Memorandum

4 November 2022

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To	S.A. Dunn & Company, LLC		
From	Steve Wilsey, Bryan Szalda/eew/1	**Tel**	716-297-6150
Subject	**Dunn Facility – CLCPA GHG Assessment**	**Project no.**	12587681

1. Introduction

S.A. Dunn & Company, LLC (S.A. Dunn) operates the Dunn Mine and Construction and Demolition Debris (C&D) Facility (Dunn Facility or Facility), located in Rensselaer, New York, pursuant to a Solid Waste Facility Permit under 6 NYCRR Parts 360 and 363 (the Solid Waste Permit) and a Mined Land Reclamation Permit issued by the New York State Department of Environmental Conservation (NYSDEC). On January 14, 2022, S.A. Dunn submitted a timely and sufficient renewal and modification application for its Solid Waste Permit and Mined Land Reclamation Permit. The permit application will not change or expand existing facility operations, other than incorporating construction of a mechanically stabilized earthen (MSE) perimeter berm as a visual mitigation measure. The MSE berm will reduce the landfill footprint by 1.2 acres, thereby slightly reducing emissions over the operational lifetime of the Facility due to reduced airspace for waste materials.

As part of the permit application process, NYSDEC requested in the March 30, 2022 Notice of Incomplete Application (NOIA) that S.A. Dunn complete an assessment in accordance with the New York State Climate Leadership and Community Protection Act (CLCPA). The CLCPA, which was adopted in 2019 and took effect on January 1, 2020, establishes goals to reduce greenhouse gas (GHG) emissions and increase production and usage of clean and renewable energy sources. Additionally, New York's CLCPA seeks to improve the economic standing of clean energy in the State of New York. The CLCPA draws on related policies and regulations, and NYSDEC has issued DAR-21 guidance and Commissioner's Policy 49 (CP-49) to guide assessments of a proposed project's GHG emission impacts relative to the goals of CLCPA.

S.A. Dunn submitted the CLCPA Assessment to NYSDEC on November 17, 2022. On January 17, 2023, NYSDEC issued a NOIA, which included comments related to the November 2022 CLCPA Assessment. This revision incorporates certain changes based on that NOIA.

As required under CLCPA Section 7(2), this submittal assesses the direct, upstream, and downstream GHG emissions for the entire Dunn Facility, and consistency with CLCPA statewide emissions limits. New York’s 2030 and 2050 statewide emission limits are tied to the 1990 statewide greenhouse gas emissions. *See* 6 NYCRR 496.1, 496.4. While the permit application is consistent with statewide GHG emission limits, this submittal includes a discussion on the justification for issuing the permit, alternatives, and potential mitigation measures. In addition, this submittal addresses the CLCPA Section 7(3) analysis requirement due to the Facility being located in or near disadvantaged communities.[1]

The emissions calculated in this memorandum (refer to attached Table 1 for a summary of total GHG emissions for the Dunn Facility) are derived from the total permitted waste disposed and to be disposed of at the Dunn Facility. The emissions reflect the hauling of the waste and materials, construction and capping of landfill space, typical landfill operational activities, the hauling of collected leachate to the local publicly owned treatment works (POTW), and the management of gas generated from the biological decomposition of the waste. Therefore, the calculated emissions discussed in Sections 2 and 3 of the memorandum conservatively account for the entire life cycle of the C&D waste (i.e., "Life Cycle Assessment") from the point of waste generation to the destination of the waste materials (i.e., direct burial of waste in the Dunn Facility to delivery of collected leachate to the POTW). Emissions have been modeled through 2050 – after the Dunn Facility is expected to close.

The Dunn Facility meets and exceeds the most stringent State and Federal regulations associated with the landfilling of C&D waste and is the least impactful solid waste management available option for GHG emissions. Should waste composition change, or if other waste management options that produce less GHG emissions become available, GHG emissions from the site may be reduced accordingly.

The Facility accepts waste generated in the greater Capital District area, including Albany, Saratoga, Schenectady, and Rensselaer counties, as well as areas outside of the Capital District (including areas in Vermont, Connecticut, and Massachusetts). This waste is generated regardless of whether the Dunn Facility exists.

In the absence of the Dunn Facility, the emissions would be generated at another disposal facility that may not be as effective at managing the waste and GHGs (e.g., since other C&D landfills in New York State or out-of-state may not currently operate a gas collection and control system). Additional GHGs would also be generated as a result of transporting the waste significantly longer distances. (This is demonstrated in attached Table 5.) Even out-of-state waste would have to be transported a longer distance for disposal if the Dunn Facility did not exist. If the waste were to be disposed of out-of-state, in addition to additional transportation emissions, NYSDEC would have no control over the landfill disposal practices, potentially resulting in additional emissions.

Furthermore, restrictions on landfills' acceptance of waste (even if the stated intent is to reduce GHG emissions in-state) would be contrary to the CLCPA since these measures would result in the additional export of waste out of New York State. Specifically, as explained above, this "mitigation" strategy would (i) increase GHG emissions in neighboring states, which may have less stringent climate policies or lack comparable landfill construction requirements designed to limit emissions, and (ii) increase emissions from longer transport of waste. These impacts (referred to as leakage) are inconsistent with the CLCPA, which explicitly requires NYSDEC to promulgate implementing regulations that minimize leakage. The Scoping Plan, CP-49, and DAR-21 likewise recognize the importance of limiting leakage, and even view its avoidance as a justification for granting a permit notwithstanding its inconsistency with statewide emission limits. Waste exportation also would be contrary to New York State's solid waste management plan.

2. GHG and HAP Emissions from Stationary Sources

The following sections detail the methodology for calculating total GHG and hazardous air pollutant (HAP) emissions from stationary sources at the Dunn Facility (note: the emissions presented in this section all occur within the Dunn Facility property boundary). Attachment B and Attachment C provide the full

[1] https://climate.ny.gov/Our-Climate-Act/Disadvantaged-Communities-Criteria

supporting calculations for the estimated total facility emissions in 2030 and 2050, respectively. Attachments D and E, prepared at the request of NYSDEC, provide the full supporting calculations for the estimated total facility emissions in 2032 and 2023, respectively. It should be noted that the estimated emissions presented in Attachment B, C, D and E were calculated using the 20-year global warming potential (GWP) values stated in 6 NYCRR 496.5 in accordance with DAR-21. A comparison of the estimated emissions using these 20-year GWP values from 6 NYCRR 496.5 with the 100-year GWP values referenced from 6 NYCRR 231-13.9 is provided in attached Table 2A (year 2030), attached Table 2B (year 2050), attached Table 2C (year 2032), and attached Table 2D (year 2023).

2.1 Methane Generation Model

Based on information provided by S.A. Dunn, GHD calculated methane generation estimates for the Dunn Facility. These estimates were based on historical waste records (referenced from the 6 NYCRR Part 360 Annual Reports) and future projections of waste acceptance utilizing the calculation methodology provided in 40 CFR 98 Subpart HH (GHG Reporting Rule – MSW Landfills) (used for annual GHG Reports submitted to the U.S. Environmental Protection Agency (EPA) each year by March 31).

Based on this methodology, the methane generation within a landfill for a given year was calculated using the following equation (Equation 1):

$$G_{CH4} = \sum \{W_x * L_{o,x} * (e^{-k\,(T - x - 1)} - e^{-k\,(T - x)})\} \text{ [for x = S through T-1]}$$

where,

G_{CH4} = modeled methane generation rate in year T in metric tons per year
x = year in which waste was disposed
S = start year of calculation
T = reporting year for which emissions are calculated
W_x = quantity of waste disposed in year x (metric tons, wet weight)
L_o = CH_4 generation potential (metric tons CH_4 / metric tons waste)
k = rate constant from Table HH-1 of 40 CFR 98, Subpart HH (yr^{-1})

The methane generation potential L_o was calculated using the following equation (Equation 2):

$$L_o = \frac{MCF * DOC * DOC_F * F * 16}{12}$$

where,

L_o = CH_4 generation potential (metric tons CH_4 / metric tons waste)
MCF = methane correction factor (default value is 1)
DOC = degradable organic carbon from Table HH-1 of 40 CFR 98 Subpart HH (metric tons C/metric ton waste)
DOC_F = Fraction of DOC dissimilated (default value is 0.5)
F = Fraction by volume of CH_4 in landfill gas (LFG) from measurement data

Attachment A presents the estimated methane generated in the years 2023, 2030, 2032, and 2050. The methane generation model considers values specific to C&D waste.[2] The LFG generated within the Dunn

[2] A DOC value of 0.08 and a k value of 0.03 / yr were referenced from Table HH-1 of 40 CFR 98 Subpart HH. The selected k value is based on the area receiving between 20-40 inches of precipitation per year (average annual value) and the landfill not practicing leachate recirculation.

Facility is assumed to be approximately 27 percent methane (CH_4) and 73 percent carbon dioxide (CO_2).[3] The embedded Table 1, below, provides the estimated LFG generated and collected over the entire life of the Facility through 2050:

Table 1 Estimated Landfill Gas Generation / Collection Rates

Year	2023	2030	2032	2050
LFG Generated (SCFM)	375	668	741	440
LFG Collected (SCFM)	282	501	555	431
Methane Generated (SCFM)	101	180	200	119
Methane Collected (SCFM)	76	135	150	116

The attached Figure 2 also shows the LFG generated and collected. As is typical of all landfills, LFG generation increases each year waste is disposed of in the Dunn Facility (in this case, until 2032). Thus, the model estimates that peak LFG generation at the Facility will occur in 2032, when waste placement is predicted to stop, with a total of 741 cfm of LFG generated and 555 cfm of LFG collected. LFG production then declines in all subsequent years.

Because the LFG model is generally considered conservative, it is likely that the peak estimate of emissions for 2032 will never be realized.

2.2 Landfill Gas Collection and Combustion

The collection system components for the Dunn Facility consist of vertical gas wells, laterals, and a main header. In addition, horizontal collectors will be utilized in the future as needed. Collected LFG is routed through the laterals and main header via blower and directed to the utility flare where combustion of the LFG occurs. A 75 percent collection efficiency, referenced from EPA AP-42, Section 2.4 (11/98), was used to determine the amount of gas collected and the resulting fugitive emissions (refer to next section for discussion of fugitive emissions estimates). If employing the calculation methodology from Table HH-3 of 40 CFR 98 Subpart HH, the Dunn Facility is expected to have a collection efficiency of approximately 80 percent in 2030 and 95 percent in 2050, as shown in the emedded Table 2, below:

Table 2 Collection Efficiency Calculation

Year	Surface Area with Daily Cover (acres)	Surface Area with Intermediate Cover (acres)	Surface Area with Final Cover (acres)	Calculated Collection Efficiency (percent)
2030	6.0	36.1	20.0	80
2050	0.0	0.0	62.1	95

Therefore, the assumption of a 75 percent collection efficiency in 2030 is considered conservative.

GHG emissions from the utility flare were calculated by assuming—based on a laboratory analysis of a LFG sample—that the LFG is approximately 27 percent methane and 73 percent carbon dioxide by volume. Information referenced from 40 CFR 98 Subpart HH was used in calculating GHG emissions

[3] Based on observations at the Dunn Facility, the methane concentration of landfill gas fluctuates over time—drifting above and below 25% methane. Based on this data, GHD initially assumed a long-term average of 25% methane, and that carbon dioxide makes up the balance (75%) of the gas. GHD has since updated the CLCPA Assessment based on the RM3C results of a laboratory analysis of a landfill gas sample collected from the Dunn Facility on February 22, 2023: Methane (CH_4) = 27%; Carbon dioxide (CO_2) = 29%; Oxygen (O_2) = 4.9%; and Nitrogen (N_2) = 35%. GHD used a methane concentration of 27%, with the balance of landfill gas (73%) conservatively assumed to be carbon dioxide.

from the utility flare. Table B.2 of Attachment B and Table C.2 of Attachment C include the calculated GHG emissions for the utility flare for the years 2030 and 2050, respectively.

Emissions of speciated HAP compounds in the fugitive LFG were calculated using values referenced from AP-42 Chapter 2, Solid Waste Disposal (Draft Section 2.4 (10/2008)).[4] A destruction efficiency of 98 percent was assumed in the calculations (except for mercury and HCl). Table B.3 of Attachment B and Table C.3 of Attachment C include the calculated fugitive HAP emissions for the utility flare for the years 2030 and 2050, respectively.

The gas collection and control system for the Dunn Facility provides a significant level of reduction for GHG and HAP emissions. The gas collection and control system ensures that over 120,559 tons CO_2eq of total GHGs and 2.2 tons of HAP will be avoided at the Dunn Facility in the peak year of emissions in 2032. In addition, not all C&D landfills have or require a gas collection and control system; therefore, other alternative C&D landfill sites may not provide this GHG reduction benefit that the Dunn Facility provides.

2.3 Fugitive Landfill Gas

Even with a properly maintained and operated gas collection and control system with soil cover, some small fraction of LFG will be released as fugitive emissions. Fugitive GHG emissions were calculated by assuming that LFG is approximately 27 percent methane and 73 percent carbon dioxide by volume. It should be noted that a portion of methane is oxidized to carbon dioxide as it passes through the soil cover; a 10 percent cover oxidation factor was used in accordance with the methodology provided in 40 CFR 98, Subpart HH.[5] Table B.4 of Attachment B and Table C.4 of Attachment C include the calculated fugitive GHG emissions for the years 2030 and 2050, respectively.

The fugitive methane emissions calculations include emissions from the leachate collection tank, as the gas collection efficiency used in the calculations is assumed to be the same across the board. Attachment F to the CLCPA Assessment, which uses the equations provided in AP-42 Chapter 7, Liquid Storage Tanks, demonstrates that emissions of other compounds from the leachate tank are de minimis (< 1 pound per year).

Emissions of speciated HAP compounds in the fugitive LFG were calculated using values referenced from AP-42 Chapter 2, Solid Waste Disposal (Draft Section 2.4 (10/2008)). Table B.5 of Attachment B and Table C.5 of Attachment C include the calculated fugitive HAP emissions for the years 2030 and 2050, respectively.

2.4 Other Small Combustion Sources

The Dunn Facility also operates the following small stationary combustion sources as part of its operational activities:

- Two 60,000 BTU / hr Propane Furnaces (refer to Table B.6 of Attachment B and Table C.6 of Attachment C for summary of expected emissions from these heating sources).

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[4] NYSDEC requested that the CLCPA Assessment use the values from AP-42 Chapter 2, Solid Waste Disposal (Draft Section 2.4 (10/2008)).

[5] The calculation methodology in 40 CFR 98 Subpart HH acknowledges that fugitive methane is oxidized within the soil cover before it escapes. See Table HH-4 for a summary of different cover oxidation factors. For the purposes of the calculations, the default value of 10% was assumed, although it is likely to be significantly higher in practice. Thus, 10% of fugitive methane is assumed to be oxidized to carbon dioxide. This oxidized portion is still accounted for as CO_2 in the totals, further ensuring that the calculations are conservative.

3. GHG and HAP Emissions from Non-Stationary Sources

This section of the CLCPA Assessment addresses GHG and HAP emissions from direct and indirect non-stationary sources (diesel/gasoline exhaust from on-site and off-site mobile equipment) during the construction and off-construction seasons. The estimated emissions calculated from these sources are shown in the attached Tables 3 and 4. The assumptions used in the calculations are provided in the footnotes for the attached Tables 3 and 4 and are also discussed in the following sections.

3.1 Off-Construction Season (Typically November 1 – April 30)

The off-construction season consists of typical operation activities at the Dunn Facility that are conducted year-round. The off-construction season is considered to last 26 weeks, generally starting on November 1 and concluding on April 30. The typical operation activities that generate GHG emissions from direct non-stationary sources include waste transportation and unloading, leachate transportation, soil transportation, daily cover, and operation and maintenance. Typical operation activities that result in indirect non-stationary GHG and HAP emissions are from transportation of employees.

The following subsections of Section 3.1 are broken into two separate groups: activities with emissions occurring within the Dunn Facility property boundary and those occurring outside the property boundary.

3.1.1 Off-Construction Season Activities Outside Dunn Facility Property Boundary

3.1.1.1 Waste and Leachate Transportation

The waste disposal capacity at the Dunn Facility serves the greater Capital District area, including Albany, Saratoga, Schenectady, and Rensselaer Counties, as well as areas outside of the Capital District (including other areas of New York State and areas in Vermont, Connecticut and Massachusetts). The GHG emissions associated with the transportation and unloading of waste from these areas can be accounted for by distance travelled by 10-wheel tractors with approximately 100 cy transfer trailers. Calculations for the associated GHG and HAP emissions are provided in the attached Table 3.

Transportation of waste from off-site to the facility entrance assumes the average distance travelled by trucks is approximately 138.1 miles (the average distance from the top 10 waste providers (in terms of tons transported in 2021) to the Dunn Facility).

Transportation of leachate from the Dunn Facility to the off-site wastewater treatment facility assumes a total of 10 million gallons of leachate is hauled per year and the average distance travelled by leachate tanker trucks is approximately 3.7 miles (each tanker truck hauls an average of 5,000 gallons of leachate per trip).

3.1.1.2 Indirect Emissions from Mobile Sources

Indirect emissions attributed to employee commutes to and from the Dunn Facility have been considered and provided in the attached Table 3. During off-construction season, there are typically 12 employees traveling to and from the site at an average travel distance of 10 miles.

3.1.2 Off-Construction Season Activities Within Dunn Facility Property Boundary

3.1.2.1 Waste Transportation and Unloading

The average truck spends 45 minutes on-site from when it enters, weighs in at the scale house, travels to the active area for unloading, unloads, and travels back to the entrance to leave. The distance from the entrance to the active area (at the furthest point) is around 0.8 miles. During waste unloading at the active area, two dozers spread and move the waste over the active area while one or two compactors compact the waste. Calculations for the associated GHG and HAP emissions are provided in the attached Table 3.

3.1.2.2 Daily Cover

Daily cover is typically completed during the last hour of each business day to control odor, prevent windblown litter, and prevent scavenging of waste from wildlife. Equipment used for daily cover operations include an excavator, two haul trucks and one dozer. Associated emissions calculations are provided in the attached Table 3.

3.1.2.3 Operation and Maintenance

Typical operation and maintenance activities that result in GHG emissions include use of a water truck, sweeper, and five light-duty vehicles. The water truck is essential to watering down access roads to control dust; sweeper trucks sweep down and maintain clear roads on the Dunn Facility; and light-duty vehicles are used to transport employees and equipment around the site for routine maintenance and operations. Emissions calculations are provided in the attached Table 3.

3.2 Construction Season (Typically May 1 – October 31)

During construction season, typical operational activities at the Dunn Facility continue, as well as additional activities such as cell construction and final cover construction. Additionally, construction season requires more contracted personnel on site for construction activities and longer shift hours to utilize longer days and ensure completion of construction projects. The construction season is considered to last 26 weeks, generally starting on May 1 and concluding on October 31.

This section does not repeat discussion of any activities described in Section 3.1, but additional discussion is provided for the following activities that only occur during construction season (note: the emissions presented in Section 3.2.1 and Section 3.2.2 all occur within the Dunn Facility property boundary).

3.2.1 Cell Construction and Mining of Materials for Onsite Use

As current cells are filled to design capacity, cell construction in future landfill areas would begin during construction season. Details of subgrade design are provided on Permit Drawing C300 of the Permit Plans for the MSE Permit Modification (dated January 2022). The majority of GHG emissions from cell construction is due to use of diesel-powered equipment to remove earth and haul gravel/stone/soil to lay the base of the cell. The equipment needed for this process includes three excavators, three haul trucks, two dozers, and a roller. Calculations for GHG and HAP emissions are provided in the attached Table 4.

3.2.2 Final Cover Construction

As future landfill cells reach final approved design grades, final cover construction begins for these sections, which will minimize fugitive emissions of LFG and increase gas collection efficiency. Details of the cover system design are provided on Permit Drawing C302 of the Permit Plans for the MSE Permit

Modification (dated January 2022). The majority of GHG and HAP emissions from cover construction is due to use of diesel-powered equipment to haul gravel/stone/soil to lay soil sections of the cover system. The equipment needed for this process includes one excavator, two haul trucks, two dozers, and a roller. Calculations for GHG and HAP emissions are provided in the attached Table 4.

4. Insignificant Emissions

The potential emission sources listed below occur, at most, sporadically throughout the year, and may not occur during each year of operation:

- Equipment used for maintenance/cleaning of the leachate collection system (e.g., jetting)
- Equipment used for installing components of the LFG collection system (e.g., drill rigs for installation of gas well collectors)
- Emissions from the production, delivery and installation of geomembranes or geotextiles and related products
- Emissions from leachate storage tanks (calculations in Attachment F, using the equations provided in *AP 42, Fifth Edition, Volume I Chapter 7: Liquid Storage Tanks*, demonstrate that emissions from these sources are de minimis at <1 pound per year).

Because these events—occurring over isolated, short periods of time each year—do not significantly contribute to the overall emissions at the Dunn Facility, they are considered “insignificant.”

5. GHG and HAP Impact Analysis

5.1 Alternative Facilities

As discussed in Section 3.1.1 of this assessment, most of the waste capacity at the Dunn Facility serves the greater Capital District area, including Albany, Saratoga, Schenectady, and Rensselaer Counties, as well as areas outside of the Capital District (including other areas of New York State and areas in Vermont, Connecticut and Massachusetts). Therefore, the alternative waste disposal options if the Dunn Facility were not available would need to consider waste transportation and disposal at more distant locations. Eleven alternative C&D landfill locations considered within New York State are:

– Lake George C&D Debris Landfill
– Burton Clark C&D Landfill
– Thurman C&D Debris Landfill
– Delaware County SWMF
– North Elba C&D Landfill
– Honeywell / Camillus Bed #15 C&D Landfill
– Chemung County Area 3 C&D Landfill
– Hakes C&D Disposal Inc.
– Voorhees Hill Road C&D Landfill
– LC Whitford Co. C&D Landfill
– Carroll C&D Management Facility

Table 5 and Figure 1 attached to this Memorandum provides additional details on alternative C&D landfill facilities located within New York State, including the additional distance travelled by waste trucks and corresponding increase to GHG emissions if the waste currently accepted at the Dunn Facility is diverted to alternative C&D landfills. Without a viable local alternative, waste disposal options farther away would become necessary for some or all the waste that the Dunn Facility would otherwise receive. These disposal options would lead to increased GHG and HAP emissions from hauling waste over longer distances. Therefore, the Dunn Facility provides the least GHG-impact and HAP-impact alternative for handling this waste that will be generated by this community.

Conservatively, any other currently available C&D disposal option would result in the generation of at least the same GHG and HAP emissions as detailed herein (assuming the options all have gas collection and control systems), plus the additional emissions generated from the increased hauling distance. The embedded Table 3, below, shows the difference in GHG emissions that would occur due to the hauling of waste over longer distances to alternative C&D landfills within New York State.

Table 3 Summary of Alternative Facilities – Waste Transport

Site	Distance from Waste Origin (Miles)	Increase in GHG Emissions vs. Dunn Facility (TPY)	Increase in HAP Emissions vs. Dunn Facility (TPY)
NYS C&D Landfills			
Dunn Facility	138.1	-	-
* Lake George C&D Landfill	197.4	6,332	0.15
* Burton Clark C&D Landfill	205.0	7,153	0.17
* Thurman C&D Debris Landfill	206.6	7,325	0.17
Delaware County SWMF	208.0	7,473	0.17
* North Elba C&D Landfill	275.7	14,712	0.34
* Honeywell / Camillus C&D LF	279.0	15,057	0.35
Chemung County C&D LF	303.7	17,701	0.41
Hakes C&D Disposal Inc.	328.8	20,382	0.47
* Voorhees Hill Rd C&D LF	375.6	25,394	0.59
* LC Whitford Co. C&D LF	376.7	25,505	0.59
** Carroll C&D Landfill	463.7	34,808	0.81

* To the best of our knowledge, these facilities are small municipal or private landfills with restrictive access that would not be commercially available as an alternative to the Dunn Facility.

** Carroll C&D Landfill is not yet in operation, and it is not known if this facility will eventualy operate.

The attached Table 6 provides a summary of remaining capacities of C&D landfills in New York State. This table shows that out of all the C&D landfills currently accepting waste in New York State, nearly 60 percent of the current available capacity is within the Dunn Facility itself. If the Dunn Facility were to cease operation, this C&D (~193,085 tons in 2020 and 214,101 tons in 2021) would need to go to an alternative facility located much farther away. Moreover, only a few facilities have enough capacity (on annual throughput basis) to accommodate the amount of waste deposited annually at the Dunn Facility (Honeywell/Camillus Bed #15 C&D and Hakes C&D Disposal Inc.); however, these facilities would require hundreds of additional miles to transport the C&D.

As stated earlier, not all C&D landfills have or require a gas collection and control system; therefore, other alternative C&D landfill sites may not provide the GHG reduction benefit that the Dunn Facility provides.

Moreover, alternative waste processing facilities besides landfills, such as anaerobic or aerobic digestion, large scale composting, or source separating organics, do not apply to C&D processing facilities. Nevertheless, S.A. Dunn's corporate parent, Waste Connections, routinely evaluates new and developing technologies for best managing C&D and utilizing the LFG it generates, and will continue to do so throughout the life of the Dunn Facility.

5.2 Emissions from Off-site Fossil Fuel Based Energy Consumption

As noted in DAR-21, as part of the assessment of indirect emissions from stationary sources, emissions generated by off-site energy plants and fossil fuel suppliers supplying energy used on the site of the Dunn Facility has been analysed. As the off-site fossil fuel-based energy consumption for the Dunn Facility is not expected to increase or change from historic values or use, current fossil fuel-based energy consumption rates were used to calculate the GHG emissions associated with indirect emissions from stationary sources. There are two sources of indirect emissions from stationary sources for off-site fossil fuel-based energy consumption: propane for heating and electrical power.

