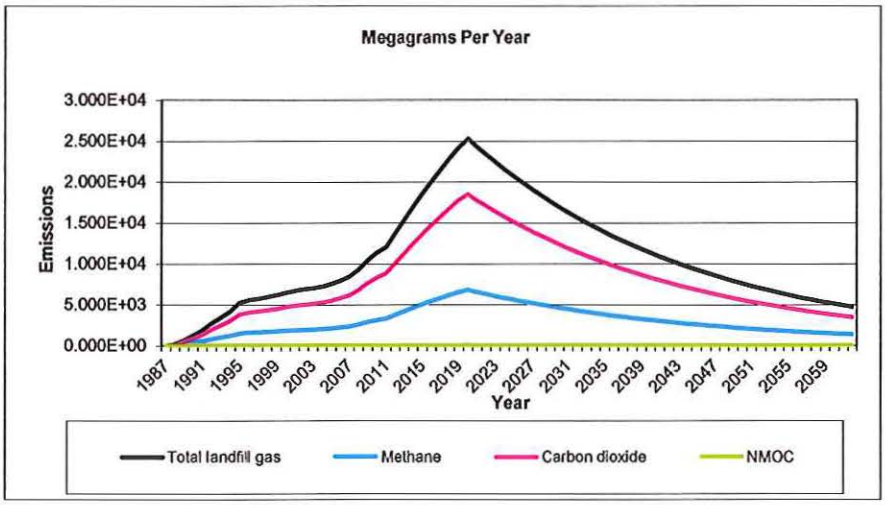
Pollutant Parameters

		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)

		Gas / Pollutant Default Parameters:		*User-specified Pollutant Parameters:*	
	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


Megagrams Per Year
Emissions
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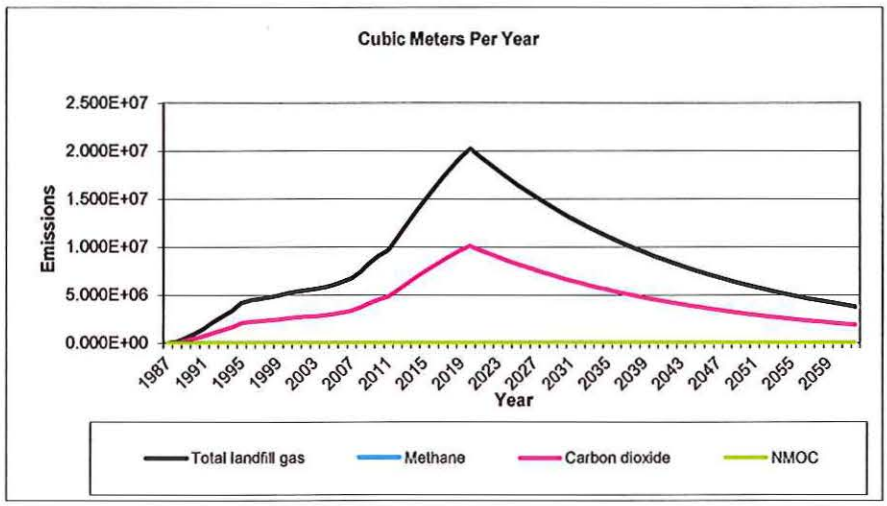
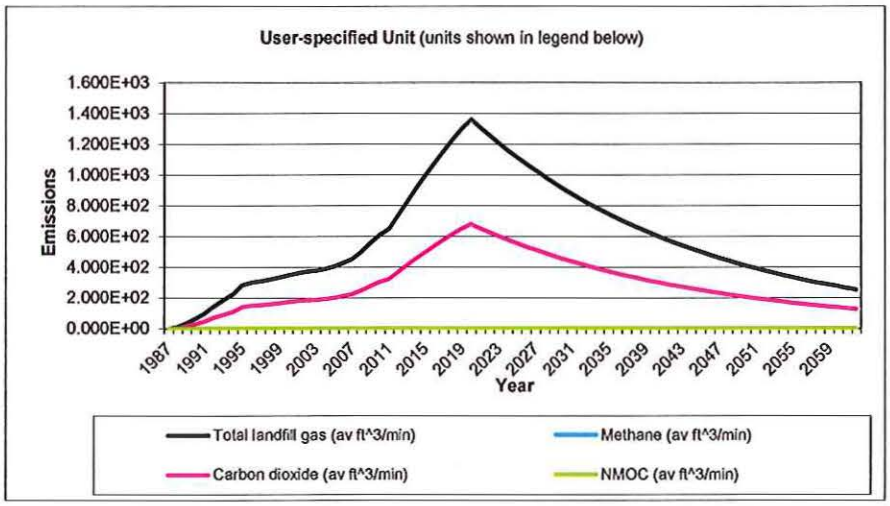
2.500E+04
2.000E+04
1.500E+04
1.000E+04
5.000E+03
0.000E+00
1987 1991 1995 1999 2003 2007 2011 2015 2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


Cubic Meters Per Year
Emissions
2.500E+07
2.000E+07
1.500E+07
1.000E+07
5.000E+06
0.000E+00
1987 1991 1995 1999 2003 2007 2011 2015 2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059
Year
Total landfill gas
Methane
Carbon dioxide
NMOC