5.2.1 Propane Energy Consumption

Attached Table 7 provides an estimate of upstream GHG emissions that occur due to the importing of fossil fuels onsite.[6] Quantities of these fossil fuels are based on an evaluation of historical records. Emission factors for the estimation of upstream fossil fuel emissions were provided by NYSDEC (Appendix A. Emission Factors for Use by State Agencies and Applicants from the NYSDEC (2022) Summary Report. 2022 NYS Statewide GHG Emissions Report).

5.2.2 Off-site Electrical Energy Consumption

Electricity is used throughout the Dunn Facility for lighting and powering of tools, equipment, and office appliances. The typical annual amount of electricity used by the Dunn Facility is estimated to be 115,560 kWh (based on meter readings provided by National Grid for the period of January 2021 through December 2021). To calculate the indirect emissions for electricity used at this facility, EPA's eGRID Power Profiler was used to determine how electricity is generated in this region. Gas, nuclear, and hydro power generation accounts for over 91 percent of electricity generation for the region of NYUP. According to the Power Profiler, the eGRID subregion of NYUP (NPCC Upstate New York) has a 4.88 percent line loss and the annual use of 115,560 kWh of electricity results in 13 tons of CO_2. A summary of indirect stationary emissions from electricity is provided in attached Table 7.

5.3 Potential Emission Reduction Measures

This section discusses potential measures to increase landfill gas (LFG) collection and mitigate emissions during the construction, operation, and maintenance activities described in Sections 2 and 3 of the CLCPA Assessment.

S.A. Dunn commits to implementing or continuing to implement the following measures to mitigate emissions at the Dunn Facility:

– Continued operation of the gas collection and control system. Since 2019, after the issuance of the initial solid waste permit, S.A. Dunn has operated a gas collection and

[6] Propane usage is mostly used for heating purposes at the Dunn Facility and is thus only used seasonally. It is not expected to change significantly on an average annual basis; therefore, the potential-to-emit (PTE) is not representative of current or future conditions. For completeness, the PTE for propane has been added to the tables but is not included in the facility-wide PTE, which is already conservative.

control system with a utility flare at the Dunn Facility, which efficiently destroys methane. Not all C&D landfills have or are required to have a gas collection and control system; therefore, other alternative C&D landfill sites (in-state or out-of-state) may not provide this greenhouse gas (GHG) reduction benefit that the Dunn Facility provides. As shown in the attached Table 1, a landfill with a gas collection and control system emits approximately 59% less GHG in 2030 and 82% less GHG in 2050; and 40% less HAPs in 2030 and 57% less HAPs in 2050 than a comparable landfill without a gas collection and control system (i.e., with uncontrolled emissions).[7]

– Expansion of the gas collection and control system to capture more gas as additional waste placement reaches permitted grades.

– To the extent practical, S.A. Dunn coordinates, and will continue to coordinate, back hauls of loads leaving the Dunn Facility, such that after loads of inbound earthen material (e.g., crushed stone for roads, drainage stone and clay for liner system construction) are delivered to the Dunn Facility, those same trucks will then reload prior to leaving the Dunn Facility with outbound sand and gravel exports. This coordination reduces truck trips—and thus truck emissions, including in the proximate disadvantaged communities.

– Regular placement, inspection, and maintenance of all cover materials in areas where waste has been placed. In addition to existing inspection practices, S.A. Dunn commits to documentation of a monthly inspection of cover materials and undertaking maintenance, as needed. The regular inspection and maintenance of cover materials will aid in the reduction of fugitive emissions through the cover soil by strengthening the interface between the gas collection zone (within the waste mass) and the ambient air. In strengthening this cover barrier, the gas collection system is able to operate more effectively by capturing additional gas and thereby reducing fugitive emissions to the atmosphere. In addition, an effective cover barrier will result in increased oxidation of methane and hydrogen sulfide within the cover soil.

– Preparation and submission of construction plans for NYSDEC review within 6 months of receiving the final permit. The construction plans will identify an area of at least 10 acres of final cap to be constructed within the construction season following NYSDEC approval of the construction plans. Further, S.A. Dunn will complete final cap on at least 20 acres (inclusive of the initial 10 or more acres of final cap) by 2030, and on all remaining areas of the landfill footprint (62.1 acres) by 2050. While an intermediate cover system does provide an adequate barrier between the waste mass and the ambient air, a final cover system is the highest level cover system that a facility can employ and results in maximized gas capture and oxidation. The GHG Reporting Rule regulations (under 40 CFR 98 Subpart HH) specify an average collection efficiency of 75% for areas with intermediate cover and 95% for areas with final cover. The installation of final cover—particularly where earlier than required—will thus result in a significant reduction of GHG emissions.

– Preparation and submission of a surface emission monitoring (SEM) work plan for NYSDEC review within 6 months of receiving the final permit. The work plan will entail an annual SEM event substantively following the field procedures for SEM detailed in the New Source Performance Standards for municipal solid waste landfills. The first SEM event will be completed within a year of receiving NYSDEC approval of the work plan. SEM results will be provided to NYSDEC upon completion, and any indicated corrective measures will be implemented by S.A. Dunn in a timely manner.

– Vegetation of all areas of the Dunn Facility where feasible. The presence of vegetation within the cover soil has been shown in studies to increase the rate of cover oxidation compared with areas that do not have vegetation.

[7] The uncontrolled emissions depicted in Table 1 represent the PTE, or worst-case scenario, if the gas collection and control system is not utilized at the Dunn Facility. This PTE scenario does not represent normal operations at the Dunn Facility.

– Mine reclamation and closure will provide a final vegetated cap, which—as explained above—will increase the rate of cover oxidation.

– Construction of the MSE berm, which will mitigate emissions by:

  - Reducing waste in place by approximately 220,000 cubic yards. This reduces the potential GHG emissions from LFG by approximately 914 tons per year at peak, and further reduces truck trips from waste disposal—and thus truck emissions—including in the proximate disadvantaged communities.

  - Reducing the amount of construction soils and sands to be hauled from the Dunn Facility by at least 500,000 cubic yards, thus decreasing truck and construction equipment emissions, including in the proximate disadvantaged communities. At 15 tons per truck, this is a potential reduction of approximately 90,000 truck trips.

  - The reductions in emissions (in tons) that will result from construction of the MSE berm, if approved, are summarized in the table below.

	Year 2023		Year 2030		Year 2032 or 2033		Year 2050	
Emissions Source	**Total CO_2 Equivalents (tons / year)**	**Total HAPs (tons / year)**	**Total CO_2 Equivalents (tons / year)**	**Total HAPs (tons / year)**	**Total CO_2 Equivalents (tons / year)**	**Total HAPs (tons / year)**	**Total CO_2 Equivalents (tons / year)**	**Total HAPs (tons / year)**
Total Emissions Under Currently Permitted Conditions	50,246	1.37	75,755	2.11	83,072	2.33	19,831	0.90
Total Emissions with the Modification	NA	NA	NA	NA	82,112	2.30	19,338	0.88
Change in Emissions as a Result of the Modification	--	--	--	--	**-960**	**-0.03**	**-482**	**-0.01**

– Incorporation of vegetation into the MSE berm, which—as explained above—will further increase the rate of cover oxidation.

– Use of the existing Dunn Facility potentially avoids the development of greenfield sites and the associated removal of vegetation.

NYSDEC's March 30 notice of incomplete application identified possible mitigation measures in addition to those already incorporated into the Dunn Facility's current design and operational practices. Those potential mitigation measures, and S.A. Dunn's evaluation of their feasibility, are provided below.

– Evaluation and introduction of intermediate waste processing methods, such as separating and treating methane-generating wastes using a co-located anaerobic digester or composting facility at the site or using similar technologies at another facility.

  - <u>Feasibility assessment:</u> The Dunn Facility is a C&D waste processing facility that does not, and is not intended to, manage organic wastes that would be suitable for a digester. Further it does not have the space, infrastructure, or vehicles appropriate to transport organic wastes. Nevertheless, S.A. Dunn and its parent company, Waste Connections, routinely evaluate new and developing technologies for best managing C&D and minimizing GHG emissions, and will continue to do so throughout the life of the Dunn Facility.

– Assessment and implementation of additional emissions monitoring, including additional methods for periodic inspection of fugitive methane sources in the gas collection and control system and across the facility to identify and repair leaks.

  - <u>Feasibility assessment:</u>

    – Since 2019, after the issuance of the initial solid waste permit, the Dunn Facility has had enhanced air monitoring in place. Beyond monitoring required by permit or regulation, NYSDEC collects hydrogen sulfide (H2S) measurements from a number of locations at the perimeter of the Dunn Facility using Acrulog monitors. Levels of H2S are generally indicative of other LFG constituents, including GHGs like methane. The Acrulog data shows very low H2S levels overall, which is indicative of well controlled landfill emissions. NYSDEC also collects particulate matter (PM) measurements at the Rensselaer City School, near the Facility perimeter. PM_{10} levels at the School are consistently lower than at the Albany County Health Department monitor location to the west of the Dunn Facility.

  – As discussed above, S.A. Dunn will prepare and implement a SEM work plan.

– Adoption of new approaches for reducing GHG emissions from offsite transport of materials, such as contracting with companies that utilize electric or low-emission vehicles.

  - Feasibility assessment: Reducing GHG emissions through consolidated waste transportation is addressed below. An evaluation of regional contractors or vendors located near the Dunn Facility indicates that no nearby companies strictly utilize electric or low-emission vehicles. However, should such options become available, S.A. Dunn will continue to evaluate the feasibility of this measure.

– Adoption of new approaches for reducing GHG emissions from onsite vehicle usage by upgrading to a fleet that operates on renewable energy sources.

  - Feasibility assessment: An evaluation has determined that this technology is currently not feasible at the Dunn Facility. However, S.A. Dunn will continue to assess the feasibility of this measure in the future.

– Consolidation of loads to and from the facility in order to reduce the number of trucks entering and exiting on a daily basis.

  - Feasibility assessment: S.A. Dunn does not directly control how third parties act in terms of consolidating their C&D prior to transportation to the Dunn Facility; however, waste consolidation through transfer stations is an integral characteristic of current industry practices to reduce fuel consumption, which in turn reduces GHG emissions. This practice of consolidation will continue.

As discussed in Section 6.1 of the CLCPA Assessment, the permit application is considered consistent with CLCPA goals under NYSDEC guidance because the permit will not change or expand existing facility operations, other than incorporating construction of the MSE berm as a visual mitigation measure. That said, the above measures will be implemented (or continue to be implemented) or assessed for potential incorporation in the future.

5.4 Landfill Carbon Sequestration

The EPA's Waste Reduction Model (WARM) incorporated carbon storage in landfills as a GHG emissions offset and sink. Likewise, the CLCPA recognizes the role that carbon sequestration could play in attaining the statewide GHG emission limits (the scoping plan to be developed under ECL 75-0103(13)(d)&(i) must consider sequestration among the potential measures and actions to be implemented). The EPA's "Landfill Carbon Storage in WARM" (October 27, 2010) provides examples of materials that have high landfill carbon storage potential. Examples of these materials include newspapers, branches, and dimensional lumber. These materials have high landfill carbon storage potential due to presence of lignin, an organic polymer that provides"strength in the cell walls of plants. While lignin can degrade in aerobic conditions, the anerobic conditions within landfills limits the degradation of lignin and the organic materials that contain lignin.

The breakdown of waste type reported in the Dunn Facility's 2021 NYSDEC Annual Report was used as an example for the calculation of potential carbon offset. Using EPA's "Advancing Sustainable Materials Management: 2018 Fact Sheet (December 2020)" and published information on their Facts and Figures about Materials Waste and Recycling website, the C&D reported in the Dunn Facility's 2021 NYSDEC Annual Report was further classified into wood products. Assuming a lignin content of 15 percent for these high potential carbon storage materials, an estimated 5,143 tons of CO_2 was sequestered in the Dunn Facility during 2021. The same annual rate of sequestration is expected to occur for future landfill areas. Calculations are provided in attached Table 8[8].

6. Summary Assessment

6.1 Discussion of Consistency With CLCPA Targets

According to CP-49, "[r]outine permit renewals that would not lead to an increase in actual or potential GHG emissions would ordinarily be considered consistent with the CLCPA pending finalization of the Scoping Plan, the subsequent adoption of a state energy plan, and future regulations unless project specific facts support a finding of inconsistency." Based on this guidance, and since the addition of the berm will actually result in a slight decrease in emissions, the renewal is considered consistent with the CLCPA.

Attached Table 1 provides an estimate of the overall GHG and HAP life-cycle emissions associated with the Dunn Facility. It is acknowledged that GHG and HAP emissions are generated from the landfilling of C&D. The current mitigation measures employed at the Dunn Facility, mainly the operation of a gas collection and control system and utility flare (which is not currently required under any state or federal regulation and was implemented after the Facility's Solid Waste Permit was initially issued) and the implementation of a final cover system (20 acres out of 62.1 acres to have final cover by 2030 and all 62.1 acres to have final cover before 2050), result in a significant reduction in GHGs (59 percent reduction in 2030 and 82 percent reduction in 2050) and HAPs (40 percent reduction in 2030 and 57 percent reduction in 2050), making the Dunn Facility operations consistent with the targets set forth in CLCPA for 2030, but slightly short of the target reduction for 2050 if the targets are assumed to be applied uniformly across all GHG sources. However, at this time, it is unclear who the State of New York will allocate responsibility for compliance with these state-wide targets across all stationary and mobile sources; therefore, the Dunn Facility is in alignment with the CLCPA state-wide targets.

In addition, the proposed capping mitigation meaure to identify an area of at least 10 acres of final cap to be constructed within the construction season following NYSDEC approval of the construction plans is estimated to increase the collection effiency to 77% (above the baseline value of 75%) based on the cover type analysis presented in embedded Table 4 below:

Table 4 Collection Efficiency Calculation – Additional Capping Mitigation Measure

Year	Surface Area with Daily Cover (acres)	Surface Area with Intermediate Cover (acres)	Surface Area with Final Cover (acres)	Calculated Collection Efficiency (percent)
Within 6 months of permit	6.0	46.1	10.0	77

Therefore, the proposed capping mitigation measure is estimated to reduce fugitive emissions from the landfill by approximately 8%.

[8] The emissions shown in attached Table 8 have been provided for informational purposes but have not been included in the CLCPA Section 7(2) total shown in attached Table 1.

6.2 Project Justification

Since the Dunn Facility is consistent with the CLCPA, project justification is not required. However, the permit renewal is readily justified. The Dunn Facility manages waste generated in the local area and region—waste which is generated regardless of the Facility's existence—and provides the avenue to manage this waste with the least amount of GHG and HAP emissions.

This is reinforced by the State's solid waste management policies. The Dunn Facility avoids increasing the need for waste exportation. In 2010, NYSDEC adopted the latest version of the State Solid Waste Management Plan entitled "Sustainable Materials Management Strategy for New York State – Beyond Waste" (Beyond Waste). This Plan sets forth sustainable and comprehensive strategies through 2020 with resulting goals and targets at the State and local level through 2030. While "Beyond Waste" does not identify landfilling as the preferred waste management option, it does identify the need for landfills and states that New York landfills and municipal waste combustors "comply with regulations that are among the most protective in the nation." Consistent with "Beyond Waste," NYSDEC has either approved or is in the process of reviewing local Solid Waste Management plans for several communities" in New York State. The Dunn Facility is critical to the long-term management of waste in these communities and is even identified in certain Solid Waste Management Plans.[9] The Plan confirms that waste exportation, which increases the potential for GHGs, is "problematic and potentially unreliable" and explains that "principles of sustainability and responsibility dictate that materials be managed in the most efficient and environmentally sensitive manner, with consideration of the risks and impacts of out-of-state transportation." If the Dunn Facility does not exist, even more GHGs and HAPs would be generated to manage the same waste because additional GHG and HAP emissions would be generated to transport the waste farther away and manage it at other facilities (as demonstrated in attached Table 5). In addition, not all C&D landfills have or require a gas collection and control system; therefore, other alternative C&D landfill sites may not provide this GHG reduction benefit that the Dunn Facility provides.

Permit denial would also be contrary to the CLCPA since the loss of the Dunn Facility would significantly increase the likelihood of GHG "leakage" through waste exportation out-of-state. The CLCPA defines leakage as "a reduction in emissions of greenhouse gases within the state that is offset by an increase in emissions of greenhouse gases outside of the state." ECL § 75-0101(12).

The CLCPA directs the Scoping Plan, which will serve as the initial framework for how the State will reduce GHG emissions and achieve net-zero emissions, to include "mechanisms to limit emission leakage." ECL § 75-0103(13)(k). The CLCPA further directs NYSDEC to promulgate regulations consistent with the Scoping Plan, and incorporate "measures to minimize leakage." ECL § 75-0109(2)€ and (3)(e). The Scoping Plan released by the Climate Action Council explicitly explains the importance of reducing leakage: "Mitigating leakage risk is of interest to the State for both climate and economic reasons, which is further demonstrated by the Climate Act requirements related to mitigating anti-competitive impacts and for the emission reduction regulations ultimately adopted by [NYSDEC] to incorporate measures to minimize emissions leakage. . . . As the State implements this Scoping Plan, it will need to carefully monitor the potential for unintended emission and economic leakage." CP-49 (p. 7) and DAR-21 (p. 6) also recognize the following as a justification for granting a permit even in circumstances where there is inconsistency with statewide emissions limits: a demonstration that the lack of the project within the State would result in emissions leakage in excess of emissions from the project.

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[9] *See, e.g.*, Draft Washington County Local Solid Waste Management Plan at PDF p. 139 (Oct. 2022), https://www.washingtoncountyny.gov/DocumentCenter/View/21792/WCSWMP__DRFTForReview_10_19_2022_wAPP; *see also* Draft New York State Solid Waste Management Plan at PDF p. 298, 307, 308, https://www.dec.ny.gov/docs/materials_minerals_pdf/draftsswmp.pdf.

Thus, renewal of the Dunn Facility's permit is justified because it ensures the Landfill's GHG minimization measures will continue while avoiding GHG leakage and providing needed in-state waste disposal capacity.

Should waste composition change, or if other waste management options become available in the future, GHG and HAP emissions from the site may be reduced accordingly. In the meantime, the Dunn Facility provides a means of managing the waste generated in the community and surrounding region that not only meets or exceeds all air regulations, but also is the least impactful waste management option for GHG and HAP emissions.

6.3 Mitigation Measures

S.A. Dunn has identified numerous potential emission reduction measures (see Section 5.3) as a way to mitigate any additional GHG and HAP emissions. These are in addition to the existing mitigation measures that are employed at the Facility.

7. Disproportionate Burden Analysis of GHG and HAP

As described previously in this assessment, the Dunn Facility operates a gas collection and control system that significantly reduces the amount of GHG and HAP emitted from the Facility. The Dunn Facility thus provides a mitigation measure that may not be employed at other C&D landfills in New York State or elsewhere. As shown in attached Table 1, these existing mitigation measures provide an estimated reduction for HAPs of 40 percent in 2030 and 57 percent in 2050.

Approximately 29 percent of GHG emissions and 25 percent of HAP emissions in 2030 occur due to the transport of waste from the point of generation to the Dunn Facility, which does not impact the disadvantaged communities located proximate to the Dunn Facility. Specifically, 84% of the waste that arrives at the Dunn Facility comes from ten off-site sources at an average distance of 138.1 miles away. While GHG and HAP emissions from the transport of this waste occur along the entirety of the 138.1 mile path, only approximately 1 mile of the 138.1 mile trip occurs within the disadvantaged communities proximate to the Dunn Facility. Of the 14,771 tons of per year of GHG emissions from waste hauling along the 138.1 mile route, only 107 tons per year (0.72% of the total tons per year of GHG emissions) are associated with this one-mile portion of the trip. Because less than 1% of this total route has the potential to result in emissions within the disadvantaged communities proximate to the Dunn Facility, and only 107 tons per year of GHG emissions are associated with this one-mile portion of the trip, the GHG and HAP emissions do not result in increased impacts or burdens to the disadvantaged communities.

Further, based on the total calculated speciated HAP emissions from landfill fugitive emissions and from the utility flare exhaust (see Tables B.3 and B.5 of Attachment B and Tables C.3 and C.5 of Attachment C), there are no high toxicity air contaminants (HTACs) that exceed the significant mass emission rates set forth in 6 NYCRR 201-9. Moreover, only five speciated HAP compounds exceed an emission rate of 100 pounds per year in 2030 (methylene chloride, ethylbenzene, toluene, xylene, and hydrogen chloride all of which are not HTACs). These five non-HTAC compounds all have significantly higher short-term guidance concentrations[10] (SGCs) and annual guidance concentrations[4] (AGCs) than those that are listed for HTAC compounds, indicating that these compounds have lower off-site impacts associated with them. In addition, HCl is only emitted from the utility flare (HCl is not emitted as fugitive emissions), which

[10] From NYSDEC DAR-1 guidance document.

provides exhaust parameters that allow for greater dispersion and mixing prior to impacting an off-site receptor.

The latest New York State Ambient Air Quality Report for 2020 provides a summary of the ambient monitoring stations located throughout New York State. Three active monitoring stations are located within Region 4 (Loudonville, Albany, and South Albany), all of which of located in close proximity to the Dunn Facility (the two Albany monitoring stations are located 1.3 miles WSW of the Dunn Facility and the Loudonville monitoring station is located 2.3 miles to the northwest of Dunn Facility). A summary of 2020 ambient monitoring results for these stations with a comparison to the national ambient air quality standard is shown in the embedded Table 5, below:

Table 5 Summary of 2020 Air Monitoring Results – NYSDEC Region 4

Compound	Avg. Period	Station	2020 Result	Air Quality Standard	Percent of Standard
Sulfur Dioxide	1-hour	Loudonville	2.47 ppb	75 ppb	3.3 percent
Sulfur Dioxide	Annual	Loudonville	0.2 ppb	30 ppb	0.7 percent
PM-2.5	24-hour	Albany Co. HD (FRM)	19.7 $\mu g/m^3$	35 $\mu g/m^3$	56.3 percent
PM-2.5	Annual	Albany Co. HD (FRM)	6.1 $\mu g/m^3$	12 $\mu g/m^3$	50.8 percent
PM-2.5	24-hour	Albany Co. HD (FEM)	19.9 μ/m^3	35 $\mu g/m^3$	56.9 percent
PM-2.5	Annual	Albany Co. HD (FEM)	8.1 $\mu g/m^3$	12 ug/m^3	67.5 percent
PM-2.5	24-hour	Loudonville	13.9 $\mu g/m^3$	35 $\mu g/m^3$	39.7 percent
PM-2.5	Annual	Loudonville	5.3 $\mu g/m^3$	12 $\mu g/m^3$	44.2 percent
Ozone	8-hour	Loudonville	0.057 ppm	0.070 ppm	81.4 percent

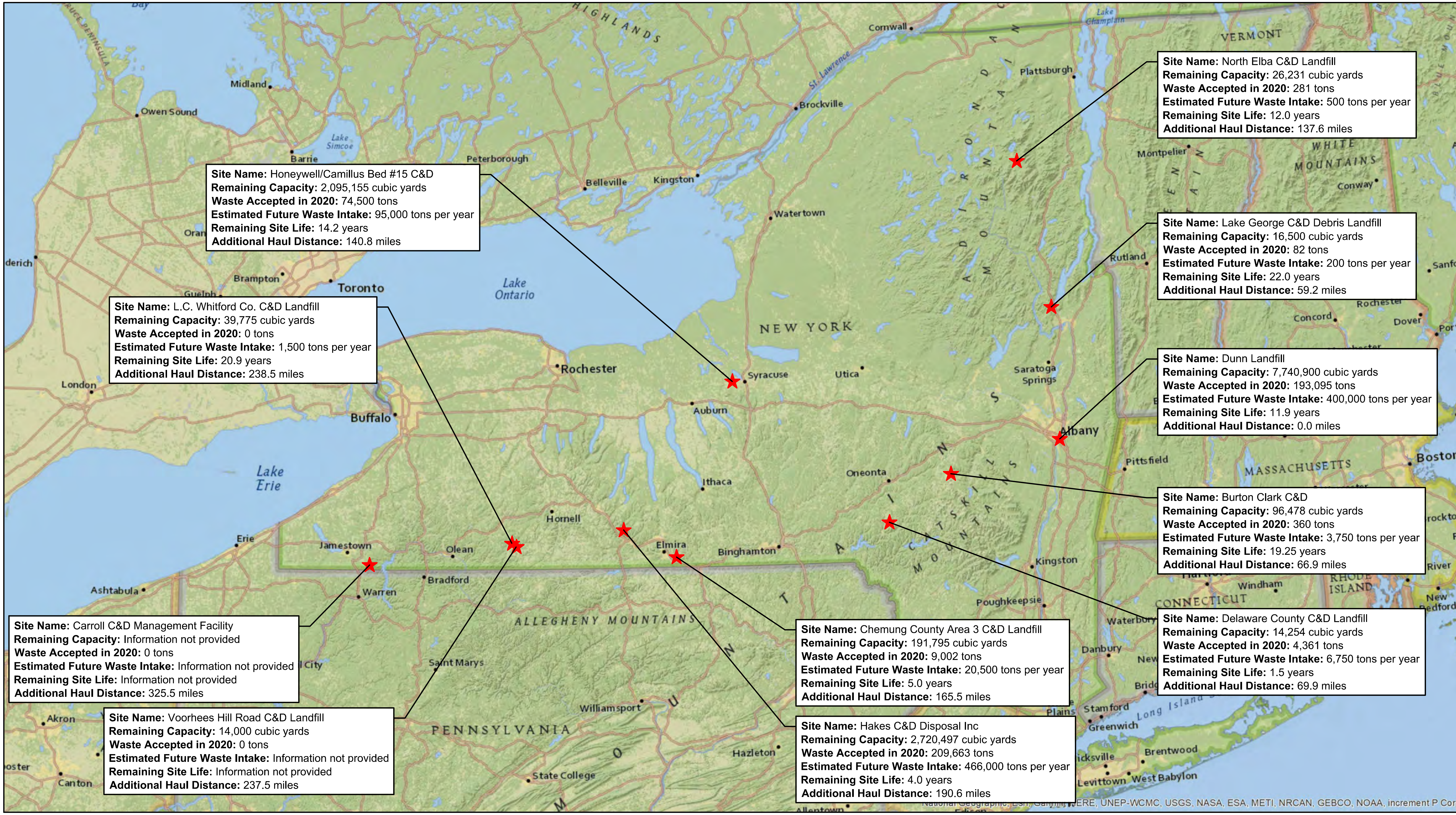
The monitoring results for 2020 indicate good air quality in the vicinity of the Dunn Facility (all of the monitoring results are in compliance with the ambient air quality standards).