User-specified Unit (units shown in legend below)
Emissions
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1.400E+03
1.200E+03
1.000E+03
8.000E+02
6.000E+02
4.000E+02
2.000E+02
0.000E+00
1987 1991 1995 1999 2003 2007 2011 2015 2019 2023 2027 2031 2035 2039 2043 2047 2051 2055 2059
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
Carbon dioxide (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1987	0	0	0	0	0	0
1988	2.166E+02	1.734E+05	1.165E+01	5.785E+01	8.671E+04	5.826E+00
1989	7.075E+02	5.666E+05	3.807E+01	1.890E+02	2.833E+05	1.903E+01
1990	1.284E+03	1.028E+06	6.909E+01	3.430E+02	5.142E+05	3.455E+01
1991	1.888E+03	1.512E+06	1.016E+02	5.043E+02	7.560E+05	5.079E+01
1992	2.765E+03	2.214E+06	1.488E+02	7.385E+02	1.107E+06	7.438E+01
1993	3.517E+03	2.817E+06	1.892E+02	9.395E+02	1.408E+06	9.462E+01
1994	4.225E+03	3.383E+06	2.273E+02	1.129E+03	1.692E+06	1.137E+02
1995	5.256E+03	4.209E+06	2.828E+02	1.404E+03	2.104E+06	1.414E+02
1996	5.583E+03	4.471E+06	3.004E+02	1.491E+03	2.235E+06	1.502E+02
1997	5.729E+03	4.587E+06	3.082E+02	1.530E+03	2.294E+06	1.541E+02
1998	5.952E+03	4.766E+06	3.202E+02	1.590E+03	2.383E+06	1.601E+02
1999	6.188E+03	4.955E+06	3.329E+02	1.653E+03	2.478E+06	1.665E+02
2000	6.480E+03	5.189E+06	3.486E+02	1.731E+03	2.594E+06	1.743E+02
2001	6.717E+03	5.379E+06	3.614E+02	1.794E+03	2.689E+06	1.807E+02
2002	6.883E+03	5.511E+06	3.703E+02	1.838E+03	2.756E+06	1.852E+02
2003	7.015E+03	5.617E+06	3.774E+02	1.874E+03	2.809E+06	1.887E+02
2004	7.231E+03	5.790E+06	3.890E+02	1.931E+03	2.895E+06	1.945E+02
2005	7.555E+03	6.050E+06	4.065E+02	2.018E+03	3.025E+06	2.032E+02
2006	7.972E+03	6.384E+06	4.289E+02	2.130E+03	3.192E+06	2.145E+02
2007	8.462E+03	6.776E+06	4.553E+02	2.260E+03	3.388E+06	2.276E+02
2008	9.299E+03	7.446E+06	5.003E+02	2.484E+03	3.723E+06	2.502E+02
2009	1.043E+04	8.349E+06	5.610E+02	2.785E+03	4.174E+06	2.805E+02
2010	1.140E+04	9.127E+06	6.132E+02	3.044E+03	4.563E+06	3.066E+02
2011	1.211E+04	9.701E+06	6.518E+02	3.236E+03	4.850E+06	3.259E+02
2012	1.375E+04	1.101E+07	7.396E+02	3.672E+03	5.504E+06	3.698E+02
2013	1.532E+04	1.227E+07	8.245E+02	4.093E+03	6.135E+06	4.122E+02
2014	1.697E+04	1.359E+07	9.128E+02	4.532E+03	6.793E+06	4.564E+02
2015	1.855E+04	1.485E+07	9.978E+02	4.954E+03	7.425E+06	4.989E+02
2016	2.006E+04	1.606E+07	1.079E+03	5.359E+03	8.032E+06	5.397E+02
2017	2.152E+04	1.723E+07	1.158E+03	5.748E+03	8.616E+06	5.789E+02
2018	2.292E+04	1.835E+07	1.233E+03	6.122E+03	9.176E+06	6.165E+02
2019	2.426E+04	1.943E+07	1.305E+03	6.481E+03	9.715E+06	6.527E+02
2020	2.525E+04	2.022E+07	1.359E+03	6.745E+03	1.011E+07	6.793E+02
2021	2.426E+04	1.943E+07	1.305E+03	6.481E+03	9.714E+06	6.527E+02
2022	2.331E+04	1.867E+07	1.254E+03	6.226E+03	9.333E+06	6.271E+02
2023	2.240E+04	1.793E+07	1.205E+03	5.982E+03	8.967E+06	6.025E+02
2024	2.152E+04	1.723E+07	1.158E+03	5.748E+03	8.615E+06	5.789E+02
2025	2.067E+04	1.656E+07	1.112E+03	5.522E+03	8.278E+06	5.562E+02
2026	1.986E+04	1.591E+07	1.069E+03	5.306E+03	7.953E+06	5.344E+02
2027	1.908E+04	1.528E+07	1.027E+03	5.098E+03	7.641E+06	5.134E+02
2028	1.834E+04	1.468E+07	9.865E+02	4.898E+03	7.341E+06	4.933E+02
2029	1.762E+04	1.411E+07	9.479E+02	4.706E+03	7.054E+06	4.739E+02
2030	1.693E+04	1.355E+07	9.107E+02	4.521E+03	6.777E+06	4.553E+02
2031	1.626E+04	1.302E+07	8.750E+02	4.344E+03	6.511E+06	4.375E+02
2032	1.563E+04	1.251E+07	8.407E+02	4.174E+03	6.256E+06	4.203E+02
2033	1.501E+04	1.202E+07	8.077E+02	4.010E+03	6.011E+06	4.039E+02
2034	1.442E+04	1.155E+07	7.760E+02	3.853E+03	5.775E+06	3.880E+02
2035	1.386E+04	1.110E+07	7.456E+02	3.702E+03	5.549E+06	3.728E+02
2036	1.332E+04	1.066E+07	7.164E+02	3.557E+03	5.331E+06	3.582E+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)
2037	1.279E+04	1.024E+07	6.883E+02	3.417E+03	5.122E+06	3.441E+02
2038	1.229E+04	9.842E+06	6.613E+02	3.283E+03	4.921E+06	3.307E+02
2039	1.181E+04	9.456E+06	6.354E+02	3.154E+03	4.728E+06	3.177E+02
2040	1.135E+04	9.086E+06	6.105E+02	3.031E+03	4.543E+06	3.052E+02
2041	1.090E+04	8.729E+06	5.865E+02	2.912E+03	4.365E+06	2.933E+02
2042	1.047E+04	8.387E+06	5.635E+02	2.798E+03	4.194E+06	2.818E+02
2043	1.006E+04	8.058E+06	5.414E+02	2.688E+03	4.029E+06	2.707E+02
2044	9.669E+03	7.742E+06	5.202E+02	2.583E+03	3.871E+06	2.601E+02
2045	9.290E+03	7.439E+06	4.998E+02	2.481E+03	3.719E+06	2.499E+02
2046	8.925E+03	7.147E+06	4.802E+02	2.384E+03	3.573E+06	2.401E+02
2047	8.575E+03	6.867E+06	4.614E+02	2.291E+03	3.433E+06	2.307E+02
2048	8.239E+03	6.597E+06	4.433E+02	2.201E+03	3.299E+06	2.216E+02
2049	7.916E+03	6.339E+06	4.259E+02	2.114E+03	3.169E+06	2.130E+02
2050	7.606E+03	6.090E+06	4.092E+02	2.032E+03	3.045E+06	2.046E+02
2051	7.307E+03	5.851E+06	3.932E+02	1.952E+03	2.926E+06	1.966E+02
2052	7.021E+03	5.622E+06	3.777E+02	1.875E+03	2.811E+06	1.889E+02
2053	6.746E+03	5.402E+06	3.629E+02	1.802E+03	2.701E+06	1.815E+02
2054	6.481E+03	5.190E+06	3.487E+02	1.731E+03	2.595E+06	1.744E+02
2055	6.227E+03	4.986E+06	3.350E+02	1.663E+03	2.493E+06	1.675E+02
2056	5.983E+03	4.791E+06	3.219E+02	1.598E+03	2.395E+06	1.609E+02
2057	5.748E+03	4.603E+06	3.093E+02	1.535E+03	2.301E+06	1.546E+02
2058	5.523E+03	4.422E+06	2.971E+02	1.475E+03	2.211E+06	1.486E+02
2059	5.306E+03	4.249E+06	2.855E+02	1.417E+03	2.125E+06	1.427E+02
2060	5.098E+03	4.082E+06	2.743E+02	1.362E+03	2.041E+06	1.371E+02
2061	4.898E+03	3.922E+06	2.635E+02	1.308E+03	1.961E+06	1.318E+02
2062	4.706E+03	3.769E+06	2.532E+02	1.257E+03	1.884E+06	1.266E+02
2063	4.522E+03	3.621E+06	2.433E+02	1.208E+03	1.810E+06	1.216E+02
2064	4.344E+03	3.479E+06	2.337E+02	1.160E+03	1.739E+06	1.169E+02
2065	4.174E+03	3.342E+06	2.246E+02	1.115E+03	1.671E+06	1.123E+02
2066	4.010E+03	3.211E+06	2.158E+02	1.071E+03	1.606E+06	1.079E+02
2067	3.853E+03	3.085E+06	2.073E+02	1.029E+03	1.543E+06	1.037E+02
2068	3.702E+03	2.964E+06	1.992E+02	9.889E+02	1.482E+06	9.959E+01
2069	3.557E+03	2.848E+06	1.914E+02	9.501E+02	1.424E+06	9.569E+01
2070	3.417E+03	2.737E+06	1.839E+02	9.128E+02	1.368E+06	9.193E+01
2071	3.283E+03	2.629E+06	1.767E+02	8.770E+02	1.315E+06	8.833E+01
2072	3.155E+03	2.526E+06	1.697E+02	8.427E+02	1.263E+06	8.487E+01
2073	3.031E+03	2.427E+06	1.631E+02	8.096E+02	1.214E+06	8.154E+01
2074	2.912E+03	2.332E+06	1.567E+02	7.779E+02	1.166E+06	7.834E+01
2075	2.798E+03	2.240E+06	1.505E+02	7.474E+02	1.120E+06	7.527E+01
2076	2.688E+03	2.153E+06	1.446E+02	7.181E+02	1.076E+06	7.232E+01
2077	2.583E+03	2.068E+06	1.390E+02	6.899E+02	1.034E+06	6.948E+01
2078	2.482E+03	1.987E+06	1.335E+02	6.629E+02	9.936E+05	6.676E+01