For these reasons, it is concluded that the Dunn Facility does not provide a significant or disproportionate burden to disadvantaged communities surrounding the facility.

Regards,

Steven D. Wilsey
Project Director

Bryan P. Szalda
Engineer



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GHD

DUNN LANFILL
RENSSELAER, NEW YORK

C&D LANDFILLS IN NEW YORK

Project No. 12587681
Date September 22

FIGURE 1

Filename: C:\US\Niagara Falls\Projects\564\12587681\Digital_Design\ACAD\Figures\AIRSPACE\12587681-FIG001.dwg
Plot Date: 28 September 2022 4:39 PM

Data Source

Figure 2
Dunn Landfill
Projected Landfill Gas Model

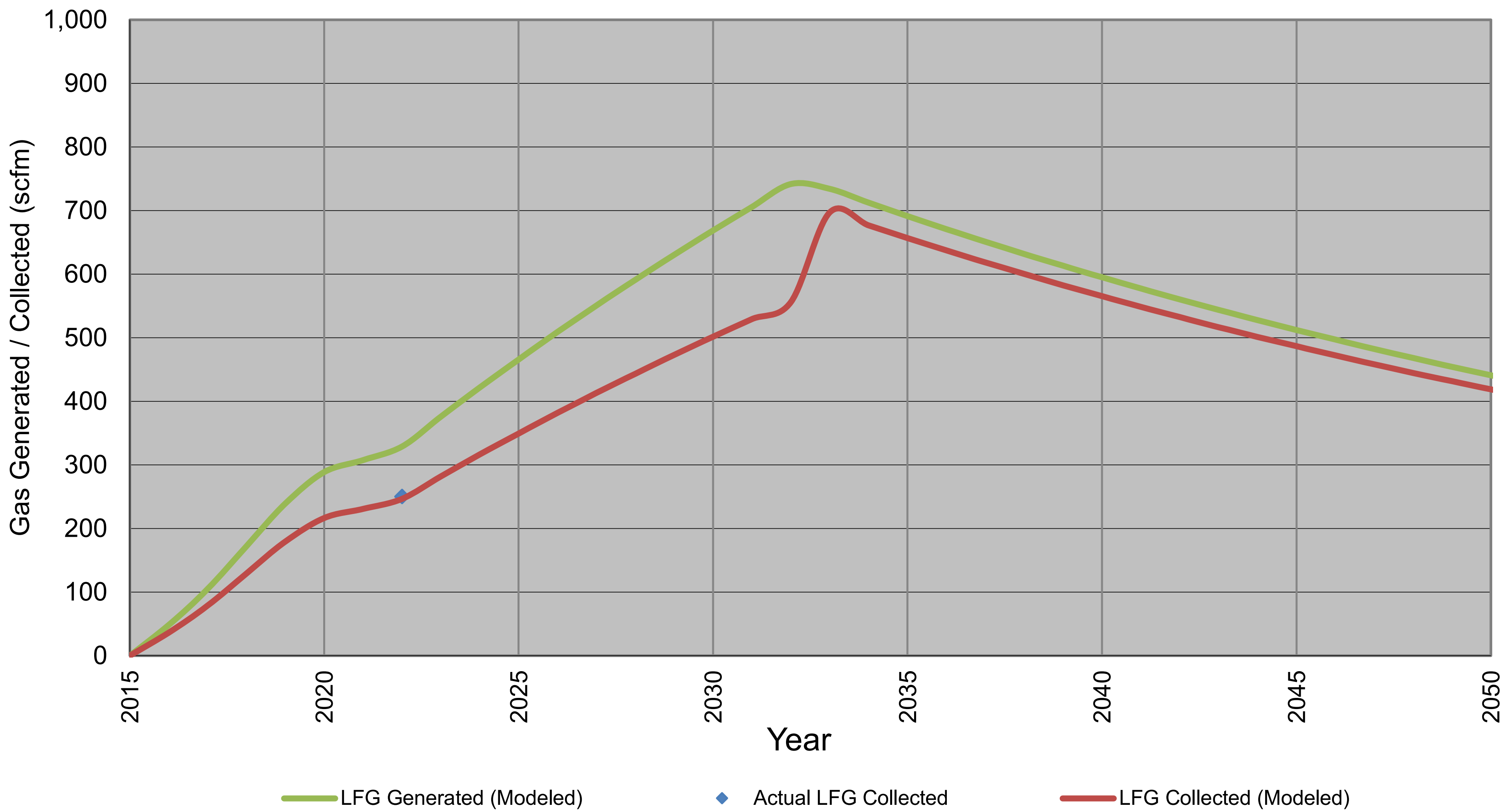

Table 1

Summary of Emissions Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Emission Summary

	Year 2023		Year 2030		Year 2032		Year 2050	
Emissions Source	Total CO_2 Equivalents (tons / year) [1]	Total HAPs (tons / year)	Total CO_2 Equivalents (tons / year) [1]	Total HAPs (tons / year)	Total CO_2 Equivalents (tons / year) [1]	Total HAPs (tons / year)	Total CO_2 Equivalents (tons / year) [1]	Total HAPs (tons / year)
Stationary Source Emissions	32,744	0.96	58,253	1.71	64,610	1.89	19,294	0.88
Non-Stationary (Off-Construction)	7,966	0.19	7,966	0.19	7,966	0.19	-	-
Non-Stationary (Construction)	9,491	0.22	9,491	0.22	9,491	0.22	-	-
Alternatives	Refer to Section 5.1, Table 5 and Table 6							
Off-site Fossil Fuel Consumption	44	-	44	-	44	-	44	-
Carbon Sequestration [2]	-5,143	-	-5,143	-	-5,143	-	-	-
Uncontrolled Emissions [4]	**111,356**	**2.16**	**184,454**	**3.53**	**202,671**	**3.87**	**110,090**	**2.06**
CLCPA Section 7(2) Total [3]	**50,246**		**75,755**		**82,112**		**19,338**	
CLCPA Section 7(3) Total [3]		**1.37**		**2.11**		**2.30**		**0.88**
% Reduction	**-**	**-**	**59**	**40**	**-**	**-**	**82**	**57**
CLPCA Target Reductions	**-**	**-**	**40**	**-**	**-**	**-**	**85**	**-**

Notes:

1. Expressed as total GHG emissions (includes sum of anthropogenic and biogenic portions). Refer to Table 2A, Table 2B, Table 2C and Table 2D for further breakdown.
2. Provided for informational purposes only (not included in Section 7(2) or Section 7(3) totals)
3. The totals presented here do not account for the emission reduction opportunities discussed in Section 5.3; actual totals may be significantly lower upon implementation of these opportunities. The totals also do not account for carbon sequestration. In addition, emissions would increase if waste is instead transported to a landfill facility located further away than Dunn Landfill (see Table 5 and Section 5.1 for further discussion of alternative facilities).
4. The uncontrolled emissions depicted in this table represent the PTE, or worst-case scenario; if the gas collection and control system is not utilized at the Dunn Facility. This PTE scenario does not represent normal operations at the Dunn Facility.

Table 2A

2030 Expected GHG Emissions from Stationary Sources
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Summary of Total Expected Facility Emissions (100-year GWP)

	Estimated Emissions - 2030 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	11,274	3,852	15,126	0.78
Utility Flare Combustion Emissions	397	15,224	15,621	0.93
Other Small Source Emissions	72	---	---	---
Totals	**11,742**	**19,077**	**30,747**	**1.71**

Summary of Total Expected Facility Emissions (20-year GWP)

	Estimated Emissions - 2030 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	37,880	3,852	41,732	0.78
Utility Flare Combustion Emissions	1,297	15,224	16,521	0.93
Other Small Source Emissions	72	---	---	---
Totals	**39,248**	**19,077**	**58,253**	**1.71**

Notes:

[1] Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO_2 eq).

The GHG emission values shown were initially calculated using 100-year global warming potential (GWP) values as provided in 6 NYCRR 231-13. The GHG emissions have since been updated using 20-year GWP values provided in 6 NYCRR 496.5.

Table 2B

2050 Expected GHG Emissions from Stationary Sources
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Summary of Total Expected Facility Emissions (100-year GWP)

	Estimated Emissions - 2050 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	1,486	508	1,994	0.10
Utility Flare Combustion Emissions	331	12,710	13,041	0.78
Other Small Source Emissions	72	---	---	---
Totals	**1,889**	**13,218**	**15,035**	**0.88**

Summary of Total Expected Facility Emissions (20-year GWP)

	Estimated Emissions - 2050 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	4,993	508	5,501	0.10
Utility Flare Combustion Emissions	1,083	12,710	13,793	0.78
Other Small Source Emissions	72	---	---	---
Totals	**6,148**	**13,218**	**19,294**	**0.88**

Notes:

1 Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO_2 eq).

The GHG emission values shown were initially calculated using 100-year global warming potential (GWP) values as provided in 40 CFR 98 Subpart A. The GHG emissions have since been updated using 20-year GWP values provided in 6 NYCRR 496.5.

Table 2C

2032 Expected GHG Emissions from Stationary Sources
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Summary of Total Expected Facility Emissions (100-year GWP)

	Estimated Emissions - 2032 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	12,504	4,273	16,777	0.86
Utility Flare Combustion Emissions	440	16,886	17,326	1.03
Other Small Source Emissions	72	---	---	---
Totals	**13,016**	**21,159**	**34,103**	**1.89**

Summary of Total Expected Facility Emissions (20-year GWP)

	Estimated Emissions - 2032 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	42,014	4,273	46,286	0.86
Utility Flare Combustion Emissions	1,438	16,886	18,324	1.03
Other Small Source Emissions	72	---	---	---
Totals	**43,524**	**21,159**	**64,610**	**1.89**

Notes:

1 Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO_2 eq).

The GHG emission values shown were initially calculated using 100-year global warming potential (GWP) values as provided in 6 NYCRR 231-13. The GHG emissions have since been updated using 20-year GWP values provided in 6 NYCRR 496.5.

Table 2D

2023 Expected GHG Emissions from Stationary Sources
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Summary of Total Expected Facility Emissions (100-year GWP)

	Estimated Emissions - 2023 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	6,337	2,165	8,502	0.44
Utility Flare Combustion Emissions	223	8,558	8,781	0.52
Other Small Source Emissions	72	---	---	---
Totals	**6,632**	**10,723**	**17,283**	**0.96**

Summary of Total Expected Facility Emissions (20-year GWP)

	Estimated Emissions - 2023 (TPY)			
Emission Source	**Anthropogenic GHG**	**Biogenic CO_2**	**Total GHG**	**Total HAP**
Landfill Fugitive Emissions	21,292	2,165	23,458	0.44
Utility Flare Combustion Emissions	729	8,558	9,287	0.52
Other Small Source Emissions	72	---	---	---
Totals	**22,093**	**10,723**	**32,744**	**0.96**

Notes:

[1] Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO_2 eq).

The GHG emission values shown were initially calculated using 100-year global warming potential (GWP) values as provided in 6 NYCRR 231-13. The GHG emissions have since been updated using 20-year GWP values provided in 6 NYCRR 496.5.

Table 3

Non-Stationary Sources (Off-Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Off-Construction Season (6 months out of year November 1 - April 30)

Direct Emissions From Non-Stationary Sources

Transport of Waste From Off-site to Active Area

Equipment Needed	Activity	Average Distance per Delivery [2] (miles)	Estimated Fuel Economy [4] (miles / gal)	Estimated Vehicle Trips [5] (trips)	Annual Fuel Consumption [All Units] (gal / year)	Idling Factor [6] (%)	Adjusted Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13] (tons / year)	Annual N_2O Emissions [13] (tons / year)	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Waste Dump Trucks	Transport Waste to Landfill Entrance	138.1	5.5	26,000	652,836	0	652,836	**7,344.8**	**0.30**	**0.06**	**7,385.6**	**0.17**
Waste Dump Trucks	Transport Waste from Entrance to Active Area	0.8	5.5	26,000	3,782	15	4,349	**48.9**	**0.00**	**0.00**	**49.2**	**0.00**
							Totals	**7,393.7**	**0.30**	**0.06**	**7,434.8**	**0.17**

Transport of Leachate From Landfill to Off-site WWTP

Equipment Needed	Activity	Average Distance per Delivery [2] (miles)	Estimated Fuel Economy [4] (miles / gal)	Estimated Vehicle Trips [5] (trips)	Annual Fuel Consumption [All Units] (gal / year)	Idling Factor [6] (%)	Adjusted Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13] (tons / year)	Annual N_2O Emissions [13] (tons / year)	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Leachate Tanker Trucks	Transport of Leachate to WWTP	3.7	5.5	2,000	1,345	0	1,345	**15.1**	**0.00**	**0.00**	**15.2**	**0.00**
							Totals	**15.1**	**0.00**	**0.00**	**15.2**	**0.00**

Waste at Active Area

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [4] (hours)	Off-Construction Operating Weeks [9] (weeks)	Fuel Consumption Per Unit [10] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13] (tons / year)	Annual N_2O Emissions [13] (tons / year)	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Compactor	Compact waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Compactor	Compact waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Dozer	Spread fresh waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Dozer	Spread fresh waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
							Totals	**398.8**	**0.02**	**0.00**	**401.0**	**0.01**

Daily Cover of Soils at Active Area

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [8] (hours)	Off-Construction Operating Weeks [9] (weeks)	Fuel Consumption Per Unit [12] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13]	Annual N_2O Emissions [13]	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Excavator	Strip daily cover	1	5	26	9.84	10	1,279	**14.4**	**0.00**	**0.00**	**14.5**	**0.00**
Haul Truck	Transport Soil to Landfill	1	5	26	5.52	6	717	**8.1**	**0.00**	**0.00**	**8.1**	**0.00**
Haul Truck	Transport Soil to Landfill	1	5	26	5.52	6	717	**8.1**	**0.00**	**0.00**	**8.1**	**0.00**
Dozer	Spread daily cover over fresh waste	1	5	26	6.20	6	806	**9.1**	**0.00**	**0.00**	**9.1**	**0.00**
							Totals	**39.6**	**0.00**	**0.00**	**39.8**	**0.00**

Table 3

Non-Stationary Sources (Off-Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Off-Construction Season (6 months out of year November 1 - April 30)

Direct Emissions From Non-Stationary Sources

Operation and Maintenance

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [8] (hours)	Off-Construction Operating Weeks [9] (weeks)	Fuel Consumption Per Unit [10] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13]	Annual N_2O Emissions [13]	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Sweeper	Sweep down roads	12	60	26	1.30	16	2,028	**22.8**	**0.00**	**0.00**	**22.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
							Totals	**60.6**	**0.00**	**0.00**	**62.7**	**0.00**

Indirect Emissions From Mobile Sources

Equipment Needed	Quantity of workers (# employees)	Operating Days per Week (days)	Total Operating Days [11] (days)	Average Distance to Site (miles)	Estimated Fuel Economy [12] (miles / gal)	Consumption [All Units] (gal / day)	Annual Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13]	Annual N_2O Emissions [13]	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Light Duty Vehicles	12	5	130	10	25.7	9.3	1,214	**11.7**	**0.00**	**0.00**	**12.4**	**0.00**
							Totals	**11.7**	**0.00**	**0.00**	**12.4**	**0.0**
							Grand Total	**7,919.6**	**0.3**	**0.1**	**7,965.8**	**0.2**

Notes:

[1] CO_2, CH_4 and N_2O emission factors for diesel fuel and gasoline combustion referenced from 40 CFR 98, Subpart C; HAP emission factor referenced from AP-42, Section 3.3, Table 3.3-2.
[2] Average distance from top 10 sources is calculated as 138.1 miles. Refer to Table 5.
[4] Based on an engineering estimate and an analysis of past fuel usage by this equipment; average of loaded and unloaded conditions
[5] Estimated Vehicle Trips = [26,000 trucks per year] x [0.5 (Half-year factor)] x [2 trips per delivery]
[6] Idling factor added to account for wait time, where vehicle is immobile.
[7] A workday consists of one 12-hour shift; however, daily cover operations only in the last hour of the workday
[8] Operating schedule is 5 days per week (12 hours/day Monday through Friday); Construction schedule is 6 days per week (11 hours/day Monday through Friday, 8 hours on Saturday)
[9] Off-Construction season is 26 weeks out of the calendar year
[10] Based on an engineering estimate and an analysis of past fuel usage by this equipment; since no fuel usage data is available for on-site light-duty trucks, an assumption of 1.0 gallons per hour of gasoline was utilized
[11] Total Operating Days = (5 days per week) x (26 off-construction weeks per year)
[12] For light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks), USEPA projects average real-world fuel economy for Model Year 2020 to be 25.7 miles per gallon
[13] Annual Emissions = (Annual Fuel Consumption [gal/yr]) x (Emission Factor from note 1 [lb per gallon of fuel combusted])
[14] 20-yr GWP values assumed to calculate CO2 equivalents: CO_2 = 1, CH_4 = 84, N_2O = 264.
[15] HAP emissions are calculated based on the HAP emission factor, multiplied by the annual amount of diesel consumed. The HAP emission factor for diesel is obtained by multiplying the heating value of diesel (0.1389 MMBTU per gallon) by the sur the individual speciated HAPs in Table 3.3-2 of USEPA AP-42, Section 3.3 (summed in units of lb/MMBTU). This is an “uncontrolled” emission factor, and is therefore conservative for estimating emissions.

Table 4

Non-Stationary Sources (Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Construction Season (6 months out of year May 1 - October 31)

Direct Emissions From Non-Stationary Sources

Transport of Waste From Off-site to Active Area

Equipment Needed	Activity	Average Distance per Delivery [2] (miles)	Estimated Fuel Economy [4] (miles / gal)	Estimated Vehicle Trips [5] (trips)	Annual Fuel Consumption [All Units] (gal / year)	Idling Factor [6] (%)	Adjusted Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Waste Dump Trucks	Transport Waste to Landfill Entrance	138.1	5.5	26,000	652,836	0	652,836	**7,344.8**	**0.30**	**0.06**	**7,385.6**	**0.17**
Waste Dump Trucks	Transport Waste from Entrance to Active Area	0.8	5.5	26,000	3,782	15	4,349	**48.9**	**0.00**	**0.00**	**49.2**	**0.00**
							Totals	**7,393.7**	**0.30**	**0.06**	**7,434.8**	**0.17**

Transport of Leachate From Landfill to Off-site WWTP

Equipment Needed	Activity	Average Distance per Delivery [2] (miles)	Estimated Fuel Economy [4] (miles / gal)	Estimated Vehicle Trips [5] (trips)	Annual Fuel Consumption [All Units] (gal / year)	Idling Factor [6] (%)	Adjusted Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [13] (tons / year)	Annual CH_4 Emissions [13] (tons / year)	Annual N_2O Emissions [13] (tons / year)	Total CO_2 Equivalents [14] (tons / year)	Total HAP Emissions [15] (tons / year)
Leachate Tanker Trucks	Transport of Leachate to WWTP	3.7	5.5	2,000	1,345	0	1,345	**15.1**	**0.00**	**0.00**	**15.2**	**0.00**
							Totals	**15.1**	**0.00**	**0.00**	**15.2**	**0.00**

Waste at Active Area

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [4] (hours)	Construction Operating Weeks [10] (weeks)	Fuel Consumption Per Unit [11] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Compactor	Compact waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Compactor	Compact waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Dozer	Spread fresh waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
Dozer	Spread fresh waste over Active Area	11	55	26	6.20	68	8,862	**99.7**	**0.00**	**0.00**	**100.3**	**0.00**
							Totals	**398.8**	**0.02**	**0.00**	**401.0**	**0.01**

Table 4

Non-Stationary Sources (Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Construction Season (6 months out of year May 1 - October 31)

Direct Emissions From Non-Stationary Sources

Transport of Waste From Off-site to Active Area

Daily Cover of Soils at Active Area

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [9] (hours)	Construction Operating Weeks [10] (weeks)	Fuel Consumption Per Unit [11] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Excavator	Strip daily cover	1	5	26	9.84	10	1,279	**14.4**	**0.00**	**0.00**	**14.5**	**0.00**
Haul Truck	Transport Soil to Landfill	1	5	26	5.52	6	717	**8.1**	**0.00**	**0.00**	**8.1**	**0.00**
Haul Truck	Transport Soil to Landfill	1	5	26	5.52	6	717	**8.1**	**0.00**	**0.00**	**8.1**	**0.00**
Dozer	Spread daily cover over fresh waste	1	5	26	6.20	6	806	**9.1**	**0.00**	**0.00**	**9.1**	**0.00**
							Totals	**39.6**	**0.00**	**0.00**	**39.8**	**0.00**

Operation and Maintenance

Equipment Needed	Activity	Daily Hours of Operation [7] (hours)	Weekly Hours of Operation [9] (hours)	Construction Operating Weeks [10] (weeks)	Fuel Consumption Per Unit [11] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Water Truck	Water down roads	12	60	26	4.77	57	7,440	**83.7**	**0.00**	**0.00**	**84.2**	**0.00**
Sweeper	Sweep down roads	12	60	26	1.30	16	2,028	**22.8**	**0.00**	**0.00**	**22.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
Light-Duty Vehicle	Maintenance and operations	6	30	26	1.0	6	780	**7.5**	**0.00**	**0.00**	**7.9**	**0.00**
							Totals	**144.3**	**0.01**	**0.00**	**146.8**	**0.00**

Table 4

Non-Stationary Sources (Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Construction Season (6 months out of year May 1 - October 31)

Direct Emissions From Non-Stationary Sources

Transport of Waste From Off-site to Active Area

Cell Construction & Mining of Materials for Onsite Use

Equipment Needed	Activity	Daily Hours of Operation [8] (hours)	Weekly Hours of Operation [9] (hours)	Construction Operating Weeks [10] (weeks)	Fuel Consumption Per Unit [11] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Excavator	Excavate areas for cell construction	10	57	26	9.84	98	14,584	**164.1**	**0.01**	**0.00**	**165.0**	**0.00**
Excavator	Excavate areas for cell construction	10	57	26	9.84	98	14,584	**164.1**	**0.01**	**0.00**	**165.0**	**0.00**
Excavator	Excavate areas for cell construction	10	57	26	9.84	98	14,584	**164.1**	**0.01**	**0.00**	**165.0**	**0.00**
Haul Truck	Transport Soil	5.0	32	26	5.52	28	4,589	**51.6**	**0.00**	**0.00**	**51.9**	**0.00**
Haul Truck	Transport Soil	5.0	32	26	5.52	28	4,589	**51.6**	**0.00**	**0.00**	**51.9**	**0.00**
Haul Truck	Transport Soil	5.0	32	26	5.52	28	4,589	**51.6**	**0.00**	**0.00**	**51.9**	**0.00**
Dozer	Spread soil over areas for cell construction	10	57	26	6.20	62	9,184	**103.3**	**0.00**	**0.00**	**103.9**	**0.00**
Dozer	Spread soil over areas for cell construction	10	57	26	6.20	62	9,184	**103.3**	**0.00**	**0.00**	**103.9**	**0.00**
Roller	Smooth and compact soil	10	57	26	4.77	48	7,068	**79.5**	**0.00**	**0.00**	**80.0**	**0.00**
							Totals	**933.3**	**0.04**	**0.01**	**938.5**	**0.02**

Final Cover Construction

Equipment Needed	Activity	Daily Hours of Operation [8] (hours)	Weekly Hours of Operation [9] (hours)	Construction Operating Weeks [10] (weeks)	Fuel Consumption Per Unit [11] (gal / hr)	Daily Fuel Consumption [All Units] (gal / day)	Total Fuel Consumption [All Units] (gallons)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Excavator	Excavate areas for cover construction	10	57	26	9.84	98	14,584	**164.1**	**0.01**	**0.00**	**165.0**	**0.00**
Haul Truck	Transport Soil	5.0	25	26	5.52	28	3,585	**40.3**	**0.00**	**0.00**	**40.6**	**0.00**
Haul Truck	Transport Soil	5.0	25	26	5.52	28	3,585	**40.3**	**0.00**	**0.00**	**40.6**	**0.00**
Dozer	Spread soil over areas as cover	10	50	26	6.20	62	8,057	**90.6**	**0.00**	**0.00**	**91.1**	**0.00**
Dozer	Spread soil over areas as cover	10	50	26	6.20	62	8,057	**90.6**	**0.00**	**0.00**	**91.1**	**0.00**
Roller	Smooth and compact soil	10	50	26	4.77	48	6,200	**69.8**	**0.00**	**0.00**	**70.1**	**0.00**
							Totals	**495.8**	**0.02**	**0.00**	**498.5**	**0.01**

Table 4

Non-Stationary Sources (Construction Season)
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	CO_2	CH_4	N_2O	HAP	
Emissions (Diesel Fuel) [1] =	22.5	0.001	0.0002	0.0005	lb / gallon of diesel combusted
Emissions (Motor Gasoline) [1] =	19.4	0.001	0.0002	0.0005	lb / gallon of gasoline combusted

Construction Season (6 months out of year May 1 - October 31)

Direct Emissions From Non-Stationary Sources

Transport of Waste From Off-site to Active Area

Indirect Emissions From Mobile Sources

Equipment Needed	Quantity of workers (# employees)	Operating Days per Week (days)	Total Operating Days [12] (days)	Average Distance to Site (miles)	Estimated Fuel Economy [13] (miles / gal)	Daily Fuel Consumption [All Units] (gal / day)	Annual Fuel Consumption [All Units] (gal / year)	Annual CO_2 Emissions [14] (tons / year)	Annual CH_4 Emissions [14] (tons / year)	Annual N_2O Emissions [14] (tons / year)	Total CO_2 Equivalents [15] (tons / year)	Total HAP Emissions [16] (tons / year)
Light Duty Vehicles	16	5	130	10	25.7	12.5	1,619	**15.7**	**0.00**	**0.00**	**16.5**	**0.00**
							Totals	**15.7**	**0.00**	**0.00**	**16.5**	**0.00**
							Grand Total	**9,436.3**	**0.4**	**0.1**	**9,491.1**	**0.2**

Notes:

1 CO_2, CH_4 and N_2O emission factors for diesel fuel and gasoline combustion referenced from 40 CFR 98, Subpart C; HAP emission factor referenced from AP-42, Section 3.3, Table 3.3-2.
2 Average distance from top 10 sources is calculated as 138.1 miles. Refer to Table 5.
4 Based on an engineering estimate and an analysis of past fuel usage by this equipment; average of loaded and unloaded conditions
5 Estimated Vehicle Trips = [26,000 trucks per year] x [0.5 (Half-year factor)] x [2 trips per delivery]
6 Idling factor added to account for wait time, where vehicle is immobile.
7 A workday consists of a 12-hour shift; however, daily cover operations only in the last hour of the workday
8 A workday consists of a 11-hour shift Mondays through Friday and an 8-hour shift on Saturdays; however, 1-hour is deducted each day for lunch hour break.
9 Operating schedule is 5 days per week (12 hours/day Monday through Friday); Construction schedule is 6 days per week (11 hours/day Monday through Friday, 8 hours on Saturday)
10 Construction season is 26 weeks out of the calendar year
11 Based on an engineering estimate and an analysis of past fuel usage by this equipment; since no fuel usage data is available for on-site light-duty trucks, an assumption of 1.0 gallons per hour of gasoline was utilized
12 Total Operating Days = (5 days per week) x (26 construction weeks per year)
13 For light-duty vehicles (cars, minivans, sport utility vehicles, and pickup trucks), USEPA projects average real-world fuel economy for Model Year 2020 to be 25.7 miles per gallon
14 Annual Emissions = (Annual Fuel Consumption [gal/yr]) x (Emission Factor from note 1 [lb per gallon of fuel combusted])
15 20-yr GWP values assumed to calculate CO2 equivalents: CO_2 = 1, CH_4 = 84, N_2O = 264.
16 HAP emissions are calculated based on the HAP emission factor, multiplied by the annual amount of diesel consumed. The HAP emission factor for diesel is obtained by multiplying the heating value of diesel (0.1389 MMBTU per gallon) by the sum of the individual speciated HAPs in Table 3.3-2 of USEPA AP-42, Section 3.3 (summed in units of lb/MMBTU).This is an “uncontrolled” emission factor, and is therefore conservative for estimating emissions.

Table 5

Alternatives Evaluation - Waste Transport
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

			Total Hauling Distance From Waste Origin to Alternative Sites in New York State											
Facility Name	**Address**	**Amount of Waste Contributed in 2021 [1]**	**Dunn Landfill**	**Lake George C&D Debris Landfill**	**Burton Clark C&D**	**Thurman C&D Debris Landfill**	**Delaware County SWMF**	**North Elba C&D Landfill**	**Honeywell/ Camillus Bed #15 C&D**	**Chemung County Area 3 C&D Landfill**	**Hakes C&D Disposal Inc**	**Voorhees Hill Road C&D Landfill**	**L.C. Whitford Co. C&D Landfill**	**Carroll C&D Management Facility**
		tons	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*	*miles*
James G Grant CO	28 Wolcott St. Readville, MA 02137	45,220.42	168.0	228.0	256.0	237.0	265.0	306.0	312.0	361.0	386.0	433.0	434.0	522.0
ReEnergy Roxbury	101 Gerard Street Roxbury, MA 02119	31,164.29	168.0	227.0	256.0	237.0	265.0	306.0	311.0	360.0	385.0	432.0	433.0	522.0
AMEC Carting LLC	1 Crescent Street Norwalk, CT 06854	28,231.65	128.0	187.0	158.0	197.0	153.0	265.0	270.0	249.0	274.0	321.0	322.0	410.0
K&W Materials & Recycling	138 Palmer Avenue West Springfield, MA 01089	18,736.04	85.5	145.0	173.0	154.0	182.0	223.0	229.0	278.0	303.0	350.0	351.0	439.0
JL Seaman	3 Merritt Street Norwalk, CT 06851	18,531.22	130.0	189.0	160.0	199.0	156.0	268.0	273.0	251.0	276.0	323.0	324.0	413.0
Queen City Recycle Center Inc	19 Cliff Street New Rochelle, NY 10801	9,836.27	143.0	197.0	171.0	206.0	141.0	278.0	258.0	237.0	262.0	308.0	310.0	398.0
North Smithfield Transfer	North Smithfield, RI	8,132.22	150.0	208.0	236.0	217.0	245.0	286.0	291.0	341.0	366.0	413.0	413.0	502.0
United Material Management	896 Main Street Holyoke, MA 01040	7,897.91	128.0	187.0	216.0	197.0	225.0	266.0	271.0	320.0	346.0	392.0	393.0	482.0
Direct Haul	Albany, NY	7,295.40	2.3	66.3	89.7	70.7	98.6	140.0	149.0	194.0	219.0	266.0	267.0	356.0
Empire Recycling	538 Stewart Avenue Brooklyn, NY 11222	5,397.22	151.0	211.0	151.0	220.0	148.0	291.0	265.0	244.0	270.0	316.0	318.0	359.0
		Weighted Average [4]	**138.1**	**197.4**	**205.0**	**206.6**	**208.0**	**275.7**	**279.0**	**303.7**	**328.8**	**375.6**	**376.7**	**463.7**
		Waste Transport GHG Emissions [2]	**14,771**	**21,103**	**21,925**	**22,096**	**22,244**	**29,483**	**29,828**	**32,472**	**35,153**	**40,165**	**40,276**	**49,579**
		Increase in Waste Transport GHG Emissions	**-**	**6,332**	**7,153**	**7,325**	**7,473**	**14,712**	**15,057**	**17,701**	**20,382**	**25,394**	**25,505**	**34,808**
		Waste Transport HAP Emissions [3]	**0.34**	**0.49**	**0.51**	**0.51**	**0.52**	**0.69**	**0.69**	**0.76**	**0.82**	**0.93**	**0.94**	**1.15**
		Increase in Waste Transport HAP Emissions	**-**	**0.15**	**0.17**	**0.17**	**0.17**	**0.34**	**0.35**	**0.41**	**0.47**	**0.59**	**0.59**	**0.81**

Notes:

1 Waste Accepted from top 10 contributing facilities during 2021 (based on 6 NYCRR Part 360 Annual Report); accounts for 180,443 tons of 214,101 total tons (or 84% of total)

2 Subsequent CO_2 Equivalent emissions for hauling waste from origin facility to waste disposal options; calculations do not account for emissions spent onsite while traveling/waiting for dumping of waste.

3 Subsequent HAP Equivalent emissions for hauling waste from origin facility to waste disposal options; calculations do not account for emissions spent onsite while traveling/waiting for dumping of waste.

4 Calculated as the sum of [Amount of waste contributed in 2021] x [Distance to Dunn LF] for each facility divided by total waste contributed for all facilities shown.

Table 6

Site Capacity Evaluation of Alternatives
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

	Constructed Areas			Still to be Constructed						
Facility Name	**Remaining Site Life**		**Remaining Capacity**	**Remaining Site Life**		**Remaining Capacity**	**Total Remaining Capacity**	**Waste Landfilled in 2020**	**Estimated Future Waste Landfilled**	**Gas Collection?**
	years	months	cy	years	months	cy	cy	tpy	tpy	Y/N/unknown
Dunn Landfill	0	8	235,900	11	3	7,505,000	**7,740,900**	193,095	400,000	Y
Lake George C&D Debris Landfill	7	0	4,500	15	0	12,000	**16,500**	82	200	Unknown
Burton Clark C&D	19	3	96,478	NA	NA	0	**96,478**	360	3,750	Unknown
Delaware County C&D Landfill	1	6	14,254	NA	NA	0	**14,254**	4,361	6,750	N [1]
North Elba C&D Landfill	12	0	26,231	NA	NA	0	**26,231**	281	500	Unknown
Honeywell/Camillus Bed #15 C&D	3	1	458,232	11	1	1,636,923	**2,095,155**	74,500	95,000	Unknown
Chemung County Area 3 C&D Landfill	5	0	191,795	NA	NA	0	**191,795**	9,002	20,500	Unknown
Hakes C&D Disposal Inc	1	5	966,997	2	7	1,753,500	**2,720,497**	209,663	466,000	Unknown
Voorhees Hill Road C&D Landfill [3]	-	-	14,000	NA	NA	0	**14,000**	0	-	Unknown
L.C. Whitford Co. C&D Landfill	4	11	7,775	16	0	32,000	**39,775**	0	1,500	Unknown
Carroll C&D Management Facility [4]	-	-	-	-	-	-	**-**	0	-	Unknown

Notes:

[1] - C&D is used as AOC material in Cell 6 of MSW Facility; Cell 6 does not currently contain gas collection system.
[2] - If future TPY value was not provided in Part 360 report, a waste density of 0.75 tons per cubic yard was assumed.
[3] - Part 360 Report for Voorhees Landfill indicates 14,000 cubic yards of airspace left but no other information with regards to remianing site life or future waste intake (in TPY).
[4] - Part 360 Report for Carroll C&D Landfill does not provide any information with regards to remianing capacity, remaining site life or future waste intake (in TPY).

Table 7

Off-Site Fossil Fuel Consumption
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Energy	Yearly Elec Use [1]	NYUP (NPCC Upstate NY)		GHG Emissions (Off-Site Fossil Fuel Usage)		
	kWh	Source	%	Offsets	lb/year	tpy
Electricity Generated	115,160	Oil	0.6	CO2e	27,005	14
		Coal	0.8			
		Gas	25.9			

Energy	Amount Imported (MMBTU/yr) [2]	Emission Factor (g / MMBTU)	GHG Emissions (Off-Site Fossil Fuel Usage)		
			GHG Emission Offsets	lb/year	tpy
Propane	1,051	26,648	CO2e	61,756	31
			Total CO2 Equ.	88,761	44

Notes:

1 The yearly electrical use for the facility is taken from meter readings provided by National Grid for the period of January 2021 through December 2021.
https://www.epa.gov/egrid/power-profiler#/NYUP

2 Propane usage is mostly used for heating purposes at the Dunn Facility and is thus only used seasonally. It is not expected to change significantly on an average annual basis; therefore, the potential-to-emit (PTE) is not representative of current or future conditions. For completeness, the PTE for propane has been calculated here for conservative purposes.

Table 8

Carbon Sequestration
Greenhouse Gas and HAP Emission Calculations
Dunn Facility
Waste Connections

Types of Solid Waste	Year Totals	Lignin Content
	Tons	%
Construction & Demolition Debris	214,101	1%

Waste	EPA 2018 Waste Data [4]		Lignin Content		Carbon	CO2 equiv.	
	C&D %	Lignin %	Tons	kg	Mol	kg	Tons
Wood Products	6.8	15	2,184	1,981,138	106,020,202	4,665,949	5,143
					Grand Total	4,665,949	5,143

Notes:

1 It is assumed that the paper/paperboard production process does not remove the lignin

2 Lignin chemical formula is C81H92O28. Molecular weight of Lignin is 1513.6 g/mol

3 It is assumed that no lignin decomposes anaerobically and all the carbon that would have decomposed into CO2 will be sequestered.

4 EPA's *'Advancing Sustainable Materials Management: 2018 Fact Sheet'* (December 2020)

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2949025/
https://www.sciencedirect.com/topics/chemical-engineering/lignin
https://academic.oup.com/femsre/article/41/6/941/4569254
https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf
https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data
https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/yard-trimmings-material-specific-data
https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/wood-material-specific-data

Attachment A

Methane Generation Model

Attachment A

Methane Generation Model - 2030
Construction and Demolition Waste
Dunn Facility

Landfill Year Open:	2015	
Year:	2030	
MCF:	1.0	(default value)
DOC:	0.08	(C&D)
DOC_F:	0.5	(default value)
F:	0.27	(approximate CH_4 concentration at Dunn LF)
k:	0.03	yr^{-1} (average precipitation = 20-40 in/yr)
Calculated L_o	0.0144	megagrams CH_4 / megagram waste

Year	C&D Waste Disposed (metric tons of waste disposed)	Contribution to 2030 Generation (metric tons of CH_4 Generated)
2015	306,889	86
2016	370,113	107
2017	451,027	134
2018	460,873	141
2019	361,351	114
2020	175,175	57
2021	194,231	65
2022	362,878	125
2023	362,878	129
2024	362,878	133
2025	362,878	137
2026	362,878	141
2027	362,878	145
2028	362,878	150
2029	362,878	154

Total 2030 CH_4 Generated (metric tons):	**1,818**
Total 2030 CH_4 Generated (scfm):	**180**
Total 2030 CO_2 Generated (scfm):	**487**
Total 2030 Gas Generated (scfm):	**668**

Attachment A

Methane Generation Model - 2050
Construction and Demolition Waste
Dunn Facility

Landfill Year Open:	2015	
Year:	2050	
MCF:	1.0	(default value)
DOC:	0.08	(C&D)
DOC_F:	0.5	(default value)
F:	0.27	(approximate CH_4 concentration at Dunn LF)
k:	0.03	yr^{-1} (average precipitation = 20-40 in/yr)
Calculated L_o	0.0144	megagrams CH_4 / megagram waste

Year	C&D Waste Disposed (metric tons of waste disposed)	Contribution to 2050 Generation (metric tons of CH_4 Generated)
2015	306,889	47
2016	370,113	59
2017	451,027	73
2018	460,873	77
2019	361,351	63
2020	175,175	31
2021	194,231	36
2022	362,878	69
2023	362,878	71
2024	362,878	73
2025	362,878	75
2026	362,878	77
2027	362,878	80
2028	362,878	82
2029	362,878	85
2030	362,878	87
2031	362,878	90
2032	90,719	23

Total 2050 CH_4 Generated (metric tons):	**1,198**
Total 2050 CH_4 Generated (scfm):	**119**
Total 2050 CO_2 Generated (scfm):	**321**
Total 2050 Gas Generated (scfm):	**440**

Attachment A

Methane Generation Model - 2032
Construction and Demolition Waste
Dunn Facility

Landfill Year Open:	2015	
Year:	2032	
MCF:	1.0	(default value)
DOC:	0.08	(C&D)
DOC_F:	0.5	(default value)
F:	0.27	(approximate CH_4 concentration at Dunn LF)
k:	0.03	yr^{-1} (average precipitation = 20-40 in/yr)
Calculated L_o	0.0144	megagrams CH_4 / megagram waste

Year	C&D Waste Disposed (metric tons of waste disposed)	Contribution to 2050 Generation (metric tons of CH_4 Generated)
2015	306,889	81
2016	370,113	100
2017	451,027	126
2018	460,873	133
2019	361,351	107
2020	175,175	54
2021	194,231	61
2022	362,878	118
2023	362,878	121
2024	362,878	125
2025	362,878	129
2026	362,878	133
2027	362,878	137
2028	362,878	141
2029	362,878	145
2030	362,878	150
2031	362,878	154

Total 2032 CH_4 Generated (metric tons):	**2,017**
Total 2032 CH_4 Generated (scfm):	**200**
Total 2032 CO_2 Generated (scfm):	**541**
Total 2032 Gas Generated (scfm):	**741**

Attachment A

Methane Generation Model - 2023
Construction and Demolition Waste
Dunn Facility

Landfill Year Open:	2015	
Year:	2023	
MCF:	1.0	(default value)
DOC:	0.08	(C&D)
DOC_F:	0.5	(default value)
F:	0.27	(approximate CH_4 concentration at Dunn LF)
k:	0.03	yr^{-1} (average precipitation = 20-40 in/yr)
Calculated L_o	0.0144	megagrams CH_4 / megagram waste

Year	C&D Waste Disposed (metric tons of waste disposed)	Contribution to 2023 Generation (metric tons of CH_4 Generated)
2015	306,889	106
2016	370,113	132
2017	451,027	165
2018	460,873	174
2019	361,351	141
2020	175,175	70
2021	194,231	80
2022	362,878	154

Total 2023 CH_4 Generated (metric tons):	**1,022**
Total 2023 CH_4 Generated (scfm):	**101**
Total 2023 CO_2 Generated (scfm):	**274**
Total 2023 Gas Generated (scfm):	**375**

Attachment B

Dunn Landfill Final Emissions

Expected 20yr GWP 2030

Table B.1

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Actual Emissions - 2030

Emission Source	2030 Emissions (tons/year)			
	HAPs	Hi-HAP[1]	Anthropogenic GHG[2]	Biogenic CO_2 [2]
Landfill Fugitive Emissions	0.8	---	37,880	3,852
Utility Flare Combustion Emissions	0.9	0.9	1,297	15,224
Other Small Combustion Sources	---	---	72	---
Totals	**1.7**	**0.9**	**39,248**	**19,077**

Notes:

1 High HAP is HCl

2 Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO_2 eq) using 20-year GWP values stated in 6 NYCRR 496.5.

Table B.2

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare Greenhouse Gas Emissions - 2030

LFG to Utility Flare = 501 cfm

	Operating Hours	Estimated Flare Emissions (TPY): Combustion CO_2	Combustion CH_4	Combustion N_2O	Escape CH_4	Collected CO_2	Biogenic CO_2	Anthropogenic GHG
Utility 750 CFM	8,760	4,079	0.3	0.0	15.0	11,145	15,224	1,297
	Total Emissions (TPY)	4,079	0.3	0.0	15.0	11,145	15,224	1,297
	Total Emissions (lb/yr)	8.16E+06	5.01E+02	9.87E+01	30,063.3	2.23E+07	3.04E+07	2.59E+06

Flare Combustion Factors

	Pounds per Hour of Operation: CO_2	CH_4	N_2O
Utility 750 CFM	931.3	0.1	0.0

Notes:

Combustion CO_2	Combustion emission factor referenced from Table C-1 of 40 CFR Part 98, Subpart C
Combustion CH_4	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Combustion N_2O	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Escape CH_4	Collected methane that escapes destruction in flare (1% of methane processed)
Collected CO_2	Portion of collected LFG that already contains CO_2 (73% of collected LFG)
Biogenic CO_2	Sum of Combustion CO_2 and Collected CO_2
Anthropogenic GHG	Sum of Combustion CH_4, Combustion N_2O and Escape CH_4 expressed as tons of CO_2 equivalents

Emission Factor Development

Enclosed Flares

	EF (kg/MMBtu)	GWP (20 year)
CO_2	52.07	1
CH_4	3.20E-03	84
N_2O	6.30E-04	264

Heating value[1]	270	Btu/scf
LFG CH_4 Concentration	27	%
CH_4 Destruction Efficiency[2]	99	% (manufacturer guarantee DE for LFG Enclosed Flares)
CH_4 Density	0.0423	pounds per cubic foot (referenced from 40 CFR Part 98, Subpart HH)
CO_2 concentration	73	%
CO_2 density	0.116	pounds per cubic foot

LFG Data:

Heat Input (Utility Flare):	8.1	MMBtu/hr
LFG combusted (Utility Flare):	501	cfm

[1] AP-42 Chapter 1.4 lists the heating value of methane as a range from 950 to 1,050 BTU/SCF, the application used 1,000 BTU/scf in the calculations. Gas with a 27% methane concentration would be 27% of this value, or 270 BTU/scf.

[2] A flare destruction efficiency of 99%, referenced from 40 CFR 98, Subpart HH, was used in the calculations. This means that 1% of the gas collected will “escape” destruction. This flare destruction efficiency is conservation because destruction efficiencies are typically measured to be higher than 99% for flares.

Table B.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2030

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	501	cfm
LFG Collected to Flares =	501	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	lb/yr	TPY	VOC (TPY)	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.002	21.79	0.01	1.33	98.0%	0.0000	0.44	0.00	0.00	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.007	60.36	0.03	3.67	98.0%	0.0001	1.21	0.00	0.00	0.00
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.61	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane	X		187.37	0.0672	0.001	8.46	0.00	0.51	98.0%	0.0000	0.17	0.00	0.00	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.002	14.17	0.01	0.86	98.0%	0.0000	0.28	0.00	0.00	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.016	138.37	0.07	8.42	98.0%	0.0003	2.77	0.00	0.00	0.00
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.001	10.43	0.01	0.63	98.0%	0.0000	0.21	0.00	0.00	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.003	29.00	0.01	1.76	98.0%	0.0001	0.58	0.00	0.00	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.67	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.013	110.69	0.06	6.73	98.0%	0.0003	2.21	0.00	0.00	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.61	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethar	X		170.92	0.106	0.001	12.18	0.01	0.74	98.0%	0.0000	0.24	0.00	0.00	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.001	10.58	0.01	0.64	98.0%	0.0000	0.21	0.00	0.00	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.085	742.87	0.37	45.20	98.0%	0.0017	14.86	0.01	0.01	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	3.95	0.00	0.24	98.0%	0.0000	0.08	0.00	0.00	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	1.80	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.006	50.33	0.03	3.06	98.0%	0.0001	1.01	0.00	0.00	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.001	6.04	0.00	0.37	98.0%	0.0000	0.12	0.00	0.00	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.001	5.91	0.00	0.36	98.0%	0.0000	0.12	0.00	0.00	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.003	23.64	0.01	1.44	98.0%	0.0001	0.47	0.00	0.00	
123911	1,4-Dioxane (1,4-Diethylene dioxide	X	X	88.11	0.00829	0.000	0.49	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.007	57.51	0.03	3.50	98.0%	0.0001	1.15	0.00	0.00	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.005	41.49	0.02	2.52	98.0%	0.0001	0.83	0.00	0.00	
622968	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.989	0.009	79.90	0.04	4.86	98.0%	0.0002	1.60	0.00	0.00	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.579	0.005	46.78	0.02	2.85	98.0%	0.0001	0.94	0.00	0.00	
592767	1-Heptene	X		98.19	0.625	0.005	41.25	0.02	2.51	98.0%	0.0001	0.83	0.00	0.00	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.001	5.02	0.00	0.31	98.0%	0.0000	0.10	0.00	0.00	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	1.47	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	1.39	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
109671	1-Pentene	X		70.13	0.22	0.001	10.37	0.01	0.63	98.0%	0.0000	0.21	0.00	0.00	
107039	1-Propanethiol (n-Propyl mercaptan	X		76.16	0.125	0.001	6.40	0.00	0.39	98.0%	0.0000	0.13	0.00	0.00	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.62	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.005	47.15	0.02	2.87	98.0%	0.0001	0.94	0.00	0.00	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.002	13.45	0.01	0.82	98.0%	0.0000	0.27	0.00	0.00	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.001	9.04	0.00	0.55	98.0%	0.0000	0.18	0.00	0.00	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	4.10	0.00	0.25	98.0%	0.0000	0.08	0.00	0.00	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	1.33	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.003	23.96	0.01	1.46	98.0%	0.0001	0.48	0.00	0.00	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.001	9.67	0.00	0.59	98.0%	0.0000	0.19	0.00	0.00	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.002	20.88	0.01	1.27	98.0%	0.0000	0.42	0.00	0.00	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.002	17.05	0.01	1.04	98.0%	0.0000	0.34	0.00	0.00	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.001	6.74	0.00	0.41	98.0%	0.0000	0.13	0.00	0.00	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.001	12.75	0.01	0.78	98.0%	0.0000	0.25	0.00	0.00	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.001	4.86	0.00	0.30	98.0%	0.0000	0.10	0.00	0.00	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.022	194.38	0.10	11.83	98.0%	0.0004	3.89	0.00	0.00	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	1.00	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
872559	2-Ethylthiophene	X		112.19	0.0629	0.001	4.74	0.00	0.29	98.0%	0.0000	0.09	0.00	0.00	
611143	2-Ethyltoluene	X		120.19	0.323	0.003	26.10	0.01	1.59	98.0%	0.0001	0.52	0.00	0.00	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.005	41.27	0.02	2.51	98.0%	0.0001	0.83	0.00	0.00	
563462	2-Methyl-1-butene	X		70.13	0.179	0.001	8.44	0.00	0.51	98.0%	0.0000	0.17	0.00	0.00	
513440	2-Methyl-1-propanethiol (Isobutyl me	X		90.19	0.17	0.001	10.31	0.01	0.63	98.0%	0.0000	0.21	0.00	0.00	
513359	2-Methyl-2-butene	X		70.13	0.303	0.002	14.28	0.01	0.87	98.0%	0.0000	0.29	0.00	0.00	
75661	2-Methyl-2-propanethiol (tert-Butylm	X		90.19	0.325	0.002	19.70	0.01	1.20	98.0%	0.0000	0.39	0.00	0.00	
78784	2-Methylbutane	X		72.15	2.26	0.013	109.61	0.05	6.67	98.0%	0.0003	2.19	0.00	0.00	
592278	2-Methylheptane	X		114.23	0.716	0.006	54.98	0.03	3.35	98.0%	0.0001	1.10	0.00	0.00	
591764	2-Methylhexane	X		100.2	0.816	0.006	54.96	0.03	3.34	98.0%	0.0001	1.10	0.00	0.00	
107835	2-Methylpentane	X		86.18	0.688	0.005	39.86	0.02	2.43	98.0%	0.0001	0.80	0.00	0.00	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.008	72.72	0.04	4.42	98.0%	0.0002	1.45	0.00	0.00	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.009	75.08	0.04	4.57	98.0%	0.0002	1.50	0.00	0.00	
620144	3-Ethyltoluene	X		120.19	0.78	0.007	63.02	0.03	3.83	98.0%	0.0001	1.26	0.00	0.00	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.40	0.00	0.02	98.0%	0.0000	0.01	0.00	0.00	
589811	3-Methylheptane	X		114.23	0.763	0.007	58.59	0.03	3.56	98.0%	0.0001	1.17	0.00	0.00	
589344	3-Methylhexane	X		100.2	1.13	0.009	76.11	0.04	4.63	98.0%	0.0002	1.52	0.00	0.00	
96140	3-Methylpentane	X		86.18	0.74	0.005	42.87	0.02	2.61	98.0%	0.0001	0.86	0.00	0.00	
616444	3-Methylthiophene	X		98.17	0.0925	0.001	6.10	0.00	0.37	98.0%	0.0000	0.12	0.00	0.00	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	1.32	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.007	59.45	0.03	3.62	98.0%	0.0001	1.19	0.00	0.00	0.00
589537	4-Methylheptane	X		114.23	0.249	0.002	19.12	0.01	1.16	98.0%	0.0000	0.38	0.00	0.00	
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	2.29	0.00	0.14	98.0%	0.0000	0.05	0.00	0.00	0.00
67641	Acetone			58.08	6.7	0.030	261.58	0.13	15.92	98.0%	0.0006	5.23	0.00		
75058	Acetonitrile	X	X	41.05	0.556	0.002	15.34	0.01	0.93	98.0%	0.0000	0.31	0.00	0.00	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.71	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
71432	Benzene	X	X	78.11	2.4	0.014	126.02	0.06	7.67	98.0%	0.0003	2.52	0.00	0.00	0.00