2079	2.384E+03	1.909E+06	1.283E+02	6.369E+02	9.546E+05	6.414E+01
2080	2.291E+03	1.834E+06	1.232E+02	6.119E+02	9.172E+05	6.162E+01
2081	2.201E+03	1.762E+06	1.184E+02	5.879E+02	8.812E+05	5.921E+01
2082	2.115E+03	1.693E+06	1.138E+02	5.648E+02	8.467E+05	5.689E+01
2083	2.032E+03	1.627E+06	1.093E+02	5.427E+02	8.135E+05	5.466E+01
2084	1.952E+03	1.563E+06	1.050E+02	5.214E+02	7.816E+05	5.251E+01
2085	1.876E+03	1.502E+06	1.009E+02	5.010E+02	7.509E+05	5.045E+01
2086	1.802E+03	1.443E+06	9.695E+01	4.813E+02	7.215E+05	4.848E+01
2087	1.731E+03	1.386E+06	9.315E+01	4.625E+02	6.932E+05	4.658E+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)
2088	1.663E+03	1.332E+06	8.950E+01	4.443E+02	6.660E+05	4.475E+01
2089	1.598E+03	1.280E+06	8.599E+01	4.269E+02	6.399E+05	4.299E+01
2090	1.536E+03	1.230E+06	8.262E+01	4.102E+02	6.148E+05	4.131E+01
2091	1.475E+03	1.181E+06	7.938E+01	3.941E+02	5.907E+05	3.969E+01
2092	1.417E+03	1.135E+06	7.626E+01	3.786E+02	5.675E+05	3.813E+01
2093	1.362E+03	1.091E+06	7.327E+01	3.638E+02	5.453E+05	3.664E+01
2094	1.309E+03	1.048E+06	7.040E+01	3.495E+02	5.239E+05	3.520E+01
2095	1.257E+03	1.007E+06	6.764E+01	3.358E+02	5.034E+05	3.382E+01
2096	1.208E+03	9.672E+05	6.499E+01	3.226E+02	4.836E+05	3.249E+01
2097	1.161E+03	9.293E+05	6.244E+01	3.100E+02	4.647E+05	3.122E+01
2098	1.115E+03	8.929E+05	5.999E+01	2.978E+02	4.464E+05	3.000E+01
2099	1.071E+03	8.579E+05	5.764E+01	2.862E+02	4.289E+05	2.882E+01
2100	1.029E+03	8.242E+05	5.538E+01	2.749E+02	4.121E+05	2.769E+01
2101	9.890E+02	7.919E+05	5.321E+01	2.642E+02	3.960E+05	2.660E+01
2102	9.502E+02	7.609E+05	5.112E+01	2.538E+02	3.804E+05	2.556E+01
2103	9.129E+02	7.310E+05	4.912E+01	2.439E+02	3.655E+05	2.456E+01
2104	8.771E+02	7.024E+05	4.719E+01	2.343E+02	3.512E+05	2.360E+01
2105	8.427E+02	6.748E+05	4.534E+01	2.251E+02	3.374E+05	2.267E+01
2106	8.097E+02	6.484E+05	4.356E+01	2.163E+02	3.242E+05	2.178E+01
2107	7.779E+02	6.229E+05	4.186E+01	2.078E+02	3.115E+05	2.093E+01
2108	7.474E+02	5.985E+05	4.021E+01	1.996E+02	2.993E+05	2.011E+01
2109	7.181E+02	5.750E+05	3.864E+01	1.918E+02	2.875E+05	1.932E+01
2110	6.900E+02	5.525E+05	3.712E+01	1.843E+02	2.762E+05	1.856E+01
2111	6.629E+02	5.308E+05	3.567E+01	1.771E+02	2.654E+05	1.783E+01
2112	6.369E+02	5.100E+05	3.427E+01	1.701E+02	2.550E+05	1.713E+01
2113	6.119E+02	4.900E+05	3.292E+01	1.635E+02	2.450E+05	1.646E+01
2114	5.880E+02	4.708E+05	3.163E+01	1.570E+02	2.354E+05	1.582E+01
2115	5.649E+02	4.523E+05	3.039E+01	1.509E+02	2.262E+05	1.520E+01
2116	5.427E+02	4.346E+05	2.920E+01	1.450E+02	2.173E+05	1.460E+01
2117	5.215E+02	4.176E+05	2.806E+01	1.393E+02	2.088E+05	1.403E+01
2118	5.010E+02	4.012E+05	2.696E+01	1.338E+02	2.006E+05	1.348E+01
2119	4.814E+02	3.855E+05	2.590E+01	1.286E+02	1.927E+05	1.295E+01
2120	4.625E+02	3.703E+05	2.488E+01	1.235E+02	1.852E+05	1.244E+01
2121	4.444E+02	3.558E+05	2.391E+01	1.187E+02	1.779E+05	1.195E+01
2122	4.269E+02	3.419E+05	2.297E+01	1.140E+02	1.709E+05	1.149E+01
2123	4.102E+02	3.285E+05	2.207E+01	1.096E+02	1.642E+05	1.103E+01
2124	3.941E+02	3.156E+05	2.120E+01	1.053E+02	1.578E+05	1.060E+01
2125	3.787E+02	3.032E+05	2.037E+01	1.011E+02	1.516E+05	1.019E+01
2126	3.638E+02	2.913E+05	1.957E+01	9.718E+01	1.457E+05	9.787E+00
2127	3.496E+02	2.799E+05	1.881E+01	9.337E+01	1.400E+05	9.403E+00