Table B.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2030

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	501	cfm
LFG Collected to Flares =	501	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	1.54	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.97	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	1.34	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	0.00
106978	Butane	X		58.12	6.22	0.028	243.01	0.12	14.79	98.0%	0.0006	4.86	0.00	0.00	
75150	Carbon disulfide	X	X	76.14	0.147	0.001	7.52	0.00	0.46	98.0%	0.0000	0.15	0.00	0.00	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.83	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.001	8.93	0.00	0.54	98.0%	0.0000	0.18	0.00	0.00	
463581	Carbonyl sulfide (Carbon oxysulfide	X	X	60.08	0.122	0.001	4.93	0.00	0.30	98.0%	0.0000	0.10	0.00	0.00	0.00
108907	Chlorobenzene	X		112.56	0.484	0.004	36.62	0.02	2.23	98.0%	0.0001	0.73	0.00	0.00	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.005	46.27	0.02	2.82	98.0%	0.0001	0.93	0.00	0.00	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.020	171.29	0.09	10.42	98.0%	0.0004	3.43	0.00	0.00	0.00
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.001	8.28	0.00	0.50	98.0%	0.0000	0.17	0.00	0.00	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.009	80.80	0.04	4.92	98.0%	0.0002	1.62	0.00	0.00	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.001	6.11	0.00	0.37	98.0%	0.0000	0.12	0.00	0.00	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.23	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.004	37.79	0.02	2.30	98.0%	0.0001	0.76	0.00	0.00	
24293 / 220703(	cis-1,4-Dimethylcyclohexane / trans-	X		112.21	0.248	0.002	18.71	0.01	1.14	98.0%	0.0000	0.37	0.00	0.00	
590181	cis-2-Butene	X		56.11	0.105	0.000	3.96	0.00	0.24	98.0%	0.0000	0.08	0.00	0.00	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	1.62	0.00	0.10	98.0%	0.0000	0.03	0.00	0.00	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.97	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
7642048	cis-2-Octene	X		112.21	0.22	0.002	16.59	0.01	1.01	98.0%	0.0000	0.33	0.00	0.00	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	2.26	0.00	0.14	98.0%	0.0000	0.05	0.00	0.00	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	1.01	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
110827	Cyclohexane	X		84.16	1.01	0.007	57.14	0.03	3.48	98.0%	0.0001	1.14	0.00	0.00	
110838	Cyclohexene	X		82.14	0.0184	0.000	1.02	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
287923	Cyclopentane	X		70.13	0.0221	0.000	1.04	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.55	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	
124185	Decane	X		142.28	3.8	0.041	363.44	0.18	22.11	98.0%	0.0008	7.27	0.00	0.00	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	2.11	0.00	0.13	98.0%	0.0000	0.04	0.00	0.00	
74953	Dibromomethane (Methylene dibron	X		173.84	0.000835	0.000	0.10	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
106467	Dichlorobenzene	X	X	147	0.94	0.011	92.89	0.05	5.65	98.0%	0.0002	1.86	0.00	0.00	0.00
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.011	95.91	0.05	5.84	98.0%	0.0002	1.92	0.00	0.00	
75092	Dichloromethane (Methylene chlorid	X	X	84.93	6.15	0.040	351.11	0.18	21.36	98.0%	0.0008	7.02	0.00	0.00	0.00
352932	Diethyl sulfide	X		90.19	0.0862	0.001	5.23	0.00	0.32	98.0%	0.0000	0.10	0.00	0.00	
624920	Dimethyl disulfide	X		94.2	0.137	0.001	8.68	0.00	0.53	98.0%	0.0000	0.17	0.00	0.00	
75183	Dimethyl sulfide	X		62.14	5.66	0.027	236.43	0.12	14.38	98.0%	0.0005	4.73	0.00	0.00	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.003	25.30	0.01	1.54	98.0%	0.0001	0.51	0.00	0.00	
74840	Ethane	X		30.07	9.05	0.021	182.93	0.09	11.13	98.0%	0.0004	3.66	0.00	0.00	
64175	Ethanol	X		46.07	0.23	0.001	7.12	0.00	0.43	98.0%	0.0000	0.14	0.00	0.00	
141786	Ethyl acetate	X		88.11	1.88	0.013	111.35	0.06	6.77	98.0%	0.0003	2.23	0.00	0.00	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.001	8.27	0.00	0.50	98.0%	0.0000	0.17	0.00	0.00	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	1.88	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
100414	Ethylbenzene	X	X	106.17	4.86	0.040	346.85	0.17	21.10	98.0%	0.0008	6.94	0.00	0.00	0.00
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.24	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	0.00
142825	Heptane	X		100.2	1.34	0.010	90.26	0.05	5.49	98.0%	0.0002	1.81	0.00	0.00	
110543	Hexane	X	X	86.18	3.1	0.021	179.59	0.09	10.93	98.0%	0.0004	3.59	0.00	0.00	0.00
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	1.53	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.036	318.80	0.16	19.40	98.0%	0.0007	6.38	0.00	0.00	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	3.67	0.00	0.22	98.0%	0.0000	0.07	0.00	0.00	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.76	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	
75332	Isopropyl mercaptan	X		76.16	0.175	0.001	8.96	0.00	0.55	98.0%	0.0000	0.18	0.00	0.00	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.004	34.74	0.02	2.11	98.0%	0.0001	0.69	0.00	0.00	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.02	0.00	0.00	0.0%	0.0000	0.02	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.005	44.31	0.02	2.70	98.0%	0.0001	0.89	0.00	0.00	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.001	6.99	0.00	0.43	98.0%	0.0000	0.14	0.00	0.00	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.010	85.15	0.04	5.18	98.0%	0.0002	1.70	0.00	0.00	
96377	Methylcyclopentane	X		84.16	0.65	0.004	36.77	0.02	2.24	98.0%	0.0001	0.74	0.00	0.00	
91203	Naphthalene	X	X	128.17	0.107	0.001	9.22	0.00	0.56	98.0%	0.0000	0.18	0.00	0.00	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.001	6.14	0.00	0.37	98.0%	0.0000	0.12	0.00	0.00	
111842	Nonane	X		128.26	2.37	0.023	204.34	0.10	12.43	98.0%	0.0005	4.09	0.00	0.00	
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.004	33.37	0.02	2.03	98.0%	0.0001	0.67	0.00	0.00	
111659	Octane	X		114.23	1.08	0.009	82.93	0.04	5.05	98.0%	0.0002	1.66	0.00	0.00	
99876	p-Cymene (1-Methyl-4-Isopropylben	X		134.22	3.58	0.037	323.00	0.16	19.65	98.0%	0.0007	6.46	0.00	0.00	
109660	Pentane	X		72.15	4.46	0.025	216.31	0.11	13.16	98.0%	0.0005	4.33	0.00	0.00	
74986	Propane	X		44.1	15.5	0.052	459.49	0.23	27.96	98.0%	0.0010	9.19	0.00	0.00	
115071	Propene	X		42.08	3.32	0.011	93.91	0.05	5.71	98.0%	0.0002	1.88	0.00	0.00	
74997	Propyne	X		40.06	0.038	0.000	1.02	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
135988	sec-Butylbenzene	X		134.22	0.0675	0.001	6.09	0.00	0.37	98.0%	0.0000	0.12	0.00	0.00	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.003	28.77	0.01	1.75	98.0%	0.0001	0.58	0.00	0.00	0.00
127184	Tetrachloroethylene (Perchloroethyl	X	X	165.83	2.03	0.026	226.29	0.11	13.77	98.0%	0.0005	4.53	0.00	0.00	0.00

Table B.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2030

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	501	cfm
LFG Collected to Flares =	501	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	Uncontrolled Emissions mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.005	46.97	0.02	2.86	98.0%	0.0001	0.94	0.00	0.00	
110021	Thiophene	X		84.14	0.349	0.002	19.74	0.01	1.20	98.0%	0.0000	0.39	0.00	0.00	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.209	1827.16	0.91	111.17	98.0%	0.0042	36.54	0.02	0.02	0.02
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	1.87	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.003	30.47	0.02	1.85	98.0%	0.0001	0.61	0.00	0.00	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.70	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.002	15.46	0.01	0.94	98.0%	0.0000	0.31	0.00	0.00	
624646	trans-2-Butene	X		56.11	0.104	0.000	3.92	0.00	0.24	98.0%	0.0000	0.08	0.00	0.00	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.17	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	1.17	0.00	0.07	98.0%	0.0000	0.02	0.00	0.00	
13389429	trans-2-Octene	X		112.21	0.241	0.002	18.18	0.01	1.11	98.0%	0.0000	0.36	0.00	0.00	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	1.64	0.00	0.10	98.0%	0.0000	0.03	0.00	0.00	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.88	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	2.11	0.00	0.13	98.0%	0.0000	0.04	0.00	0.00	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.008	73.13	0.04	4.45	98.0%	0.0002	1.46	0.00	0.00	0.00
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.003	22.90	0.01	1.39	98.0%	0.0001	0.46	0.00	0.00	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.001	5.68	0.00	0.35	98.0%	0.0000	0.11	0.00	0.00	0.00
1120214	Undecane	X		156.31	1.67	0.020	175.47	0.09	10.68	98.0%	0.0004	3.51	0.00	0.00	
85306269	Vinyl acetate	X	X	86.09	0.248	0.002	14.35	0.01	0.87	98.0%	0.0000	0.29	0.00	0.00	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.007	59.66	0.03	3.63	98.0%	0.0001	1.19	0.00	0.00	0.00
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.075	658.73	0.33	40.08	98.0%	0.0015	13.17	0.01	0.01	0.01
7647-01-0	HCl		X	35.45	74	0.201	1763.41	0.88	107.29	0.0%	0.2013	1763.41	0.88		0.88
															0.93

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

[2] Control efficiency of 98% applied for flares

Equations:

$$(mg/m^3) = \frac{\text{(Molecular weight) x (1 atm) x (Median ppmv)}}{\text{(298.15 K) x (0.08206 L*atm/K*mol)}}$$

$$(lb/hr) = \frac{(mg/m^3) \text{ x } (2.205 \text{ x } 10^{-6} \text{ [lb/mg]}) \text{ x (Fugitive LFG Emission rate } [ft^3/min]) \text{ x (60 min/hr)}}{(35.3147\ ft^3/m^3)}$$

(lb/yr) = (lb/hr) x (8,760 hours/yr)

$$(TPY) = \frac{\text{(lb/yr)}}{\text{(2,000 lb/ton)}}$$

(Controlled Emissions) = (Uncontrolled Emissions) x (100% - Average Control [%])

Table B.4

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive Emissions - 2030

Year	Total LFG Generated (cfm)	Collection Efficiency (%)	LFG to Collection System (cfm)	Fugitive LFG (cfm)	Fugitive LFG (ft^3/yr)	Fugitive LFG (m^3/yr)	Fugitive HAP Emissions (TPY)	Fugitive CH_4 Emissions (TPY)	Oxidized CO_2 Emissions (TPY)	Fugitive Biogenic CO_2 Emissions (TPY)	Total Anthropogenic GHG Emissions (TPY)
2030	668	75%	501	167	87,742,686	2,484,596	0.8	450.9	137.4	3,852.4	37,880

Notes:

Total landfill gas (LFG) Generated in average cubic feet per minute (cfm) from Methane Generation Model (according to 40 CFR 98, Subpart HH)
Collection efficiency of 75% assumed for gas collection system
LFG to Collection System = (Total LFG Generated) * (Collection Efficiency (%))
Fugitive LFG = (Total LFG Generated) * (100% - Collection Efficiency (%))
Fugitive LFG (ft^3/yr) = (Fugitive LFG (cfm)) * (60 minutes per hour) * (8,760 hours per year)
Fugitive LFG (m^3/yr) = (Fugitive LFG (ft^3/yr)) / (35.3147 cubic feet per cubic meter)
NMOC concentration of 595 ppm referenced from USEPA AP-42, Chapter 2.4 (11/98)

Conversion from NMOC in ppm to mg/m^3 = $\frac{595 \text{ ppm} \times 86.18}{24.47}$ mg/m^3

Fugitive NMOC Emissions (lb/yr) = [Fugitive LFG (m^3/yr)] * [2,095.9 mg of NMOC per m^3 of LFG] * [2.2046 x10^{-6} pounds per mg]
Fugitive NMOC Emissions (TPY) = (Fugitive NMOC Emissions (lb/yr)) / (2000 pounds per ton)
Fugitive VOC Emissions = Fugitive NMOC Emissions (tons/yr) * 39% (VOCs are 39% of total NMOC according to USEPA AP-42, Chapter 2.4 (11/98)
Total Fugitive HAP Emissions determined from sum of individual speciated HAPs (see Table B.5)
Fugitive CH_4 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.0423 lb CH4 / ft^3 CH_4] * [90% oxidation factor] / [2,000 lb/ton]
Oxidized CO_2 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.116 lb CO_2 / ft^3 CH_4] * [10% oxidized] / [2,000 lb/ton]
Fugitive Biogenic emissions (TPY) = { [Fugitive LFG (ft^3/yr)] * [73% CO_2] * [0.116 lb CO_2 / ft^3 CO_2] / [2,000 lb/ton] } + Oxidized CO_2 Emissions
Total Fugitive Anthropogenic GHG Emissions (tons CO_2 equivalents / year) = [Fugitive CH4 Emissions (TPY)] * 84

Equations:

$$(\text{mg/m}^3) = \frac{(\text{ppm}) \times (\text{Molecular weight (g / mol)}) \times (1 \text{ atm})}{(298.15 \text{ K}) \times (0.08206 \text{ L*atm/K*mol})}$$ (assuming standard conditions of 1 atmosphere and 25^o Celsius)

(lb/yr) = (Fugitive LFG Emission rate [m^3/year]) x (mg/m^3) x (2.205 x 10^{-6} [lb/mg])

$$(\text{TPY}) = \frac{(\text{lb/yr})}{(2{,}000 \text{ lb/ton})}$$

Table B.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2030

Fugitive Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	501	cfm
Fugitive Emission Estimates =	167	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.001	7.26	0.00	1.33	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.002	20.12	0.01	3.67	0.01
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.20	0.00	0.04	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	X		187.37	0.0672	0.000	2.82	0.00	0.51	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.001	4.72	0.00	0.86	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.005	46.12	0.02	8.42	0.02
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.000	3.48	0.00	0.63	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.001	9.67	0.00	1.76	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.22	0.00	0.04	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.004	36.90	0.02	6.73	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.20	0.00	0.04	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 11	X		170.92	0.106	0.000	4.06	0.00	0.74	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.000	3.53	0.00	0.64	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.028	247.62	0.12	45.20	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	1.32	0.00	0.24	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	0.60	0.00	0.11	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.002	16.78	0.01	3.06	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.000	2.01	0.00	0.37	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.000	1.97	0.00	0.36	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.001	7.88	0.00	1.44	
123911	1,4-Dioxane (1,4-Diethylene dioxide)	X	X	88.11	0.00829	0.000	0.16	0.00	0.03	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.002	19.17	0.01	3.50	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.002	13.83	0.01	2.52	
622968	1-Ethyl-4-methylbenzene (4-Ethyl toluene)	X		120.19	0.989	0.003	26.63	0.01	4.86	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl toluene) + 1,3,	X		120.19	0.579	0.002	15.59	0.01	2.85	
592767	1-Heptene	X		98.19	0.625	0.002	13.75	0.01	2.51	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	1.67	0.00	0.31	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	0.49	0.00	0.09	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	0.46	0.00	0.08	
109671	1-Pentene	X		70.13	0.22	0.000	3.46	0.00	0.63	
107039	1-Propanethiol (n-Propyl mercaptan)	X		76.16	0.125	0.000	2.13	0.00	0.39	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.21	0.00	0.04	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.002	15.72	0.01	2.87	0.01
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.001	4.48	0.00	0.82	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.000	3.01	0.00	0.55	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	1.37	0.00	0.25	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	0.44	0.00	0.08	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.001	7.99	0.00	1.46	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.000	3.22	0.00	0.59	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.001	6.96	0.00	1.27	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.001	5.68	0.00	1.04	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.000	2.25	0.00	0.41	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.000	4.25	0.00	0.78	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	1.62	0.00	0.30	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.007	64.79	0.03	11.83	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.33	0.00	0.06	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	1.58	0.00	0.29	
611143	2-Ethyltoluene	X		120.19	0.323	0.001	8.70	0.00	1.59	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.002	13.76	0.01	2.51	
563462	2-Methyl-1-butene	X		70.13	0.179	0.000	2.81	0.00	0.51	
513440	2-Methyl-1-propanethiol (Isobutyl mercaptan)	X		90.19	0.17	0.000	3.44	0.00	0.63	
513359	2-Methyl-2-butene	X		70.13	0.303	0.001	4.76	0.00	0.87	
75661	2-Methyl-2-propanethiol (tert-Butylmercaptan)	X		90.19	0.325	0.001	6.57	0.00	1.20	
78784	2-Methylbutane	X		72.15	2.26	0.004	36.54	0.02	6.67	
592278	2-Methylheptane	X		114.23	0.716	0.002	18.33	0.01	3.35	
591764	2-Methylhexane	X		100.2	0.816	0.002	18.32	0.01	3.34	
107835	2-Methylpentane	X		86.18	0.688	0.002	13.29	0.01	2.43	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.003	24.24	0.01	4.42	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.003	25.03	0.01	4.57	
620144	3-Ethyltoluene	X		120.19	0.78	0.002	21.01	0.01	3.83	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.13	0.00	0.02	
589811	3-Methylheptane	X		114.23	0.763	0.002	19.53	0.01	3.56	
589344	3-Methylhexane	X		100.2	1.13	0.003	25.37	0.01	4.63	
96140	3-Methylpentane	X		86.18	0.74	0.002	14.29	0.01	2.61	
616444	3-Methylthiophene	X		98.17	0.0925	0.000	2.03	0.00	0.37	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	0.44	0.00	0.08	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.002	19.82	0.01	3.62	0.01
589537	4-Methylheptane	X		114.23	0.249	0.001	6.37	0.00	1.16	

Table B.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2030

Fugitive Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	501	cfm
Fugitive Emission Estimates =	167	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	0.76	0.00	0.14	0.00
67641	Acetone			58.08	6.7	0.010	87.19	0.04	15.92	
75058	Acetonitrile	X	X	41.05	0.556	0.001	5.11	0.00	0.93	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.24	0.00	0.04	0.00
71432	Benzene	X	X	78.11	2.4	0.005	42.01	0.02	7.67	0.02
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	0.51	0.00	0.09	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.32	0.00	0.06	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	0.45	0.00	0.08	0.00
106978	Butane	X		58.12	6.22	0.009	81.00	0.04	14.79	
75150	Carbon disulfide	X	X	76.14	0.147	0.000	2.51	0.00	0.46	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.28	0.00	0.05	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.000	2.98	0.00	0.54	
463581	Carbonyl sulfide (Carbon oxysulfide)	X	X	60.08	0.122	0.000	1.64	0.00	0.30	0.00
108907	Chlorobenzene	X		112.56	0.484	0.001	12.21	0.01	2.23	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.002	15.42	0.01	2.82	0.01
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.007	57.10	0.03	10.42	0.03
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.000	2.76	0.00	0.50	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.003	26.93	0.01	4.92	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.000	2.04	0.00	0.37	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.08	0.00	0.01	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.001	12.60	0.01	2.30	
24293 / 220703(	cis-1,4-Dimethylcyclohexane / trans-1,3-Dimethyl	X		112.21	0.248	0.001	6.24	0.00	1.14	
590181	cis-2-Butene	X		56.11	0.105	0.000	1.32	0.00	0.24	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	0.54	0.00	0.10	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.32	0.00	0.06	
7642048	cis-2-Octene	X		112.21	0.22	0.001	5.53	0.00	1.01	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	0.75	0.00	0.14	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.34	0.00	0.06	
110827	Cyclohexane	X		84.16	1.01	0.002	19.05	0.01	3.48	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.34	0.00	0.06	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.35	0.00	0.06	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.18	0.00	0.03	
124185	Decane	X		142.28	3.8	0.014	121.15	0.06	22.11	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	0.70	0.00	0.13	
74953	Dibromomethane (Methylene dibromide)	X		173.84	0.000835	0.000	0.03	0.00	0.01	
106467	Dichlorobenzene	X	X	147	0.94	0.004	30.96	0.02	5.65	0.02
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.004	31.97	0.02	5.84	
75092	Dichloromethane (Methylene chloride)	X	X	84.93	6.15	0.013	117.04	0.06	21.36	0.06
352932	Diethyl sulfide	X		90.19	0.0862	0.000	1.74	0.00	0.32	
624920	Dimethyl disulfide	X		94.2	0.137	0.000	2.89	0.00	0.53	
75183	Dimethyl sulfide	X		62.14	5.66	0.009	78.81	0.04	14.38	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.001	8.43	0.00	1.54	
74840	Ethane	X		30.07	9.05	0.007	60.98	0.03	11.13	
64175	Ethanol	X		46.07	0.23	0.000	2.37	0.00	0.43	
141786	Ethyl acetate	X		88.11	1.88	0.004	37.12	0.02	6.77	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.000	2.76	0.00	0.50	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	0.63	0.00	0.11	
100414	Ethylbenzene	X	X	106.17	4.86	0.013	115.62	0.06	21.10	0.06
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.08	0.00	0.01	0.00
142825	Heptane	X		100.2	1.34	0.003	30.09	0.02	5.49	
110543	Hexane	X	X	86.18	3.1	0.007	59.86	0.03	10.93	0.03
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	0.51	0.00	0.09	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.012	106.27	0.05	19.40	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	1.22	0.00	0.22	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.25	0.00	0.05	
75332	Isopropyl mercaptan	X		76.16	0.175	0.000	2.99	0.00	0.55	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.001	11.58	0.01	2.11	0.01
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.01	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.00	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.002	14.77	0.01	2.70	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.000	2.33	0.00	0.43	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.003	28.38	0.01	5.18	
96377	Methylcyclopentane	X		84.16	0.65	0.001	12.26	0.01	2.24	
91203	Naphthalene	X	X	128.17	0.107	0.000	3.07	0.00	0.56	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.000	2.05	0.00	0.37	
111842	Nonane	X		128.26	2.37	0.008	68.11	0.03	12.43	

Table B.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2030

Fugitive Emission Estimates

Average LFG Generated =	668	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	501	cfm
Fugitive Emission Estimates =	167	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median[1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.001	11.12	0.01	2.03	
111659	Octane	X		114.23	1.08	0.003	27.64	0.01	5.05	
99876	p-Cymene (1-Methyl-4-Isopropylbenzene)	X		134.22	3.58	0.012	107.67	0.05	19.65	
109660	Pentane	X		72.15	4.46	0.008	72.10	0.04	13.16	
74986	Propane	X		44.1	15.5	0.017	153.16	0.08	27.96	
115071	Propene	X		42.08	3.32	0.004	31.30	0.02	5.71	
74997	Propyne	X		40.06	0.038	0.000	0.34	0.00	0.06	
135988	sec-Butylbenzene	X		134.22	0.0675	0.000	2.03	0.00	0.37	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.001	9.59	0.00	1.75	0.00
127184	Tetrachloroethylene (Perchloroethylene)	X	X	165.83	2.03	0.009	75.43	0.04	13.77	0.04
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.002	15.66	0.01	2.86	
110021	Thiophene	X		84.14	0.349	0.001	6.58	0.00	1.20	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.070	609.05	0.30	111.17	0.30
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	0.62	0.00	0.11	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.001	10.16	0.01	1.85	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.23	0.00	0.04	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.001	5.15	0.00	0.94	
624646	trans-2-Butene	X		56.11	0.104	0.000	1.31	0.00	0.24	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.06	0.00	0.01	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.39	0.00	0.07	
13389429	trans-2-Octene	X		112.21	0.241	0.001	6.06	0.00	1.11	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	0.55	0.00	0.10	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.29	0.00	0.05	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	0.70	0.00	0.13	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.003	24.38	0.01	4.45	0.01
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.001	7.63	0.00	1.39	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.000	1.89	0.00	0.35	0.00
1120214	Undecane	X		156.31	1.67	0.007	58.49	0.03	10.68	
85306269	Vinyl acetate	X	X	86.09	0.248	0.001	4.78	0.00	0.87	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.002	19.89	0.01	3.63	0.01
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.025	219.58	0.11	40.08	0.11
										0.78

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ atm) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L{*}atm/K{*}mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate } [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

(lb/yr) = (lb/hr) x (8,760 hours/yr)

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table B.6

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Propane Heating Emissions

Maximum propane combusted per year **11.489** 10^3 gallons

Emission Calculations:					
				Lbs/yr	Tons/yr
PM=	0.70 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**8.042**	**0.00402**
SO_X =	0.1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**1.149**	**0.00057**
NO_X =	13 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**149.351**	**0.07468**
VOC =	1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**11.489**	**0.00574**
CO =	7.5 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**86.164**	**0.04308**
CO_2 =	12,500 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**143,607**	**71.80328**

* Emissions factors from AP-42 7/2008, section 1.5 (Assume a sulfur content of 1%)

Attachment C

Dunn Landfill Final Emissions

Expected 20yr GWP 2050

Table C.1

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Actual Emissions - 2050

Emission Source	2050 Emissions (tons/year)			
	HAPs	Hi-HAP[1]	Anthropogenic GHG[2]	Biogenic CO_2 [2]
Landfill Fugitive Emissions	0.1	---	4,993	508
Utility Flare Combustion Emissions	0.8	0.7	1,083	12,710
Other Small Combustion Sources	---	---	72	---
Totals	**0.9**	**0.7**	**6,148**	**13,218**

Notes:

1 High HAP is HCl.

2 Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO2 eq) using 20-year GWP values stated in 6 NYCRR 496.5.