Results (Continued)

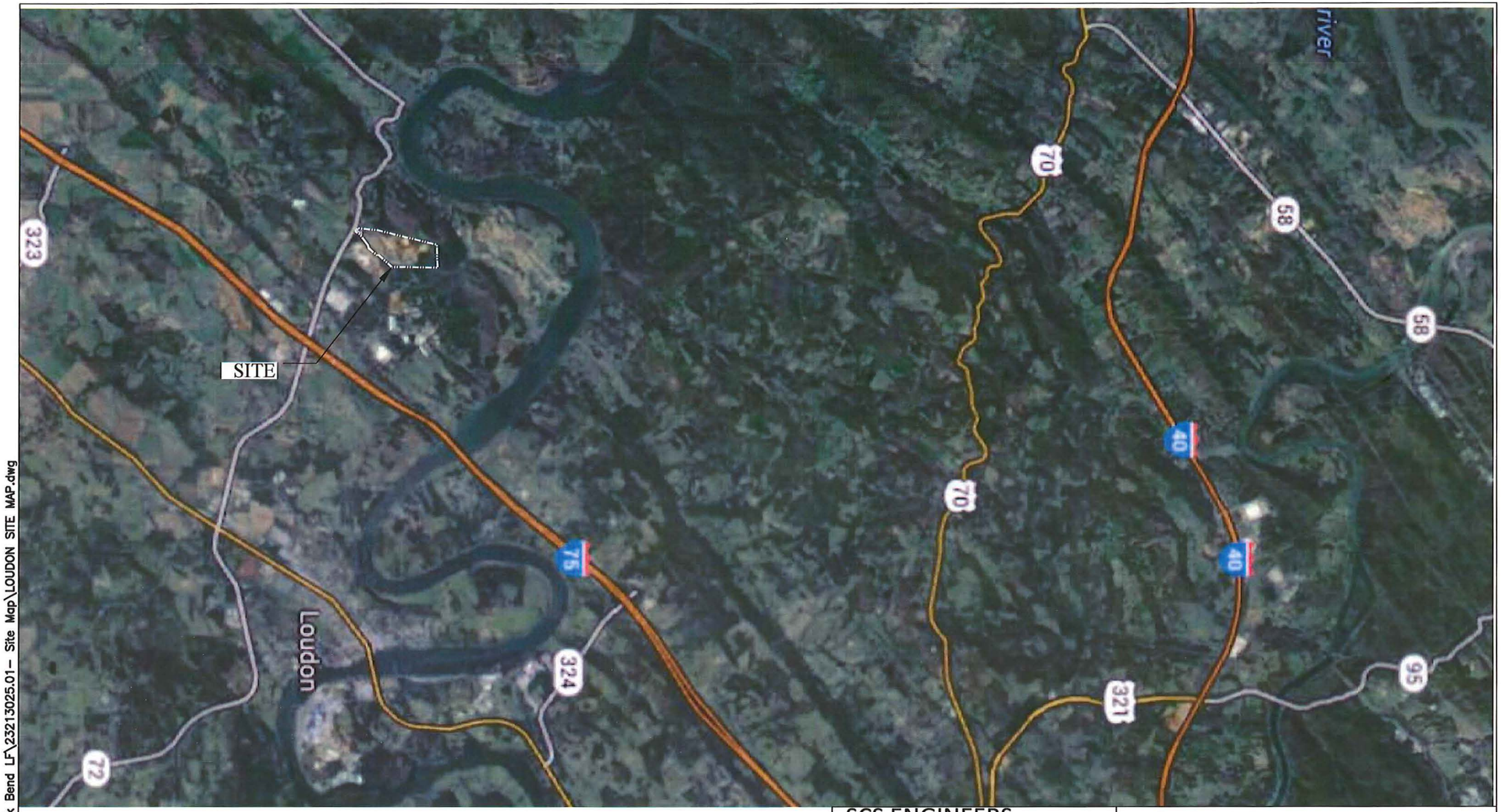
Year	Carbon dioxide			NMOC		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1987	0	0	0	0	0	0
1988	1.587E+02	8.671E+04	5.826E+00	5.097E-02	1.422E+01	9.554E-04
1989	5.185E+02	2.833E+05	1.903E+01	1.665E-01	4.646E+01	3.121E-03
1990	9.412E+02	5.142E+05	3.455E+01	3.023E-01	8.432E+01	5.666E-03
1991	1.384E+03	7.560E+05	5.079E+01	4.444E-01	1.240E+02	8.330E-03
1992	2.026E+03	1.107E+06	7.438E+01	6.508E-01	1.815E+02	1.220E-02
1993	2.578E+03	1.408E+06	9.462E+01	8.279E-01	2.310E+02	1.552E-02
1994	3.096E+03	1.692E+06	1.137E+02	9.944E-01	2.774E+02	1.864E-02
1995	3.852E+03	2.104E+06	1.414E+02	1.237E+00	3.451E+02	2.319E-02
1996	4.092E+03	2.235E+06	1.502E+02	1.314E+00	3.666E+02	2.463E-02
1997	4.199E+03	2.294E+06	1.541E+02	1.348E+00	3.762E+02	2.527E-02
1998	4.362E+03	2.383E+06	1.601E+02	1.401E+00	3.908E+02	2.626E-02
1999	4.535E+03	2.478E+06	1.665E+02	1.456E+00	4.063E+02	2.730E-02
2000	4.749E+03	2.594E+06	1.743E+02	1.525E+00	4.255E+02	2.859E-02
2001	4.923E+03	2.689E+06	1.807E+02	1.581E+00	4.411E+02	2.964E-02
2002	5.044E+03	2.756E+06	1.852E+02	1.620E+00	4.519E+02	3.037E-02
2003	5.141E+03	2.809E+06	1.887E+02	1.651E+00	4.606E+02	3.095E-02
2004	5.299E+03	2.895E+06	1.945E+02	1.702E+00	4.748E+02	3.190E-02
2005	5.537E+03	3.025E+06	2.032E+02	1.778E+00	4.961E+02	3.333E-02
2006	5.843E+03	3.192E+06	2.145E+02	1.876E+00	5.235E+02	3.517E-02
2007	6.202E+03	3.388E+06	2.276E+02	1.992E+00	5.556E+02	3.733E-02
2008	6.815E+03	3.723E+06	2.502E+02	2.189E+00	6.106E+02	4.102E-02
2009	7.641E+03	4.174E+06	2.805E+02	2.454E+00	6.846E+02	4.600E-02
2010	8.353E+03	4.563E+06	3.066E+02	2.683E+00	7.484E+02	5.028E-02
2011	8.879E+03	4.850E+06	3.259E+02	2.851E+00	7.955E+02	5.345E-02
2012	1.008E+04	5.504E+06	3.698E+02	3.236E+00	9.027E+02	6.065E-02
2013	1.123E+04	6.135E+06	4.122E+02	3.607E+00	1.006E+03	6.761E-02
2014	1.243E+04	6.793E+06	4.564E+02	3.993E+00	1.114E+03	7.485E-02
2015	1.359E+04	7.425E+06	4.989E+02	4.365E+00	1.218E+03	8.182E-02
2016	1.470E+04	8.032E+06	5.397E+02	4.722E+00	1.317E+03	8.851E-02
2017	1.577E+04	8.616E+06	5.789E+02	5.065E+00	1.413E+03	9.494E-02
2018	1.680E+04	9.176E+06	6.165E+02	5.394E+00	1.505E+03	1.011E-01
2019	1.778E+04	9.715E+06	6.527E+02	5.711E+00	1.593E+03	1.070E-01
2020	1.851E+04	1.011E+07	6.793E+02	5.943E+00	1.658E+03	1.114E-01
2021	1.778E+04	9.714E+06	6.527E+02	5.710E+00	1.593E+03	1.070E-01
2022	1.708E+04	9.333E+06	6.271E+02	5.486E+00	1.531E+03	1.028E-01
2023	1.641E+04	8.967E+06	6.025E+02	5.271E+00	1.471E+03	9.881E-02
2024	1.577E+04	8.615E+06	5.789E+02	5.065E+00	1.413E+03	9.493E-02
2025	1.515E+04	8.278E+06	5.562E+02	4.866E+00	1.358E+03	9.121E-02
2026	1.456E+04	7.953E+06	5.344E+02	4.675E+00	1.304E+03	8.763E-02
2027	1.399E+04	7.641E+06	5.134E+02	4.492E+00	1.253E+03	8.420E-02
2028	1.344E+04	7.341E+06	4.933E+02	4.316E+00	1.204E+03	8.090E-02
2029	1.291E+04	7.054E+06	4.739E+02	4.146E+00	1.157E+03	7.772E-02
2030	1.241E+04	6.777E+06	4.553E+02	3.984E+00	1.111E+03	7.468E-02
2031	1.192E+04	6.511E+06	4.375E+02	3.828E+00	1.068E+03	7.175E-02
2032	1.145E+04	6.256E+06	4.203E+02	3.678E+00	1.026E+03	6.894E-02
2033	1.100E+04	6.011E+06	4.039E+02	3.533E+00	9.858E+02	6.623E-02
2034	1.057E+04	5.775E+06	3.880E+02	3.395E+00	9.471E+02	6.364E-02
2035	1.016E+04	5.549E+06	3.728E+02	3.262E+00	9.100E+02	6.114E-02
2036	9.758E+03	5.331E+06	3.582E+02	3.134E+00	8.743E+02	5.874E-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)
2037	9.376E+03	5.122E+06	3.441E+02	3.011E+00	8.400E+02	5.644E-02
2038	9.008E+03	4.921E+06	3.307E+02	2.893E+00	8.071E+02	5.423E-02
2039	8.655E+03	4.728E+06	3.177E+02	2.779E+00	7.754E+02	5.210E-02
2040	8.316E+03	4.543E+06	3.052E+02	2.670E+00	7.450E+02	5.006E-02
2041	7.990E+03	4.365E+06	2.933E+02	2.566E+00	7.158E+02	4.809E-02
2042	7.676E+03	4.194E+06	2.818E+02	2.465E+00	6.877E+02	4.621E-02
2043	7.375E+03	4.029E+06	2.707E+02	2.369E+00	6.608E+02	4.440E-02
2044	7.086E+03	3.871E+06	2.601E+02	2.276E+00	6.349E+02	4.266E-02
2045	6.808E+03	3.719E+06	2.499E+02	2.186E+00	6.100E+02	4.098E-02
2046	6.541E+03	3.573E+06	2.401E+02	2.101E+00	5.861E+02	3.938E-02
2047	6.285E+03	3.433E+06	2.307E+02	2.018E+00	5.631E+02	3.783E-02
2048	6.038E+03	3.299E+06	2.216E+02	1.939E+00	5.410E+02	3.635E-02
2049	5.802E+03	3.169E+06	2.130E+02	1.863E+00	5.198E+02	3.492E-02
2050	5.574E+03	3.045E+06	2.046E+02	1.790E+00	4.994E+02	3.355E-02
2051	5.356E+03	2.926E+06	1.966E+02	1.720E+00	4.798E+02	3.224E-02
2052	5.146E+03	2.811E+06	1.889E+02	1.652E+00	4.610E+02	3.097E-02
2053	4.944E+03	2.701E+06	1.815E+02	1.588E+00	4.429E+02	2.976E-02
2054	4.750E+03	2.595E+06	1.744E+02	1.525E+00	4.256E+02	2.859E-02
2055	4.564E+03	2.493E+06	1.675E+02	1.466E+00	4.089E+02	2.747E-02
2056	4.385E+03	2.395E+06	1.609E+02	1.408E+00	3.928E+02	2.640E-02
2057	4.213E+03	2.301E+06	1.546E+02	1.353E+00	3.774E+02	2.536E-02
2058	4.048E+03	2.211E+06	1.486E+02	1.300E+00	3.626E+02	2.437E-02
2059	3.889E+03	2.125E+06	1.427E+02	1.249E+00	3.484E+02	2.341E-02
2060	3.736E+03	2.041E+06	1.371E+02	1.200E+00	3.348E+02	2.249E-02
2061	3.590E+03	1.961E+06	1.318E+02	1.153E+00	3.216E+02	2.161E-02
2062	3.449E+03	1.884E+06	1.266E+02	1.108E+00	3.090E+02	2.076E-02
2063	3.314E+03	1.810E+06	1.216E+02	1.064E+00	2.969E+02	1.995E-02
2064	3.184E+03	1.739E+06	1.169E+02	1.023E+00	2.853E+02	1.917E-02
2065	3.059E+03	1.671E+06	1.123E+02	9.824E-01	2.741E+02	1.842E-02
2066	2.939E+03	1.606E+06	1.079E+02	9.439E-01	2.633E+02	1.769E-02
2067	2.824E+03	1.543E+06	1.037E+02	9.069E-01	2.530E+02	1.700E-02
2068	2.713E+03	1.482E+06	9.959E+01	8.713E-01	2.431E+02	1.633E-02
2069	2.607E+03	1.424E+06	9.569E+01	8.372E-01	2.336E+02	1.569E-02
2070	2.505E+03	1.368E+06	9.193E+01	8.043E-01	2.244E+02	1.508E-02
2071	2.406E+03	1.315E+06	8.833E+01	7.728E-01	2.156E+02	1.449E-02
2072	2.312E+03	1.263E+06	8.487E+01	7.425E-01	2.071E+02	1.392E-02
2073	2.221E+03	1.214E+06	8.154E+01	7.134E-01	1.990E+02	1.337E-02
2074	2.134E+03	1.166E+06	7.834E+01	6.854E-01	1.912E+02	1.285E-02
2075	2.051E+03	1.120E+06	7.527E+01	6.585E-01	1.837E+02	1.234E-02
2076	1.970E+03	1.076E+06	7.232E+01	6.327E-01	1.765E+02	1.186E-02
2077	1.893E+03	1.034E+06	6.948E+01	6.079E-01	1.696E+02	1.140E-02
2078	1.819E+03	9.936E+05	6.676E+01	5.841E-01	1.629E+02	1.095E-02
2079	1.747E+03	9.546E+05	6.414E+01	5.612E-01	1.566E+02	1.052E-02
2080	1.679E+03	9.172E+05	6.162E+01	5.392E-01	1.504E+02	1.011E-02
2081	1.613E+03	8.812E+05	5.921E+01	5.180E-01	1.445E+02	9.710E-03
2082	1.550E+03	8.467E+05	5.689E+01	4.977E-01	1.389E+02	9.329E-03
2083	1.489E+03	8.135E+05	5.466E+01	4.782E-01	1.334E+02	8.964E-03
2084	1.431E+03	7.816E+05	5.251E+01	4.594E-01	1.282E+02	8.612E-03
2085	1.375E+03	7.509E+05	5.045E+01	4.414E-01	1.232E+02	8.274E-03
2086	1.321E+03	7.215E+05	4.848E+01	4.241E-01	1.183E+02	7.950E-03
2087	1.269E+03	6.932E+05	4.658E+01	4.075E-01	1.137E+02	7.638E-03