Table C.2

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare Greenhouse Gas Emissions - 2050

LFG to Utility Flare = 418 cfm

	Operating Hours	Estimated Flare Emissions (TPY)						
		Combustion CO_2	Combustion CH_4	Combustion N_2O	Escape CH_4	Collected CO_2	Biogenic CO_2	Anthropogenic GHG
Utility 750 CFM	8,760	3,406	0.2	0.0	12.5	9,305	12,710	1,083
	Total Emissions (TPY)	3,406	0.2	0.0	12.5	9,305	12,710	1,083
	Total Emissions (lb/yr)	6.81E+06	4.19E+02	8.24E+01	25,098.4	1.86E+07	2.54E+07	2.17E+06

Flare Combustion Factors

	Pounds per Hour of Operation		
	CO_2	CH_4	N_2O
Utility 750 CFM	777.5	0.0	0.0

Notes:

Combustion CO_2	Combustion emission factor referenced from Table C-1 of 40 CFR Part 98, Subpart C
Combustion CH_4	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Combustion N_2O	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Escape CH_4	Collected methane that escapes destruction in flare (1% of methane processed)
Collected CO_2	Portion of collected LFG that already contains CO_2 (73% of collected LFG)
Biogenic CO_2	Sum of Combustion CO_2 and Collected CO_2
Anthropogenic GHG	Sum of Combustion CH_4, Combustion N_2O and Escape CH_4 expressed as tons of CO_2 equivalents

Emission Factor Development

Enclosed Flares

	EF (kg/MMBtu)	GWP (20 year)
CO_2	52.07	1
CH_4	3.20E-03	84
N_2O	6.30E-04	264

Heating value[1]	270	Btu/scf
LFG CH_4 Concentration	27	%
CH_4 Destruction Efficiency[2]	99	% (manufacturer guarantee DE for LFG Enclosed Flares)
CH_4 Density	0.0423	pounds per cubic foot (referenced from 40 CFR Part 98, Subpart HH)
CO_2 concentration	73	%
CO_2 density	0.116	pounds per cubic foot

LFG Data:

Heat Input (Utility Flare):	6.8	MMBtu/hr
LFG combusted (Utility Flare):	418	cfm

[1] AP-42 Chapter 1.4 lists the heating value of methane as a range from 950 to 1,050 BTU/SCF, the application used 1,000 BTU/scf in the calculations. Gas with a 27% methane concentration would be 27% of this value, or 270 BTU/scf

[2] A flare destruction efficiency of 99%, referenced from 40 CFR 98, Subpart HH, was used in the calculations. This means that 1% of the gas collected will “escape” destruction. This flare destruction efficiency is conservation because destruction efficiencies are typically measured to be higher than 99% for flares.

Table C.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2050

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Total LFG Collected =	418	cfm
LFG Collected to Flares =	418	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.002	18.19	0.01	1.33	98.0%	0.0000	0.36	0.00	0.00	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.006	50.40	0.03	3.67	98.0%	0.0001	1.01	0.00	0.00	0.00
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.51	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane	X		187.37	0.0672	0.001	7.07	0.00	0.51	98.0%	0.0000	0.14	0.00	0.00	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.001	11.83	0.01	0.86	98.0%	0.0000	0.24	0.00	0.00	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.013	115.52	0.06	8.42	98.0%	0.0003	2.31	0.00	0.00	0.00
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.001	8.70	0.00	0.63	98.0%	0.0000	0.17	0.00	0.00	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.003	24.21	0.01	1.76	98.0%	0.0001	0.48	0.00	0.00	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.56	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.011	92.41	0.05	6.73	98.0%	0.0002	1.85	0.00	0.00	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.51	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethar	X		170.92	0.106	0.001	10.17	0.01	0.74	98.0%	0.0000	0.20	0.00	0.00	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.001	8.83	0.00	0.64	98.0%	0.0000	0.18	0.00	0.00	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.071	620.19	0.31	45.20	98.0%	0.0014	12.40	0.01	0.01	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	3.30	0.00	0.24	98.0%	0.0000	0.07	0.00	0.00	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	1.50	0.00	0.11	98.0%	0.0000	0.03	0.00	0.00	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.005	42.02	0.02	3.06	98.0%	0.0001	0.84	0.00	0.00	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.001	5.04	0.00	0.37	98.0%	0.0000	0.10	0.00	0.00	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.001	4.93	0.00	0.36	98.0%	0.0000	0.10	0.00	0.00	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.002	19.73	0.01	1.44	98.0%	0.0000	0.39	0.00	0.00	
123911	1,4-Dioxane (1,4-Diethylene dioxide	X	X	88.11	0.00829	0.000	0.41	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.005	48.02	0.02	3.50	98.0%	0.0001	0.96	0.00	0.00	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.004	34.64	0.02	2.52	98.0%	0.0001	0.69	0.00	0.00	
622968	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.989	0.008	66.71	0.03	4.86	98.0%	0.0002	1.33	0.00	0.00	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.579	0.004	39.05	0.02	2.85	98.0%	0.0001	0.78	0.00	0.00	
592767	1-Heptene	X		98.19	0.625	0.004	34.44	0.02	2.51	98.0%	0.0001	0.69	0.00	0.00	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	4.19	0.00	0.31	98.0%	0.0000	0.08	0.00	0.00	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	1.23	0.00	0.09	98.0%	0.0000	0.02	0.00	0.00	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	1.16	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	
109671	1-Pentene	X		70.13	0.22	0.001	8.66	0.00	0.63	98.0%	0.0000	0.17	0.00	0.00	
107039	1-Propanethiol (n-Propyl mercaptan	X		76.16	0.125	0.001	5.34	0.00	0.39	98.0%	0.0000	0.11	0.00	0.00	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.52	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.004	39.36	0.02	2.87	98.0%	0.0001	0.79	0.00	0.00	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.001	11.23	0.01	0.82	98.0%	0.0000	0.22	0.00	0.00	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.001	7.54	0.00	0.55	98.0%	0.0000	0.15	0.00	0.00	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	3.42	0.00	0.25	98.0%	0.0000	0.07	0.00	0.00	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	1.11	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.002	20.00	0.01	1.46	98.0%	0.0000	0.40	0.00	0.00	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.001	8.08	0.00	0.59	98.0%	0.0000	0.16	0.00	0.00	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.002	17.43	0.01	1.27	98.0%	0.0000	0.35	0.00	0.00	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.002	14.23	0.01	1.04	98.0%	0.0000	0.28	0.00	0.00	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.001	5.62	0.00	0.41	98.0%	0.0000	0.11	0.00	0.00	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.001	10.64	0.01	0.78	98.0%	0.0000	0.21	0.00	0.00	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	4.05	0.00	0.30	98.0%	0.0000	0.08	0.00	0.00	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.019	162.28	0.08	11.83	98.0%	0.0004	3.25	0.00	0.00	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.84	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	3.96	0.00	0.29	98.0%	0.0000	0.08	0.00	0.00	
611143	2-Ethyltoluene	X		120.19	0.323	0.002	21.79	0.01	1.59	98.0%	0.0000	0.44	0.00	0.00	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.004	34.46	0.02	2.51	98.0%	0.0001	0.69	0.00	0.00	
563462	2-Methyl-1-butene	X		70.13	0.179	0.001	7.04	0.00	0.51	98.0%	0.0000	0.14	0.00	0.00	
513440	2-Methyl-1-propanethiol (Isobutyl me	X		90.19	0.17	0.001	8.60	0.00	0.63	98.0%	0.0000	0.17	0.00	0.00	
513359	2-Methyl-2-butene	X		70.13	0.303	0.001	11.93	0.01	0.87	98.0%	0.0000	0.24	0.00	0.00	
75661	2-Methyl-2-propanethiol (tert-Butylm	X		90.19	0.325	0.002	16.45	0.01	1.20	98.0%	0.0000	0.33	0.00	0.00	
78784	2-Methylbutane	X		72.15	2.26	0.010	91.51	0.05	6.67	98.0%	0.0002	1.83	0.00	0.00	
592278	2-Methylheptane	X		114.23	0.716	0.005	45.90	0.02	3.35	98.0%	0.0001	0.92	0.00	0.00	
591764	2-Methylhexane	X		100.2	0.816	0.005	45.89	0.02	3.34	98.0%	0.0001	0.92	0.00	0.00	
107835	2-Methylpentane	X		86.18	0.688	0.004	33.27	0.02	2.43	98.0%	0.0001	0.67	0.00	0.00	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.007	60.71	0.03	4.42	98.0%	0.0001	1.21	0.00	0.00	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.007	62.68	0.03	4.57	98.0%	0.0001	1.25	0.00	0.00	
620144	3-Ethyltoluene	X		120.19	0.78	0.006	52.61	0.03	3.83	98.0%	0.0001	1.05	0.00	0.00	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.33	0.00	0.02	98.0%	0.0000	0.01	0.00	0.00	
589811	3-Methylheptane	X		114.23	0.763	0.006	48.91	0.02	3.56	98.0%	0.0001	0.98	0.00	0.00	
589344	3-Methylhexane	X		100.2	1.13	0.007	63.54	0.03	4.63	98.0%	0.0001	1.27	0.00	0.00	
96140	3-Methylpentane	X		86.18	0.74	0.004	35.79	0.02	2.61	98.0%	0.0001	0.72	0.00	0.00	
616444	3-Methylthiophene	X		98.17	0.0925	0.001	5.10	0.00	0.37	98.0%	0.0000	0.10	0.00	0.00	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	1.10	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.006	49.63	0.02	3.62	98.0%	0.0001	0.99	0.00	0.00	0.00
589537	4-Methylheptane	X		114.23	0.249	0.002	15.96	0.01	1.16	98.0%	0.0000	0.32	0.00	0.00	
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	1.91	0.00	0.14	98.0%	0.0000	0.04	0.00	0.00	0.00
67641	Acetone			58.08	6.7	0.025	218.38	0.11	15.92	98.0%	0.0005	4.37	0.00		
75058	Acetonitrile	X	X	41.05	0.556	0.001	12.81	0.01	0.93	98.0%	0.0000	0.26	0.00	0.00	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.60	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
71432	Benzene	X	X	78.11	2.4	0.012	105.20	0.05	7.67	98.0%	0.0002	2.10	0.00	0.00	0.00

Table C.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2050

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Total LFG Collected =	418	cfm
LFG Collected to Flares =	418	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	lb/yr	TPY	VOC (TPY)	HAP (TPY)
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	1.29	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.81	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	1.12	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	0.00
106978	Butane	X		58.12	6.22	0.023	202.88	0.10	14.79	98.0%	0.0005	4.06	0.00	0.00	
75150	Carbon disulfide	X	X	76.14	0.147	0.001	6.28	0.00	0.46	98.0%	0.0000	0.13	0.00	0.00	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.69	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.001	7.46	0.00	0.54	98.0%	0.0000	0.15	0.00	0.00	
463581	Carbonyl sulfide (Carbon oxysulfide	X	X	60.08	0.122	0.000	4.11	0.00	0.30	98.0%	0.0000	0.08	0.00	0.00	0.00
108907	Chlorobenzene	X		112.56	0.484	0.003	30.57	0.02	2.23	98.0%	0.0001	0.61	0.00	0.00	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.004	38.63	0.02	2.82	98.0%	0.0001	0.77	0.00	0.00	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.016	143.00	0.07	10.42	98.0%	0.0003	2.86	0.00	0.00	0.00
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.001	6.91	0.00	0.50	98.0%	0.0000	0.14	0.00	0.00	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.008	67.46	0.03	4.92	98.0%	0.0002	1.35	0.00	0.00	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.001	5.10	0.00	0.37	98.0%	0.0000	0.10	0.00	0.00	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.19	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.004	31.55	0.02	2.30	98.0%	0.0001	0.63	0.00	0.00	
24293 / 220703	cis-1,4-Dimethylcyclohexane / trans-	X		112.21	0.248	0.002	15.62	0.01	1.14	98.0%	0.0000	0.31	0.00	0.00	
590181	cis-2-Butene	X		56.11	0.105	0.000	3.31	0.00	0.24	98.0%	0.0000	0.07	0.00	0.00	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	1.35	0.00	0.10	98.0%	0.0000	0.03	0.00	0.00	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.81	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
7642048	cis-2-Octene	X		112.21	0.22	0.002	13.85	0.01	1.01	98.0%	0.0000	0.28	0.00	0.00	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	1.89	0.00	0.14	98.0%	0.0000	0.04	0.00	0.00	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.85	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
110827	Cyclohexane	X		84.16	1.01	0.005	47.70	0.02	3.48	98.0%	0.0001	0.95	0.00	0.00	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.85	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.87	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.46	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	
124185	Decane	X		142.28	3.8	0.035	303.42	0.15	22.11	98.0%	0.0007	6.07	0.00	0.00	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	1.76	0.00	0.13	98.0%	0.0000	0.04	0.00	0.00	
74953	Dibromomethane (Methylene dibron	X		173.84	0.000835	0.000	0.08	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
106467	Dichlorobenzene	X	X	147	0.94	0.009	77.55	0.04	5.65	98.0%	0.0002	1.55	0.00	0.00	0.00
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.009	80.07	0.04	5.84	98.0%	0.0002	1.60	0.00	0.00	
75092	Dichloromethane (Methylene chlorid	X	X	84.93	6.15	0.033	293.12	0.15	21.36	98.0%	0.0007	5.86	0.00	0.00	0.00
352932	Diethyl sulfide	X		90.19	0.0862	0.000	4.36	0.00	0.32	98.0%	0.0000	0.09	0.00	0.00	
624920	Dimethyl disulfide	X		94.2	0.137	0.001	7.24	0.00	0.53	98.0%	0.0000	0.14	0.00	0.00	
75183	Dimethyl sulfide	X		62.14	5.66	0.023	197.38	0.10	14.38	98.0%	0.0005	3.95	0.00	0.00	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.002	21.13	0.01	1.54	98.0%	0.0000	0.42	0.00	0.00	
74840	Ethane	X		30.07	9.05	0.017	152.72	0.08	11.13	98.0%	0.0003	3.05	0.00	0.00	
64175	Ethanol	X		46.07	0.23	0.001	5.95	0.00	0.43	98.0%	0.0000	0.12	0.00	0.00	
141786	Ethyl acetate	X		88.11	1.88	0.011	92.96	0.05	6.77	98.0%	0.0002	1.86	0.00	0.00	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.001	6.90	0.00	0.50	98.0%	0.0000	0.14	0.00	0.00	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	1.57	0.00	0.11	98.0%	0.0000	0.03	0.00	0.00	
100414	Ethylbenzene	X	X	106.17	4.86	0.033	289.57	0.14	21.10	98.0%	0.0007	5.79	0.00	0.00	0.00
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.20	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	0.00
142825	Heptane	X		100.2	1.34	0.009	75.35	0.04	5.49	98.0%	0.0002	1.51	0.00	0.00	
110543	Hexane	X	X	86.18	3.1	0.017	149.93	0.07	10.93	98.0%	0.0003	3.00	0.00	0.00	0.00
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	1.27	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.030	266.15	0.13	19.40	98.0%	0.0006	5.32	0.00	0.00	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	3.07	0.00	0.22	98.0%	0.0000	0.06	0.00	0.00	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.63	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	
75332	Isopropyl mercaptan	X		76.16	0.175	0.001	7.48	0.00	0.55	98.0%	0.0000	0.15	0.00	0.00	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.003	29.00	0.01	2.11	98.0%	0.0001	0.58	0.00	0.00	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.004	36.99	0.02	2.70	98.0%	0.0001	0.74	0.00	0.00	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.001	5.84	0.00	0.43	98.0%	0.0000	0.12	0.00	0.00	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.008	71.08	0.04	5.18	98.0%	0.0002	1.42	0.00	0.00	
96377	Methylcyclopentane	X		84.16	0.65	0.004	30.70	0.02	2.24	98.0%	0.0001	0.61	0.00	0.00	
91203	Naphthalene	X	X	128.17	0.107	0.001	7.70	0.00	0.56	98.0%	0.0000	0.15	0.00	0.00	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.001	5.12	0.00	0.37	98.0%	0.0000	0.10	0.00	0.00	
111842	Nonane	X		128.26	2.37	0.019	170.59	0.09	12.43	98.0%	0.0004	3.41	0.00	0.00	
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.003	27.86	0.01	2.03	98.0%	0.0001	0.56	0.00	0.00	
111659	Octane	X		114.23	1.08	0.008	69.23	0.03	5.05	98.0%	0.0002	1.38	0.00	0.00	
99876	p-Cymene (1-Methyl-4-Isopropylben	X		134.22	3.58	0.031	269.66	0.13	19.65	98.0%	0.0006	5.39	0.00	0.00	
109660	Pentane	X		72.15	4.46	0.021	180.59	0.09	13.16	98.0%	0.0004	3.61	0.00	0.00	
74986	Propane	X		44.1	15.5	0.044	383.61	0.19	27.96	98.0%	0.0009	7.67	0.00	0.00	
115071	Propene	X		42.08	3.32	0.009	78.40	0.04	5.71	98.0%	0.0002	1.57	0.00	0.00	
74997	Propyne	X		40.06	0.038	0.000	0.85	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
135988	sec-Butylbenzene	X		134.22	0.0675	0.001	5.08	0.00	0.37	98.0%	0.0000	0.10	0.00	0.00	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.003	24.02	0.01	1.75	98.0%	0.0001	0.48	0.00	0.00	0.00
127184	Tetrachloroethylene (Perchloroethyl	X	X	165.83	2.03	0.022	188.92	0.09	13.77	98.0%	0.0004	3.78	0.00	0.00	0.00

Table C.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2050

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Total LFG Collected =	418	cfm
LFG Collected to Flares =	418	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median[1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	Uncontrolled Emissions mg/m3	Avg. Control[2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.004	39.21	0.02	2.86	98.0%	0.0001	0.78	0.00	0.00	
110021	Thiophene	X		84.14	0.349	0.002	16.48	0.01	1.20	98.0%	0.0000	0.33	0.00	0.00	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.174	1525.41	0.76	111.17	98.0%	0.0035	30.51	0.02	0.02	0.02
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	1.56	0.00	0.11	98.0%	0.0000	0.03	0.00	0.00	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.003	25.44	0.01	1.85	98.0%	0.0001	0.51	0.00	0.00	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.59	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.001	12.91	0.01	0.94	98.0%	0.0000	0.26	0.00	0.00	
624646	trans-2-Butene	X		56.11	0.104	0.000	3.27	0.00	0.24	98.0%	0.0000	0.07	0.00	0.00	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.14	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.97	0.00	0.07	98.0%	0.0000	0.02	0.00	0.00	
13389429	trans-2-Octene	X		112.21	0.241	0.002	15.18	0.01	1.11	98.0%	0.0000	0.30	0.00	0.00	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	1.37	0.00	0.10	98.0%	0.0000	0.03	0.00	0.00	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.73	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	1.76	0.00	0.13	98.0%	0.0000	0.04	0.00	0.00	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.007	61.05	0.03	4.45	98.0%	0.0001	1.22	0.00	0.00	0.00
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.002	19.12	0.01	1.39	98.0%	0.0000	0.38	0.00	0.00	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.001	4.74	0.00	0.35	98.0%	0.0000	0.09	0.00	0.00	0.00
1120214	Undecane	X		156.31	1.67	0.017	146.49	0.07	10.68	98.0%	0.0003	2.93	0.00	0.00	
85306269	Vinyl acetate	X	X	86.09	0.248	0.001	11.98	0.01	0.87	98.0%	0.0000	0.24	0.00	0.00	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.006	49.81	0.02	3.63	98.0%	0.0001	1.00	0.00	0.00	0.00
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.063	549.95	0.27	40.08	98.0%	0.0013	11.00	0.01	0.01	0.01
7647-01-0	HCl		X	35.45	74	0.168	1472.19	0.74	107.29	0.0%	0.1681	1472.19	0.74		0.74
															0.78

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

[2] Control efficiency of 98% applied for flares

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ atm) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L^*atm/K^*mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate } [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

(lb/yr) = (lb/hr) x (8,760 hours/yr)

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

(Controlled Emissions) = (Uncontrolled Emissions) x (100% - Average Control [%])

Table C.4

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive Emissions - 2050

Year	Total LFG Generated (cfm)	Collection Efficiency (%)	LFG to Collection System (cfm)	Fugitive LFG (cfm)	Fugitive LFG (ft^3/yr)	Fugitive LFG (m^3/yr)	Fugitive HAP Emissions (TPY)	Fugitive CH_4 Emissions (TPY)	Oxidized CO_2 Emissions (TPY)	Fugitive Biogenic CO_2 Emissions (TPY)	Total Anthropogenic GHG Emissions (TPY)
2050	440	95%	418	22	11,566,145	327,517	0.1	59.4	18.1	507.8	4,993

Notes:

Total landfill gas (LFG) Generated in average cubic feet per minute (cfm) from Methane Generation Model (according to 40 CFR 98, Subpart HH)
Collection efficiency of 95% assumed for gas collection system based on final cover applied to entire landfill area
LFG to Collection System = (Total LFG Generated) * (Collection Efficiency (%))
Fugitive LFG = (Total LFG Generated) * (100% - Collection Efficiency (%))
Fugitive LFG (ft^3/yr) = (Fugitive LFG (cfm)) * (60 minutes per hour) * (8,760 hours per year)
Fugitive LFG (m^3/yr) = (Fugitive LFG (ft^3/yr)) / (35.3147 cubic feet per cubic meter)
Total Fugitive HAP Emissions determined from sum of individual speciated HAPs (see Table C.5)
Fugitive CH_4 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.0423 lb CH4 / ft^3 CH_4] * [90% oxidation factor] / [2,000 lb/ton]
Oxidized CO_2 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.116 lb CO_2 / ft^3 CH_4] * [10% oxidized] / [2,000 lb/ton]
Fugitive Biogenic emissions (TPY) = { [Fugitive LFG (ft^3/yr)] * [73% CO_2] * [0.116 lb CO_2 / ft^3 CO_2] / [2,000 lb/ton] } + Oxidized CO_2 Emissions
Total Fugitive Anthropogenic GHG Emissions (tons CO_2 equivalents / year) = [Fugitive CH4 Emissions (TPY)] * 84

Equations:

$$(mg/m^3) = \frac{(ppm) \times (\text{Molecular weight } (g / mol)) \times (1\ atm)}{(298.15\ K) \times (0.08206\ L{*}atm/K{*}mol)}$$ (assuming standard conditions of 1 atmosphere and 25° Celsius)

$$(lb/yr) = (\text{Fugitive LFG Emission rate } [m^3/year]) \times (mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg])$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table C.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2050