Results (Continued)

Year	Carbon dioxide			NMOC		
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
2088	1.219E+03	6.660E+05	4.475E+01	3.915E-01	1.092E+02	7.339E-03
2089	1.171E+03	6.399E+05	4.299E+01	3.762E-01	1.049E+02	7.051E-03
2090	1.125E+03	6.148E+05	4.131E+01	3.614E-01	1.008E+02	6.775E-03
2091	1.081E+03	5.907E+05	3.969E+01	3.472E-01	9.687E+01	6.509E-03
2092	1.039E+03	5.675E+05	3.813E+01	3.336E-01	9.308E+01	6.254E-03
2093	9.981E+02	5.453E+05	3.664E+01	3.205E-01	8.943E+01	6.009E-03
2094	9.590E+02	5.239E+05	3.520E+01	3.080E-01	8.592E+01	5.773E-03
2095	9.214E+02	5.034E+05	3.382E+01	2.959E-01	8.255E+01	5.547E-03
2096	8.853E+02	4.836E+05	3.249E+01	2.843E-01	7.931E+01	5.329E-03
2097	8.506E+02	4.647E+05	3.122E+01	2.731E-01	7.620E+01	5.120E-03
2098	8.172E+02	4.464E+05	3.000E+01	2.624E-01	7.322E+01	4.919E-03
2099	7.852E+02	4.289E+05	2.882E+01	2.521E-01	7.034E+01	4.726E-03
2100	7.544E+02	4.121E+05	2.769E+01	2.423E-01	6.759E+01	4.541E-03
2101	7.248E+02	3.960E+05	2.660E+01	2.328E-01	6.494E+01	4.363E-03
2102	6.964E+02	3.804E+05	2.556E+01	2.236E-01	6.239E+01	4.192E-03
2103	6.691E+02	3.655E+05	2.456E+01	2.149E-01	5.994E+01	4.028E-03
2104	6.428E+02	3.512E+05	2.360E+01	2.064E-01	5.759E+01	3.870E-03
2105	6.176E+02	3.374E+05	2.267E+01	1.983E-01	5.534E+01	3.718E-03
2106	5.934E+02	3.242E+05	2.178E+01	1.906E-01	5.317E+01	3.572E-03
2107	5.701E+02	3.115E+05	2.093E+01	1.831E-01	5.108E+01	3.432E-03
2108	5.478E+02	2.993E+05	2.011E+01	1.759E-01	4.908E+01	3.298E-03
2109	5.263E+02	2.875E+05	1.932E+01	1.690E-01	4.715E+01	3.168E-03
2110	5.057E+02	2.762E+05	1.856E+01	1.624E-01	4.530E+01	3.044E-03
2111	4.858E+02	2.654E+05	1.783E+01	1.560E-01	4.353E+01	2.925E-03
2112	4.668E+02	2.550E+05	1.713E+01	1.499E-01	4.182E+01	2.810E-03
2113	4.485E+02	2.450E+05	1.646E+01	1.440E-01	4.018E+01	2.700E-03
2114	4.309E+02	2.354E+05	1.582E+01	1.384E-01	3.861E+01	2.594E-03
2115	4.140E+02	2.262E+05	1.520E+01	1.330E-01	3.709E+01	2.492E-03
2116	3.978E+02	2.173E+05	1.460E+01	1.277E-01	3.564E+01	2.395E-03
2117	3.822E+02	2.088E+05	1.403E+01	1.227E-01	3.424E+01	2.301E-03
2118	3.672E+02	2.006E+05	1.348E+01	1.179E-01	3.290E+01	2.210E-03
2119	3.528E+02	1.927E+05	1.295E+01	1.133E-01	3.161E+01	2.124E-03
2120	3.390E+02	1.852E+05	1.244E+01	1.089E-01	3.037E+01	2.040E-03
2121	3.257E+02	1.779E+05	1.195E+01	1.046E-01	2.918E+01	1.960E-03
2122	3.129E+02	1.709E+05	1.149E+01	1.005E-01	2.803E+01	1.884E-03
2123	3.006E+02	1.642E+05	1.103E+01	9.655E-02	2.693E+01	1.810E-03
2124	2.888E+02	1.578E+05	1.060E+01	9.276E-02	2.588E+01	1.739E-03
2125	2.775E+02	1.516E+05	1.019E+01	8.912E-02	2.486E+01	1.671E-03
2126	2.666E+02	1.457E+05	9.787E+00	8.563E-02	2.389E+01	1.605E-03
2127	2.562E+02	1.400E+05	9.403E+00	8.227E-02	2.295E+01	1.542E-03