Fugitive Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Average LFG Collected =	418	cfm
Fugitive Emission Estimates =	22	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.000	0.96	0.00	1.33	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.000	2.65	0.00	3.67	0.00
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.03	0.00	0.04	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	X		187.37	0.0672	0.000	0.37	0.00	0.51	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.000	0.62	0.00	0.86	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.001	6.08	0.00	8.42	0.00
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.000	0.46	0.00	0.63	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.000	1.27	0.00	1.76	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.03	0.00	0.04	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.001	4.86	0.00	6.73	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.03	0.00	0.04	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114	X		170.92	0.106	0.000	0.54	0.00	0.74	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.000	0.46	0.00	0.64	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.004	32.64	0.02	45.20	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	0.17	0.00	0.24	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	0.08	0.00	0.11	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.000	2.21	0.00	3.06	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.000	0.27	0.00	0.37	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.000	0.26	0.00	0.36	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.000	1.04	0.00	1.44	
123911	1,4-Dioxane (1,4-Diethylene dioxide)	X	X	88.11	0.00829	0.000	0.02	0.00	0.03	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.000	2.53	0.00	3.50	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.000	1.82	0.00	2.52	
622968	1-Ethyl-4-methylbenzene (4-Ethyl toluene)	X		120.19	0.989	0.000	3.51	0.00	4.86	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl toluene) + 1,3,	X		120.19	0.579	0.000	2.06	0.00	2.85	
592767	1-Heptene	X		98.19	0.625	0.000	1.81	0.00	2.51	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	0.22	0.00	0.31	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	0.06	0.00	0.09	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	0.06	0.00	0.08	
109671	1-Pentene	X		70.13	0.22	0.000	0.46	0.00	0.63	
107039	1-Propanethiol (n-Propyl mercaptan)	X		76.16	0.125	0.000	0.28	0.00	0.39	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.03	0.00	0.04	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.000	2.07	0.00	2.87	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.000	0.59	0.00	0.82	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.000	0.40	0.00	0.55	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	0.18	0.00	0.25	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	0.06	0.00	0.08	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.000	1.05	0.00	1.46	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.000	0.43	0.00	0.59	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.000	0.92	0.00	1.27	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.000	0.75	0.00	1.04	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.000	0.30	0.00	0.41	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.000	0.56	0.00	0.78	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	0.21	0.00	0.30	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.001	8.54	0.00	11.83	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.04	0.00	0.06	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	0.21	0.00	0.29	
611143	2-Ethyltoluene	X		120.19	0.323	0.000	1.15	0.00	1.59	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.000	1.81	0.00	2.51	
563462	2-Methyl-1-butene	X		70.13	0.179	0.000	0.37	0.00	0.51	
513440	2-Methyl-1-propanethiol (Isobutyl mercaptan)	X		90.19	0.17	0.000	0.45	0.00	0.63	
513359	2-Methyl-2-butene	X		70.13	0.303	0.000	0.63	0.00	0.87	
75661	2-Methyl-2-propanethiol (tert-Butylmercaptan)	X		90.19	0.325	0.000	0.87	0.00	1.20	
78784	2-Methylbutane	X		72.15	2.26	0.001	4.82	0.00	6.67	
592278	2-Methylheptane	X		114.23	0.716	0.000	2.42	0.00	3.35	
591764	2-Methylhexane	X		100.2	0.816	0.000	2.42	0.00	3.34	
107835	2-Methylpentane	X		86.18	0.688	0.000	1.75	0.00	2.43	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.000	3.20	0.00	4.42	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.000	3.30	0.00	4.57	
620144	3-Ethyltoluene	X		120.19	0.78	0.000	2.77	0.00	3.83	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.02	0.00	0.02	
589811	3-Methylheptane	X		114.23	0.763	0.000	2.57	0.00	3.56	
589344	3-Methylhexane	X		100.2	1.13	0.000	3.34	0.00	4.63	
96140	3-Methylpentane	X		86.18	0.74	0.000	1.88	0.00	2.61	
616444	3-Methylthiophene	X		98.17	0.0925	0.000	0.27	0.00	0.37	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	0.06	0.00	0.08	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.000	2.61	0.00	3.62	0.00
589537	4-Methylheptane	X		114.23	0.249	0.000	0.84	0.00	1.16	

Table C.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2050

Fugitive Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Average LFG Collected =	418	cfm
Fugitive Emission Estimates =	22	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	0.10	0.00	0.14	0.00
67641	Acetone			58.08	6.7	0.001	11.49	0.01	15.92	
75058	Acetonitrile	X	X	41.05	0.556	0.000	0.67	0.00	0.93	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.03	0.00	0.04	0.00
71432	Benzene	X	X	78.11	2.4	0.001	5.54	0.00	7.67	0.00
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	0.07	0.00	0.09	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.04	0.00	0.06	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	0.06	0.00	0.08	0.00
106978	Butane	X		58.12	6.22	0.001	10.68	0.01	14.79	
75150	Carbon disulfide	X	X	76.14	0.147	0.000	0.33	0.00	0.46	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.04	0.00	0.05	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.000	0.39	0.00	0.54	
463581	Carbonyl sulfide (Carbon oxysulfide)	X	X	60.08	0.122	0.000	0.22	0.00	0.30	0.00
108907	Chlorobenzene	X		112.56	0.484	0.000	1.61	0.00	2.23	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.000	2.03	0.00	2.82	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.001	7.53	0.00	10.42	0.00
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.000	0.36	0.00	0.50	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.000	3.55	0.00	4.92	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.000	0.27	0.00	0.37	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.01	0.00	0.01	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.000	1.66	0.00	2.30	
24293 / 220703	cis-1,4-Dimethylcyclohexane / trans-1,3-Dimethyl	X		112.21	0.248	0.000	0.82	0.00	1.14	
590181	cis-2-Butene	X		56.11	0.105	0.000	0.17	0.00	0.24	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	0.07	0.00	0.10	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.04	0.00	0.06	
7642048	cis-2-Octene	X		112.21	0.22	0.000	0.73	0.00	1.01	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	0.10	0.00	0.14	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.04	0.00	0.06	
110827	Cyclohexane	X		84.16	1.01	0.000	2.51	0.00	3.48	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.04	0.00	0.06	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.05	0.00	0.06	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.02	0.00	0.03	
124185	Decane	X		142.28	3.8	0.002	15.97	0.01	22.11	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	0.09	0.00	0.13	
74953	Dibromomethane (Methylene dibromide)	X		173.84	0.000835	0.000	0.00	0.00	0.01	
106467	Dichlorobenzene	X	X	147	0.94	0.000	4.08	0.00	5.65	0.00
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.000	4.21	0.00	5.84	
75092	Dichloromethane (Methylene chloride)	X	X	84.93	6.15	0.002	15.43	0.01	21.36	0.01
352932	Diethyl sulfide	X		90.19	0.0862	0.000	0.23	0.00	0.32	
624920	Dimethyl disulfide	X		94.2	0.137	0.000	0.38	0.00	0.53	
75183	Dimethyl sulfide	X		62.14	5.66	0.001	10.39	0.01	14.38	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.000	1.11	0.00	1.54	
74840	Ethane	X		30.07	9.05	0.001	8.04	0.00	11.13	
64175	Ethanol	X		46.07	0.23	0.000	0.31	0.00	0.43	
141786	Ethyl acetate	X		88.11	1.88	0.001	4.89	0.00	6.77	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.000	0.36	0.00	0.50	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	0.08	0.00	0.11	
100414	Ethylbenzene	X	X	106.17	4.86	0.002	15.24	0.01	21.10	0.01
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.01	0.00	0.01	0.00
142825	Heptane	X		100.2	1.34	0.000	3.97	0.00	5.49	
110543	Hexane	X	X	86.18	3.1	0.001	7.89	0.00	10.93	0.00
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	0.07	0.00	0.09	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.002	14.01	0.01	19.40	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	0.16	0.00	0.22	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.03	0.00	0.05	
75332	Isopropyl mercaptan	X		76.16	0.175	0.000	0.39	0.00	0.55	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.000	1.53	0.00	2.11	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.00	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.00	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.000	1.95	0.00	2.70	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.000	0.31	0.00	0.43	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.000	3.74	0.00	5.18	
96377	Methylcyclopentane	X		84.16	0.65	0.000	1.62	0.00	2.24	
91203	Naphthalene	X	X	128.17	0.107	0.000	0.41	0.00	0.56	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.000	0.27	0.00	0.37	
111842	Nonane	X		128.26	2.37	0.001	8.98	0.00	12.43	

Table C.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2050

Fugitive Emission Estimates

Average LFG Generated =	440	cfm
Average LFG Collection Efficiency =	95%	
Average LFG Collected =	418	cfm
Fugitive Emission Estimates =	22	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.000	1.47	0.00	2.03	
111659	Octane	X		114.23	1.08	0.000	3.64	0.00	5.05	
99876	p-Cymene (1-Methyl-4-Isopropylbenzene)	X		134.22	3.58	0.002	14.19	0.01	19.65	
109660	Pentane	X		72.15	4.46	0.001	9.50	0.00	13.16	
74986	Propane	X		44.1	15.5	0.002	20.19	0.01	27.96	
115071	Propene	X		42.08	3.32	0.000	4.13	0.00	5.71	
74997	Propyne	X		40.06	0.038	0.000	0.04	0.00	0.06	
135988	sec-Butylbenzene	X		134.22	0.0675	0.000	0.27	0.00	0.37	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.000	1.26	0.00	1.75	0.00
127184	Tetrachloroethylene (Perchloroethylene)	X	X	165.83	2.03	0.001	9.94	0.00	13.77	0.00
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.000	2.06	0.00	2.86	
110021	Thiophene	X		84.14	0.349	0.000	0.87	0.00	1.20	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.009	80.28	0.04	111.17	0.04
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	0.08	0.00	0.11	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.000	1.34	0.00	1.85	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.03	0.00	0.04	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.000	0.68	0.00	0.94	
624646	trans-2-Butene	X		56.11	0.104	0.000	0.17	0.00	0.24	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.01	0.00	0.01	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.05	0.00	0.07	
13389429	trans-2-Octene	X		112.21	0.241	0.000	0.80	0.00	1.11	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	0.07	0.00	0.10	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.04	0.00	0.05	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	0.09	0.00	0.13	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.000	3.21	0.00	4.45	0.00
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.000	1.01	0.00	1.39	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.000	0.25	0.00	0.35	0.00
1120214	Undecane	X		156.31	1.67	0.001	7.71	0.00	10.68	
85306269	Vinyl acetate	X	X	86.09	0.248	0.000	0.63	0.00	0.87	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.000	2.62	0.00	3.63	0.00
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.003	28.94	0.01	40.08	0.01
										0.10

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ \text{atm}) \times (\text{Median ppmv})}{(298.15\ \text{K}) \times (0.08206\ \text{L*atm/K*mol})}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate } [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

$$(lb/yr) = (lb/hr) \times (8{,}760\ hours/yr)$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table C.6

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Propane Heating Emissions

Maximum propane combusted per year **11.489** 10^3 gallons

Emission Calculations:						
					Lbs/yr	Tons/yr
PM=	0.70 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**8.042**	**0.00402**
SO_{X} =	0.1 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**1.149**	**0.00057**
NO_{X} =	13 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**149.351**	**0.07468**
VOC =	1 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**11.489**	**0.00574**
CO =	7.5 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**86.164**	**0.04308**
CO_2 =	12,500 lb. X / 10^3 gal	11.488525	10^3 gal propane	=	**143,607**	**71.80328**

* Emissions factors from AP-42 7/2008, section 1.5 (Assume a sulfur content of 1%)

Attachment D

Dunn Landfill Final Emissions

Expected 20yr GWP 2032

Table D.1

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Actual Emissions - 2032

Emission Source	2032 Emissions (tons/year)			
	HAPs	Hi-HAP[1]	Anthropogenic GHG[2]	Biogenic CO_2 [2]
Landfill Fugitive Emissions	0.9	---	42,014	4,273
Utility Flare Combustion Emissions	1.0	1.0	1,438	16,886
Other Small Combustion Sources	---	---	72	---
Totals	**1.9**	**1.0**	**43,524**	**21,159**

Notes:

1 High HAP is HCl.

2 Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO2 eq) using 20-year GWP values stated in 6 NYCRR 496.5.

Table D.2

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare Greenhouse Gas Emissions - 2032

LFG to Utility Flare = 555 cfm

	Operating Hours	Estimated Flare Emissions (TPY)						
		Combustion CO_2	Combustion CH_4	Combustion N_2O	Escape CH_4	Collected CO_2	Biogenic CO_2	Anthropogenic GHG
Utility 750 CFM	8,760	4,524	0.3	0.1	16.7	12,361	16,886	1,438
	Total Emissions (TPY)	4,524	0.3	0.1	16.7	12,361	16,886	1,438
	Total Emissions (lb/yr)	9.05E+06	5.56E+02	1.09E+02	33,344.1	2.47E+07	3.38E+07	2.88E+06

Flare Combustion Factors

	Pounds per Hour of Operation		
	CO_2	CH_4	N_2O
Utility 750 CFM	1,033.0	0.1	0.0

Notes:

Combustion CO_2	Combustion emission factor referenced from Table C-1 of 40 CFR Part 98, Subpart C
Combustion CH_4	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Combustion N_2O	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Escape CH_4	Collected methane that escapes destruction in flare (1% of methane processed)
Collected CO_2	Portion of collected LFG that already contains CO_2 (73% of collected LFG)
Biogenic CO_2	Sum of Combustion CO_2 and Collected CO_2
Anthropogenic GHG	Sum of Combustion CH_4, Combustion N_2O and Escape CH_4 expressed as tons of CO_2 equivalents

Emission Factor Development

Enclosed Flares

	EF (kg/MMBtu)	GWP (20 year)
CO_2	52.07	1
CH_4	3.20E-03	84
N_2O	6.30E-04	264

Heating value[1]	270	Btu/scf
LFG CH_4 Concentration	27	%
CH_4 Destruction Efficiency[2]	99	% (manufacturer guarantee DE for LFG Enclosed Flares)
CH_4 Density	0.0423	pounds per cubic foot (referenced from 40 CFR Part 98, Subpart HH)
CO_2 concentration	73	%
CO_2 density	0.116	pounds per cubic foot

LFG Data:

Heat Input (Utility Flare):	9.0	MMBtu/hr
LFG combusted (Utility Flare):	555	cfm

Table D.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2032

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	555	cfm
LFG Collected to Flares =	555	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	lb/yr	TPY	VOC (TPY)	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.003	24.17	0.01	1.33	98.0%	0.0001	0.48	0.00	0.00	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.008	66.95	0.03	3.67	98.0%	0.0002	1.34	0.00	0.00	0.00
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.68	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane	X		187.37	0.0672	0.001	9.39	0.00	0.51	98.0%	0.0000	0.19	0.00	0.00	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.002	15.71	0.01	0.86	98.0%	0.0000	0.31	0.00	0.00	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.018	153.47	0.08	8.42	98.0%	0.0004	3.07	0.00	0.00	0.00
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.001	11.56	0.01	0.63	98.0%	0.0000	0.23	0.00	0.00	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.004	32.17	0.02	1.76	98.0%	0.0001	0.64	0.00	0.00	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.75	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.014	122.77	0.06	6.73	98.0%	0.0003	2.46	0.00	0.00	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.67	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethar	X		170.92	0.106	0.002	13.51	0.01	0.74	98.0%	0.0000	0.27	0.00	0.00	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.001	11.73	0.01	0.64	98.0%	0.0000	0.23	0.00	0.00	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.094	823.94	0.41	45.20	98.0%	0.0019	16.48	0.01	0.01	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.001	4.38	0.00	0.24	98.0%	0.0000	0.09	0.00	0.00	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	1.99	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.006	55.83	0.03	3.06	98.0%	0.0001	1.12	0.00	0.00	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.001	6.69	0.00	0.37	98.0%	0.0000	0.13	0.00	0.00	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.001	6.55	0.00	0.36	98.0%	0.0000	0.13	0.00	0.00	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.003	26.22	0.01	1.44	98.0%	0.0001	0.52	0.00	0.00	
123911	1,4-Dioxane (1,4-Diethylene dioxide	X	X	88.11	0.00829	0.000	0.54	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.007	63.79	0.03	3.50	98.0%	0.0001	1.28	0.00	0.00	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.005	46.02	0.02	2.52	98.0%	0.0001	0.92	0.00	0.00	
622968	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.989	0.010	88.62	0.04	4.86	98.0%	0.0002	1.77	0.00	0.00	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.579	0.006	51.88	0.03	2.85	98.0%	0.0001	1.04	0.00	0.00	
592767	1-Heptene	X		98.19	0.625	0.005	45.75	0.02	2.51	98.0%	0.0001	0.92	0.00	0.00	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.001	5.57	0.00	0.31	98.0%	0.0000	0.11	0.00	0.00	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	1.63	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	1.54	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
109671	1-Pentene	X		70.13	0.22	0.001	11.50	0.01	0.63	98.0%	0.0000	0.23	0.00	0.00	
107039	1-Propanethiol (n-Propyl mercaptan	X		76.16	0.125	0.001	7.10	0.00	0.39	98.0%	0.0000	0.14	0.00	0.00	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.69	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.006	52.29	0.03	2.87	98.0%	0.0001	1.05	0.00	0.00	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.002	14.92	0.01	0.82	98.0%	0.0000	0.30	0.00	0.00	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.001	10.02	0.01	0.55	98.0%	0.0000	0.20	0.00	0.00	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.001	4.54	0.00	0.25	98.0%	0.0000	0.09	0.00	0.00	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	1.47	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.003	26.57	0.01	1.46	98.0%	0.0001	0.53	0.00	0.00	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.001	10.73	0.01	0.59	98.0%	0.0000	0.21	0.00	0.00	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.003	23.16	0.01	1.27	98.0%	0.0001	0.46	0.00	0.00	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.002	18.91	0.01	1.04	98.0%	0.0000	0.38	0.00	0.00	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.001	7.47	0.00	0.41	98.0%	0.0000	0.15	0.00	0.00	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.002	14.14	0.01	0.78	98.0%	0.0000	0.28	0.00	0.00	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.001	5.39	0.00	0.30	98.0%	0.0000	0.11	0.00	0.00	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.025	215.59	0.11	11.83	98.0%	0.0005	4.31	0.00	0.00	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	1.11	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
872559	2-Ethylthiophene	X		112.19	0.0629	0.001	5.26	0.00	0.29	98.0%	0.0000	0.11	0.00	0.00	
611143	2-Ethyltoluene	X		120.19	0.323	0.003	28.94	0.01	1.59	98.0%	0.0001	0.58	0.00	0.00	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.005	45.78	0.02	2.51	98.0%	0.0001	0.92	0.00	0.00	
563462	2-Methyl-1-butene	X		70.13	0.179	0.001	9.36	0.00	0.51	98.0%	0.0000	0.19	0.00	0.00	
513440	2-Methyl-1-propanethiol (Isobutyl me	X		90.19	0.17	0.001	11.43	0.01	0.63	98.0%	0.0000	0.23	0.00	0.00	
513359	2-Methyl-2-butene	X		70.13	0.303	0.002	15.84	0.01	0.87	98.0%	0.0000	0.32	0.00	0.00	
75661	2-Methyl-2-propanethiol (tert-Butylm	X		90.19	0.325	0.002	21.85	0.01	1.20	98.0%	0.0000	0.44	0.00	0.00	
78784	2-Methylbutane	X		72.15	2.26	0.014	121.57	0.06	6.67	98.0%	0.0003	2.43	0.00	0.00	
592278	2-Methylheptane	X		114.23	0.716	0.007	60.98	0.03	3.35	98.0%	0.0001	1.22	0.00	0.00	
591764	2-Methylhexane	X		100.2	0.816	0.007	60.96	0.03	3.34	98.0%	0.0001	1.22	0.00	0.00	
107835	2-Methylpentane	X		86.18	0.688	0.005	44.21	0.02	2.43	98.0%	0.0001	0.88	0.00	0.00	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.009	80.66	0.04	4.42	98.0%	0.0002	1.61	0.00	0.00	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.010	83.27	0.04	4.57	98.0%	0.0002	1.67	0.00	0.00	
620144	3-Ethyltoluene	X		120.19	0.78	0.008	69.90	0.03	3.83	98.0%	0.0002	1.40	0.00	0.00	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.44	0.00	0.02	98.0%	0.0000	0.01	0.00	0.00	
589811	3-Methylheptane	X		114.23	0.763	0.007	64.98	0.03	3.56	98.0%	0.0001	1.30	0.00	0.00	
589344	3-Methylhexane	X		100.2	1.13	0.010	84.42	0.04	4.63	98.0%	0.0002	1.69	0.00	0.00	
96140	3-Methylpentane	X		86.18	0.74	0.005	47.55	0.02	2.61	98.0%	0.0001	0.95	0.00	0.00	
616444	3-Methylthiophene	X		98.17	0.0925	0.001	6.77	0.00	0.37	98.0%	0.0000	0.14	0.00	0.00	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	1.46	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.008	65.94	0.03	3.62	98.0%	0.0002	1.32	0.00	0.00	0.00
589537	4-Methylheptane	X		114.23	0.249	0.002	21.21	0.01	1.16	98.0%	0.0000	0.42	0.00	0.00	
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	2.54	0.00	0.14	98.0%	0.0000	0.05	0.00	0.00	0.00
67641	Acetone			58.08	6.7	0.033	290.13	0.15	15.92	98.0%	0.0007	5.80	0.00		
75058	Acetonitrile	X	X	41.05	0.556	0.002	17.02	0.01	0.93	98.0%	0.0000	0.34	0.00	0.00	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.79	0.00	0.04	98.0%	0.0000	0.02	0.00	0.00	0.00
71432	Benzene	X	X	78.11	2.4	0.016	139.77	0.07	7.67	98.0%	0.0003	2.80	0.00	0.00	0.00

Table D.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2032

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	555	cfm
LFG Collected to Flares =	555	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	lb/yr	TPY	VOC (TPY)	HAP (TPY)
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	1.71	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	1.07	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	1.49	0.00	0.08	98.0%	0.0000	0.03	0.00	0.00	0.00
106978	Butane	X		58.12	6.22	0.031	269.53	0.13	14.79	98.0%	0.0006	5.39	0.00	0.00	
75150	Carbon disulfide	X	X	76.14	0.147	0.001	8.34	0.00	0.46	98.0%	0.0000	0.17	0.00	0.00	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.92	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.001	9.91	0.00	0.54	98.0%	0.0000	0.20	0.00	0.00	
463581	Carbonyl sulfide (Carbon oxysulfide	X	X	60.08	0.122	0.001	5.46	0.00	0.30	98.0%	0.0000	0.11	0.00	0.00	0.00
108907	Chlorobenzene	X		112.56	0.484	0.005	40.62	0.02	2.23	98.0%	0.0001	0.81	0.00	0.00	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.006	51.32	0.03	2.82	98.0%	0.0001	1.03	0.00	0.00	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.022	189.98	0.09	10.42	98.0%	0.0004	3.80	0.00	0.00	0.00
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.001	9.19	0.00	0.50	98.0%	0.0000	0.18	0.00	0.00	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.010	89.62	0.04	4.92	98.0%	0.0002	1.79	0.00	0.00	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.001	6.78	0.00	0.37	98.0%	0.0000	0.14	0.00	0.00	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.25	0.00	0.01	98.0%	0.0000	0.01	0.00	0.00	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.005	41.91	0.02	2.30	98.0%	0.0001	0.84	0.00	0.00	
24293 / 220703(	cis-1,4-Dimethylcyclohexane / trans-	X		112.21	0.248	0.002	20.75	0.01	1.14	98.0%	0.0000	0.41	0.00	0.00	
590181	cis-2-Butene	X		56.11	0.105	0.001	4.39	0.00	0.24	98.0%	0.0000	0.09	0.00	0.00	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	1.79	0.00	0.10	98.0%	0.0000	0.04	0.00	0.00	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	1.08	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
7642048	cis-2-Octene	X		112.21	0.22	0.002	18.41	0.01	1.01	98.0%	0.0000	0.37	0.00	0.00	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	2.50	0.00	0.14	98.0%	0.0000	0.05	0.00	0.00	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	1.12	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
110827	Cyclohexane	X		84.16	1.01	0.007	63.37	0.03	3.48	98.0%	0.0001	1.27	0.00	0.00	
110838	Cyclohexene	X		82.14	0.0184	0.000	1.13	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
287923	Cyclopentane	X		70.13	0.0221	0.000	1.16	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.61	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	
124185	Decane	X		142.28	3.8	0.046	403.10	0.20	22.11	98.0%	0.0009	8.06	0.00	0.00	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	2.34	0.00	0.13	98.0%	0.0000	0.05	0.00	0.00	
74953	Dibromomethane (Methylene dibron	X		173.84	0.000835	0.000	0.11	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
106467	Dichlorobenzene	X	X	147	0.94	0.012	103.02	0.05	5.65	98.0%	0.0002	2.06	0.00	0.00	0.00
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.012	106.37	0.05	5.84	98.0%	0.0002	2.13	0.00	0.00	
75092	Dichloromethane (Methylene chlorid	X	X	84.93	6.15	0.044	389.43	0.19	21.36	98.0%	0.0009	7.79	0.00	0.00	0.00
352932	Diethyl sulfide	X		90.19	0.0862	0.001	5.80	0.00	0.32	98.0%	0.0000	0.12	0.00	0.00	
624920	Dimethyl disulfide	X		94.2	0.137	0.001	9.62	0.00	0.53	98.0%	0.0000	0.19	0.00	0.00	
75183	Dimethyl sulfide	X		62.14	5.66	0.030	262.23	0.13	14.38	98.0%	0.0006	5.24	0.00	0.00	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.003	28.07	0.01	1.54	98.0%	0.0001	0.56	0.00	0.00	
74840	Ethane	X		30.07	9.05	0.023	202.89	0.10	11.13	98.0%	0.0005	4.06	0.00	0.00	
64175	Ethanol	X		46.07	0.23	0.001	7.90	0.00	0.43	98.0%	0.0000	0.16	0.00	0.00	
141786	Ethyl acetate	X		88.11	1.88	0.014	123.50	0.06	6.77	98.0%	0.0003	2.47	0.00	0.00	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.001	9.17	0.00	0.50	98.0%	0.0000	0.18	0.00	0.00	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	2.08	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
100414	Ethylbenzene	X	X	106.17	4.86	0.044	384.70	0.19	21.10	98.0%	0.0009	7.69	0.00	0.00	0.00
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.26	0.00	0.01	98.0%	0.0000	0.01	0.00	0.00	0.00
142825	Heptane	X		100.2	1.34	0.011	100.11	0.05	5.49	98.0%	0.0002	2.00	0.00	0.00	
110543	Hexane	X	X	86.18	3.1	0.023	199.19	0.10	10.93	98.0%	0.0005	3.98	0.00	0.00	0.00
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	1.69	0.00	0.09	98.0%	0.0000	0.03	0.00	0.00	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.040	353.59	0.18	19.40	98.0%	0.0008	7.07	0.00	0.00	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	4.07	0.00	0.22	98.0%	0.0000	0.08	0.00	0.00	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.84	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	
75332	Isopropyl mercaptan	X		76.16	0.175	0.001	9.94	0.00	0.55	98.0%	0.0000	0.20	0.00	0.00	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.004	38.53	0.02	2.11	98.0%	0.0001	0.77	0.00	0.00	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.02	0.00	0.00	0.0%	0.0000	0.02	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.006	49.14	0.02	2.70	98.0%	0.0001	0.98	0.00	0.00	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.001	7.76	0.00	0.43	98.0%	0.0000	0.16	0.00	0.00	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.011	94.44	0.05	5.18	98.0%	0.0002	1.89	0.00	0.00	
96377	Methylcyclopentane	X		84.16	0.65	0.005	40.79	0.02	2.24	98.0%	0.0001	0.82	0.00	0.00	
91203	Naphthalene	X	X	128.17	0.107	0.001	10.22	0.01	0.56	98.0%	0.0000	0.20	0.00	0.00	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.001	6.80	0.00	0.37	98.0%	0.0000	0.14	0.00	0.00	
111842	Nonane	X		128.26	2.37	0.026	226.64	0.11	12.43	98.0%	0.0005	4.53	0.00	0.00	
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.004	37.01	0.02	2.03	98.0%	0.0001	0.74	0.00	0.00	
111659	Octane	X		114.23	1.08	0.010	91.98	0.05	5.05	98.0%	0.0002	1.84	0.00	0.00	
99876	p-Cymene (1-Methyl-4-Isopropylben	X		134.22	3.58	0.041	358.25	0.18	19.65	98.0%	0.0008	7.17	0.00	0.00	
109660	Pentane	X		72.15	4.46	0.027	239.92	0.12	13.16	98.0%	0.0005	4.80	0.00	0.00	
74986	Propane	X		44.1	15.5	0.058	509.63	0.25	27.96	98.0%	0.0012	10.19	0.01	0.01	
115071	Propene	X		42.08	3.32	0.012	104.16	0.05	5.71	98.0%	0.0002	2.08	0.00	0.00	
74997	Propyne	X		40.06	0.038	0.000	1.13	0.00	0.06	98.0%	0.0000	0.02	0.00	0.00	
135988	sec-Butylbenzene	X		134.22	0.0675	0.001	6.75	0.00	0.37	98.0%	0.0000	0.14	0.00	0.00	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.004	31.91	0.02	1.75	98.0%	0.0001	0.64	0.00	0.00	0.00
127184	Tetrachloroethylene (Perchloroethyl	X	X	165.83	2.03	0.029	250.99	0.13	13.77	98.0%	0.0006	5.02	0.00	0.00	0.00