NOTE:
BACKGROUND IMAGERY
PROVIDED BY GOOGLE MAPS.

1 MI. 0 1 MI. 2 MI.
SCALE IN FEET

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS, INC.
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PH. (913) 681-0030 FAX NO. (913) 681-0012

PROJ. NO.	CADD FILE:	DATE:	SCALE:
23213025.01	--	SEPT. 2014	AS SHOWN

FIGURE 1

SITE LOCATION MAP

MATLOCK BEND LANDFILL
21712 HIGHWAY 72
LOUDON, TN 37774

SANTEK ENVIRONMENTAL
650 25TH STREET NW
SUITE 100
CLEVELAND, TENNESSEE

N:\Santek\Matlock Bend LF\23213025.01- Site Map\LOUDON SITE MAP.dwg

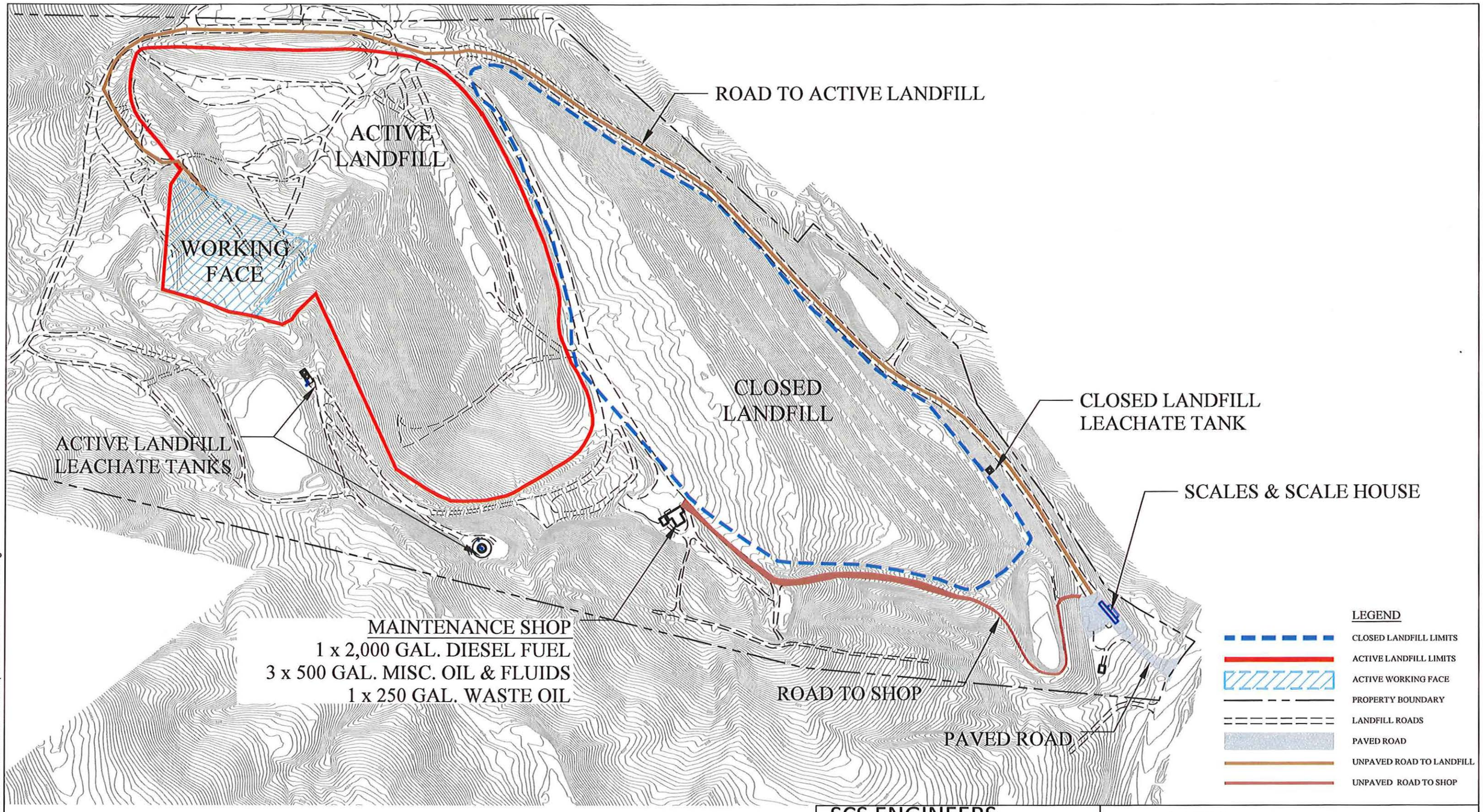

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FIGURE 2

FACIILITY MAP

MATLOCK BEND LANDFILL
21712 HIGHWAY 72
LOUDON, TN 37774

SANTEK ENVIRONMENTAL
6525TH STREET NW
SUITE 100
CLEVELAND, TENNESSEE

Process Flow Diagram
for Matlock Bend Landfill

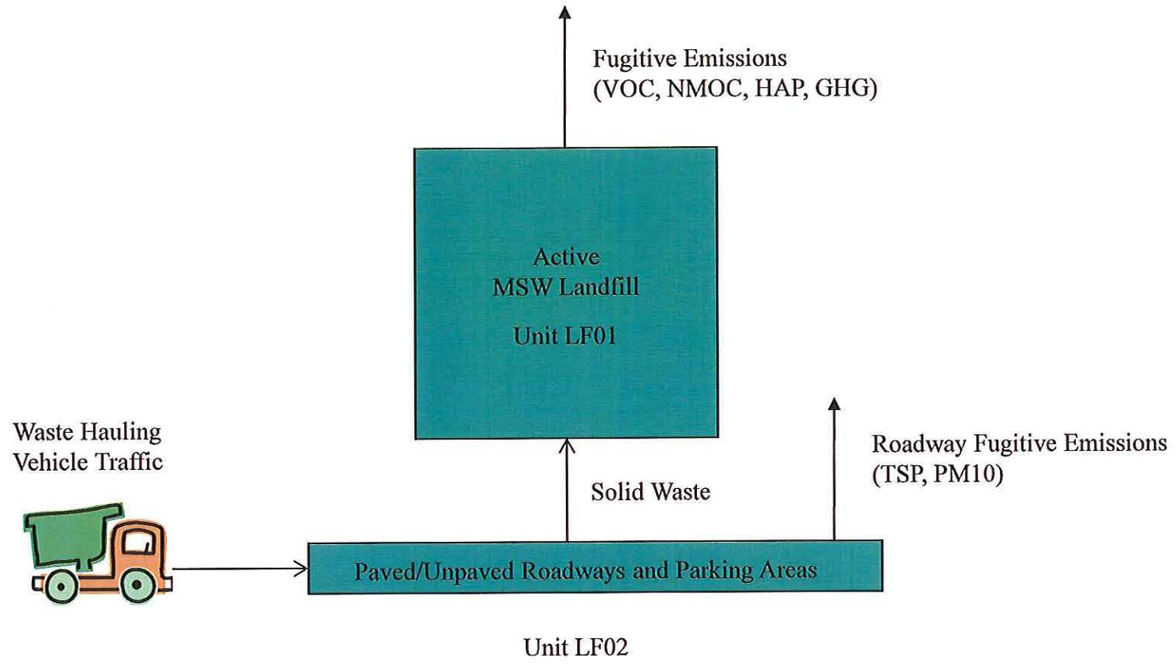

FIGURE 3

November 2014