Table D.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2032

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	555	cfm
LFG Collected to Flares =	555	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	Uncontrolled Emissions mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.006	52.10	0.03	2.86	98.0%	0.0001	1.04	0.00	0.00	
110021	Thiophene	X		84.14	0.349	0.002	21.89	0.01	1.20	98.0%	0.0000	0.44	0.00	0.00	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.231	2026.56	1.01	111.17	98.0%	0.0046	40.53	0.02	0.02	0.02
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	2.07	0.00	0.11	98.0%	0.0000	0.04	0.00	0.00	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.004	33.80	0.02	1.85	98.0%	0.0001	0.68	0.00	0.00	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.78	0.00	0.04	98.0%	0.0000	0.02	0.00	0.00	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.002	17.15	0.01	0.94	98.0%	0.0000	0.34	0.00	0.00	
624646	trans-2-Butene	X		56.11	0.104	0.000	4.35	0.00	0.24	98.0%	0.0000	0.09	0.00	0.00	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.18	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	1.29	0.00	0.07	98.0%	0.0000	0.03	0.00	0.00	
13389429	trans-2-Octene	X		112.21	0.241	0.002	20.16	0.01	1.11	98.0%	0.0000	0.40	0.00	0.00	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	1.81	0.00	0.10	98.0%	0.0000	0.04	0.00	0.00	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.97	0.00	0.05	98.0%	0.0000	0.02	0.00	0.00	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	2.34	0.00	0.13	98.0%	0.0000	0.05	0.00	0.00	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.009	81.11	0.04	4.45	98.0%	0.0002	1.62	0.00	0.00	0.00
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.003	25.40	0.01	1.39	98.0%	0.0001	0.51	0.00	0.00	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.001	6.30	0.00	0.35	98.0%	0.0000	0.13	0.00	0.00	0.00
1120214	Undecane	X		156.31	1.67	0.022	194.62	0.10	10.68	98.0%	0.0004	3.89	0.00	0.00	
85306269	Vinyl acetate	X	X	86.09	0.248	0.002	15.92	0.01	0.87	98.0%	0.0000	0.32	0.00	0.00	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.008	66.17	0.03	3.63	98.0%	0.0002	1.32	0.00	0.00	0.00
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.083	730.62	0.37	40.08	98.0%	0.0017	14.61	0.01	0.01	0.01
7647-01-0	HCl		X	35.45	74	0.223	1955.86	0.98	107.29	0.0%	0.2233	1955.86	0.98		0.98
															1.03

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

[2] Control efficiency of 98% applied for flares

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ \text{atm}) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L{*}atm/K{*}mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate}\ [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

$$(lb/yr) = (lb/hr) \times (8{,}760\ hours/yr)$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

(Controlled Emissions) = (Uncontrolled Emissions) x (100% - Average Control [%])

Table D.4

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive Emissions - 2032

Year	Total LFG Generated (cfm)	Collection Efficiency (%)	LFG to Collection System (cfm)	Fugitive LFG (cfm)	Fugitive LFG (ft^3/yr)	Fugitive LFG (m^3/yr)	Fugitive HAP Emissions (TPY)	Fugitive CH_4 Emissions (TPY)	Oxidized CO_2 Emissions (TPY)	Fugitive Biogenic CO_2 Emissions (TPY)	Total Anthropogenic GHG Emissions (TPY)
2032	741	75%	555	185	97,318,016	2,755,739	0.9	500.2	152.4	4,272.8	42,014

Notes:

Total landfill gas (LFG) Generated in average cubic feet per minute (cfm) from Methane Generation Model (according to 40 CFR 98, Subpart HH)
Collection efficiency of 95% assumed for gas collection system based on final cover applied to entire landfill area
LFG to Collection System = (Total LFG Generated) * (Collection Efficiency (%))
Fugitive LFG = (Total LFG Generated) * (100% - Collection Efficiency (%))
Fugitive LFG (ft^3/yr) = (Fugitive LFG (cfm)) * (60 minutes per hour) * (8,760 hours per year)
Fugitive LFG (m^3/yr) = (Fugitive LFG (ft^3/yr)) / (35.3147 cubic feet per cubic meter)
Total Fugitive HAP Emissions determined from sum of individual speciated HAPs (see Table D.5)
Fugitive CH_4 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.0423 lb CH4 / ft^3 CH_4] * [90% oxidation factor] / [2,000 lb/ton]
Oxidized CO_2 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.116 lb CO_2 / ft^3 CH_4] * [10% oxidized] / [2,000 lb/ton]
Fugitive Biogenic emissions (TPY) = { [Fugitive LFG (ft^3/yr)] * [73% CO_2] * [0.116 lb CO_2 / ft^3 CO_2] / [2,000 lb/ton] } + Oxidized CO_2 Emissions
Total Fugitive Anthropogenic GHG Emissions (tons CO_2 equivalents / year) = [Fugitive CH4 Emissions (TPY)] * 84

Equations:

$$(mg/m^3) = \frac{(ppm) \times (\text{Molecular weight } (g / mol)) \times (1\ atm)}{(298.15\ K) \times (0.08206\ L{*}atm/K{*}mol)}$$ (assuming standard conditions of 1 atmosphere and 25° Celsius)

$$(lb/yr) = (\text{Fugitive LFG Emission rate } [m^3/year]) \times (mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg])$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table D.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2032

Fugitive Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	555	cfm
Fugitive Emission Estimates =	185	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.001	8.06	0.00	1.33	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.003	22.32	0.01	3.67	0.01
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.23	0.00	0.04	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	X		187.37	0.0672	0.000	3.13	0.00	0.51	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.001	5.24	0.00	0.86	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.006	51.16	0.03	8.42	0.03
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.000	3.85	0.00	0.63	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.001	10.72	0.01	1.76	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.25	0.00	0.04	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.005	40.92	0.02	6.73	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.22	0.00	0.04	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114	X		170.92	0.106	0.001	4.50	0.00	0.74	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.000	3.91	0.00	0.64	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.031	274.65	0.14	45.20	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	1.46	0.00	0.24	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	0.66	0.00	0.11	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.002	18.61	0.01	3.06	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.000	2.23	0.00	0.37	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.000	2.18	0.00	0.36	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.001	8.74	0.00	1.44	
123911	1,4-Dioxane (1,4-Diethylene dioxide)	X	X	88.11	0.00829	0.000	0.18	0.00	0.03	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.002	21.26	0.01	3.50	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.002	15.34	0.01	2.52	
622968	1-Ethyl-4-methylbenzene (4-Ethyl toluene)	X		120.19	0.989	0.003	29.54	0.01	4.86	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl toluene) + 1,3,5	X		120.19	0.579	0.002	17.29	0.01	2.85	
592767	1-Heptene	X		98.19	0.625	0.002	15.25	0.01	2.51	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	1.86	0.00	0.31	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	0.54	0.00	0.09	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	0.51	0.00	0.08	
109671	1-Pentene	X		70.13	0.22	0.000	3.83	0.00	0.63	
107039	1-Propanethiol (n-Propyl mercaptan)	X		76.16	0.125	0.000	2.37	0.00	0.39	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.23	0.00	0.04	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.002	17.43	0.01	2.87	0.01
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.001	4.97	0.00	0.82	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.000	3.34	0.00	0.55	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	1.51	0.00	0.25	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	0.49	0.00	0.08	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.001	8.86	0.00	1.46	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.000	3.58	0.00	0.59	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.001	7.72	0.00	1.27	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.001	6.30	0.00	1.04	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.000	2.49	0.00	0.41	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.001	4.71	0.00	0.78	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	1.80	0.00	0.30	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.008	71.86	0.04	11.83	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.37	0.00	0.06	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	1.75	0.00	0.29	
611143	2-Ethyltoluene	X		120.19	0.323	0.001	9.65	0.00	1.59	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.002	15.26	0.01	2.51	
563462	2-Methyl-1-butene	X		70.13	0.179	0.000	3.12	0.00	0.51	
513440	2-Methyl-1-propanethiol (Isobutyl mercaptan)	X		90.19	0.17	0.000	3.81	0.00	0.63	
513359	2-Methyl-2-butene	X		70.13	0.303	0.001	5.28	0.00	0.87	
75661	2-Methyl-2-propanethiol (tert-Butylmercaptan)	X		90.19	0.325	0.001	7.28	0.00	1.20	
78784	2-Methylbutane	X		72.15	2.26	0.005	40.52	0.02	6.67	
592278	2-Methylheptane	X		114.23	0.716	0.002	20.33	0.01	3.35	
591764	2-Methylhexane	X		100.2	0.816	0.002	20.32	0.01	3.34	
107835	2-Methylpentane	X		86.18	0.688	0.002	14.74	0.01	2.43	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.003	26.89	0.01	4.42	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.003	27.76	0.01	4.57	
620144	3-Ethyltoluene	X		120.19	0.78	0.003	23.30	0.01	3.83	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.15	0.00	0.02	
589811	3-Methylheptane	X		114.23	0.763	0.002	21.66	0.01	3.56	
589344	3-Methylhexane	X		100.2	1.13	0.003	28.14	0.01	4.63	
96140	3-Methylpentane	X		86.18	0.74	0.002	15.85	0.01	2.61	
616444	3-Methylthiophene	X		98.17	0.0925	0.000	2.26	0.00	0.37	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	0.49	0.00	0.08	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.003	21.98	0.01	3.62	0.01
589537	4-Methylheptane	X		114.23	0.249	0.001	7.07	0.00	1.16	

Table D.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2032

Fugitive Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	555	cfm
Fugitive Emission Estimates =	185	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	0.85	0.00	0.14	0.00
67641	Acetone			58.08	6.7	0.011	96.71	0.05	15.92	
75058	Acetonitrile	X	X	41.05	0.556	0.001	5.67	0.00	0.93	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.26	0.00	0.04	0.00
71432	Benzene	X	X	78.11	2.4	0.005	46.59	0.02	7.67	0.02
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	0.57	0.00	0.09	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.36	0.00	0.06	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	0.50	0.00	0.08	0.00
106978	Butane	X		58.12	6.22	0.010	89.84	0.04	14.79	
75150	Carbon disulfide	X	X	76.14	0.147	0.000	2.78	0.00	0.46	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.31	0.00	0.05	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.000	3.30	0.00	0.54	
463581	Carbonyl sulfide (Carbon oxysulfide)	X	X	60.08	0.122	0.000	1.82	0.00	0.30	0.00
108907	Chlorobenzene	X		112.56	0.484	0.002	13.54	0.01	2.23	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.002	17.11	0.01	2.82	0.01
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.007	63.33	0.03	10.42	0.03
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.000	3.06	0.00	0.50	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.003	29.87	0.01	4.92	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.000	2.26	0.00	0.37	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.08	0.00	0.01	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.002	13.97	0.01	2.30	
24293 / 220703	cis-1,4-Dimethylcyclohexane / trans-1,3-Dimethylc	X		112.21	0.248	0.001	6.92	0.00	1.14	
590181	cis-2-Butene	X		56.11	0.105	0.000	1.46	0.00	0.24	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	0.60	0.00	0.10	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.36	0.00	0.06	
7642048	cis-2-Octene	X		112.21	0.22	0.001	6.14	0.00	1.01	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	0.83	0.00	0.14	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.37	0.00	0.06	
110827	Cyclohexane	X		84.16	1.01	0.002	21.12	0.01	3.48	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.38	0.00	0.06	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.39	0.00	0.06	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.20	0.00	0.03	
124185	Decane	X		142.28	3.8	0.015	134.37	0.07	22.11	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	0.78	0.00	0.13	
74953	Dibromomethane (Methylene dibromide)	X		173.84	0.000835	0.000	0.04	0.00	0.01	
106467	Dichlorobenzene	X	X	147	0.94	0.004	34.34	0.02	5.65	0.02
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.004	35.46	0.02	5.84	
75092	Dichloromethane (Methylene chloride)	X	X	84.93	6.15	0.015	129.81	0.06	21.36	0.06
352932	Diethyl sulfide	X		90.19	0.0862	0.000	1.93	0.00	0.32	
624920	Dimethyl disulfide	X		94.2	0.137	0.000	3.21	0.00	0.53	
75183	Dimethyl sulfide	X		62.14	5.66	0.010	87.41	0.04	14.38	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.001	9.36	0.00	1.54	
74840	Ethane	X		30.07	9.05	0.008	67.63	0.03	11.13	
64175	Ethanol	X		46.07	0.23	0.000	2.63	0.00	0.43	
141786	Ethyl acetate	X		88.11	1.88	0.005	41.17	0.02	6.77	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.000	3.06	0.00	0.50	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	0.69	0.00	0.11	
100414	Ethylbenzene	X	X	106.17	4.86	0.015	128.23	0.06	21.10	0.06
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.09	0.00	0.01	0.00
142825	Heptane	X		100.2	1.34	0.004	33.37	0.02	5.49	
110543	Hexane	X	X	86.18	3.1	0.008	66.40	0.03	10.93	0.03
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	0.56	0.00	0.09	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.013	117.86	0.06	19.40	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	1.36	0.00	0.22	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.28	0.00	0.05	
75332	Isopropyl mercaptan	X		76.16	0.175	0.000	3.31	0.00	0.55	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.001	12.84	0.01	2.11	0.01
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.01	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.00	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.002	16.38	0.01	2.70	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.000	2.59	0.00	0.43	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.004	31.48	0.02	5.18	
96377	Methylcyclopentane	X		84.16	0.65	0.002	13.60	0.01	2.24	
91203	Naphthalene	X	X	128.17	0.107	0.000	3.41	0.00	0.56	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.000	2.27	0.00	0.37	
111842	Nonane	X		128.26	2.37	0.009	75.55	0.04	12.43	

Table D.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2032

Fugitive Emission Estimates

Average LFG Generated =	741	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	555	cfm
Fugitive Emission Estimates =	185	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.001	12.34	0.01	2.03	
111659	Octane	X		114.23	1.08	0.003	30.66	0.02	5.05	
99876	p-Cymene (1-Methyl-4-Isopropylbenzene)	X		134.22	3.58	0.014	119.42	0.06	19.65	
109660	Pentane	X		72.15	4.46	0.009	79.97	0.04	13.16	
74986	Propane	X		44.1	15.5	0.019	169.88	0.08	27.96	
115071	Propene	X		42.08	3.32	0.004	34.72	0.02	5.71	
74997	Propyne	X		40.06	0.038	0.000	0.38	0.00	0.06	
135988	sec-Butylbenzene	X		134.22	0.0675	0.000	2.25	0.00	0.37	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.001	10.64	0.01	1.75	0.01
127184	Tetrachloroethylene (Perchloroethylene)	X	X	165.83	2.03	0.010	83.66	0.04	13.77	0.04
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.002	17.37	0.01	2.86	
110021	Thiophene	X		84.14	0.349	0.001	7.30	0.00	1.20	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.077	675.52	0.34	111.17	0.34
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	0.69	0.00	0.11	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.001	11.27	0.01	1.85	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.26	0.00	0.04	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.001	5.72	0.00	0.94	
624646	trans-2-Butene	X		56.11	0.104	0.000	1.45	0.00	0.24	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.06	0.00	0.01	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.43	0.00	0.07	
13389429	trans-2-Octene	X		112.21	0.241	0.001	6.72	0.00	1.11	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	0.60	0.00	0.10	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.32	0.00	0.05	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	0.78	0.00	0.13	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.003	27.04	0.01	4.45	0.01
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.001	8.47	0.00	1.39	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.000	2.10	0.00	0.35	0.00
1120214	Undecane	X		156.31	1.67	0.007	64.87	0.03	10.68	
85306269	Vinyl acetate	X	X	86.09	0.248	0.001	5.31	0.00	0.87	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.003	22.06	0.01	3.63	0.01
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.028	243.54	0.12	40.08	0.12
										0.86

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ \text{atm}) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L*atm/K*mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate } [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

$$(lb/yr) = (lb/hr) \times (8{,}760\ hours/yr)$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table D.6

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Propane Heating Emissions

Maximum propane combusted per year **11.489** 10^3 gallons

Emission Calculations:					
				Lbs/yr	Tons/yr
PM=	0.70 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**8.042**	**0.00402**
SO_X =	0.1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**1.149**	**0.00057**
NO_X =	13 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**149.351**	**0.07468**
VOC =	1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**11.489**	**0.00574**
CO =	7.5 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**86.164**	**0.04308**
CO_2 =	12,500 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**143,607**	**71.80328**

* Emissions factors from AP-42 7/2008, section 1.5 (Assume a sulfur content of 1%)

Attachment E

Dunn Landfill Final Emissions

Expected 20yr GWP 2023

Table E.1

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Actual Emissions - 2023

Emission Source	2023 Emissions (tons/year)			
	HAPs	Hi-HAP[1]	Anthropogenic GHG[2]	Biogenic CO_2 [2]
Landfill Fugitive Emissions	0.4	---	21,292	2,165
Utility Flare Combustion Emissions	0.5	0.50	729	8,558
Other Small Combustion Sources	---	---	72	---
Totals	**1.0**	**0.5**	**22,093**	**10,723**

Notes:

[1] High HAP is HCl.

[2] Total greenhouse gas emissions are expressed as tons of carbon dioxide equivalents (tons CO2 eq) using 20-year GWP values stated in 6 NYCRR 496.5.

Table E.2

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare Greenhouse Gas Emissions - 2023

LFG to Utility Flare = 282 cfm

	Operating Hours	Estimated Flare Emissions (TPY)						
		Combustion CO_2	Combustion CH_4	Combustion N_2O	Escape CH_4	Collected CO_2	Biogenic CO_2	Anthropogenic GHG
Utility 750 CFM	8,760	2,293	0.1	0.0	8.4	6,265	8,558	729
	Total Emissions (TPY)	2,293	0.1	0.0	8.4	6,265	8,558	729
	Total Emissions (lb/yr)	4.59E+06	2.82E+02	5.55E+01	16,898.6	1.25E+07	1.71E+07	1.46E+06

Flare Combustion Factors

	Pounds per Hour of Operation		
	CO_2	CH_4	N_2O
Utility 750 CFM	523.5	0.0	0.0

Notes:

Combustion CO_2	Combustion emission factor referenced from Table C-1 of 40 CFR Part 98, Subpart C
Combustion CH_4	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Combustion N_2O	Combustion emission factor referenced from Table C-2 of 40 CFR Part 98, Subpart C
Escape CH_4	Collected methane that escapes destruction in flare (1% of methane processed)
Collected CO_2	Portion of collected LFG that already contains CO_2 (73% of collected LFG)
Biogenic CO_2	Sum of Combustion CO_2 and Collected CO_2
Anthropogenic GHG	Sum of Combustion CH_4, Combustion N_2O and Escape CH_4 expressed as tons of CO_2 equivalents

Emission Factor Development

Enclosed Flares

	EF (kg/MMBtu)	GWP (20 year)
CO_2	52.07	1
CH_4	3.20E-03	84
N_2O	6.30E-04	264

Heating value	270	Btu/scf
LFG CH_4 Concentration	27	%
CH_4 Destruction Efficiency	99	% (manufacturer guarantee DE for LFG Enclosed Flares)
CH_4 Density	0.0423	pounds per cubic foot (referenced from 40 CFR Part 98, Subpart HH)
CO_2 concentration	73	%
CO_2 density	0.116	pounds per cubic foot

LFG Data:

Heat Input (Utility Flare):	4.6	MMBtu/hr
LFG combusted (Utility Flare):	282	cfm

Table E.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2023

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	282	cfm
LFG Collected to Flares =	282	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	Uncontrolled Emissions mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.001	12.25	0.01	1.33	98.0%	0.0000	0.24	0.00	0.00	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.004	33.93	0.02	3.67	98.0%	0.0001	0.68	0.00	0.00	0.00
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.34	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane	X		187.37	0.0672	0.001	4.76	0.00	0.51	98.0%	0.0000	0.10	0.00	0.00	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.001	7.96	0.00	0.86	98.0%	0.0000	0.16	0.00	0.00	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.009	77.78	0.04	8.42	98.0%	0.0002	1.56	0.00	0.00	0.00
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.001	5.86	0.00	0.63	98.0%	0.0000	0.12	0.00	0.00	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.002	16.30	0.01	1.76	98.0%	0.0000	0.33	0.00	0.00	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.38	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.007	62.22	0.03	6.73	98.0%	0.0001	1.24	0.00	0.00	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.34	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethar	X		170.92	0.106	0.001	6.85	0.00	0.74	98.0%	0.0000	0.14	0.00	0.00	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.001	5.95	0.00	0.64	98.0%	0.0000	0.12	0.00	0.00	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.048	417.57	0.21	45.20	98.0%	0.0010	8.35	0.00	0.00	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	2.22	0.00	0.24	98.0%	0.0000	0.04	0.00	0.00	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	1.01	0.00	0.11	98.0%	0.0000	0.02	0.00	0.00	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.003	28.29	0.01	3.06	98.0%	0.0001	0.57	0.00	0.00	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.000	3.39	0.00	0.37	98.0%	0.0000	0.07	0.00	0.00	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.000	3.32	0.00	0.36	98.0%	0.0000	0.07	0.00	0.00	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.002	13.29	0.01	1.44	98.0%	0.0000	0.27	0.00	0.00	
123911	1,4-Dioxane (1,4-Diethylene dioxide	X	X	88.11	0.00829	0.000	0.28	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.004	32.33	0.02	3.50	98.0%	0.0001	0.65	0.00	0.00	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.003	23.32	0.01	2.52	98.0%	0.0001	0.47	0.00	0.00	
622968	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.989	0.005	44.91	0.02	4.86	98.0%	0.0001	0.90	0.00	0.00	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl to	X		120.19	0.579	0.003	26.29	0.01	2.85	98.0%	0.0001	0.53	0.00	0.00	
592767	1-Heptene	X		98.19	0.625	0.003	23.19	0.01	2.51	98.0%	0.0001	0.46	0.00	0.00	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	2.82	0.00	0.31	98.0%	0.0000	0.06	0.00	0.00	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	0.82	0.00	0.09	98.0%	0.0000	0.02	0.00	0.00	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	0.78	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	
109671	1-Pentene	X		70.13	0.22	0.001	5.83	0.00	0.63	98.0%	0.0000	0.12	0.00	0.00	
107039	1-Propanethiol (n-Propyl mercaptan	X		76.16	0.125	0.000	3.60	0.00	0.39	98.0%	0.0000	0.07	0.00	0.00	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.35	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.003	26.50	0.01	2.87	98.0%	0.0001	0.53	0.00	0.00	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.001	7.56	0.00	0.82	98.0%	0.0000	0.15	0.00	0.00	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.001	5.08	0.00	0.55	98.0%	0.0000	0.10	0.00	0.00	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	2.30	0.00	0.25	98.0%	0.0000	0.05	0.00	0.00	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	0.75	0.00	0.08	98.0%	0.0000	0.01	0.00	0.00	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.002	13.47	0.01	1.46	98.0%	0.0000	0.27	0.00	0.00	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.001	5.44	0.00	0.59	98.0%	0.0000	0.11	0.00	0.00	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.001	11.74	0.01	1.27	98.0%	0.0000	0.23	0.00	0.00	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.001	9.58	0.00	1.04	98.0%	0.0000	0.19	0.00	0.00	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.000	3.79	0.00	0.41	98.0%	0.0000	0.08	0.00	0.00	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.001	7.16	0.00	0.78	98.0%	0.0000	0.14	0.00	0.00	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	2.73	0.00	0.30	98.0%	0.0000	0.05	0.00	0.00	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.012	109.26	0.05	11.83	98.0%	0.0002	2.19	0.00	0.00	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.56	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	2.67	0.00	0.29	98.0%	0.0000	0.05	0.00	0.00	
611143	2-Ethyltoluene	X		120.19	0.323	0.002	14.67	0.01	1.59	98.0%	0.0000	0.29	0.00	0.00	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.003	23.20	0.01	2.51	98.0%	0.0001	0.46	0.00	0.00	
563462	2-Methyl-1-butene	X		70.13	0.179	0.001	4.74	0.00	0.51	98.0%	0.0000	0.09	0.00	0.00	
513440	2-Methyl-1-propanethiol (Isobutyl me	X		90.19	0.17	0.001	5.79	0.00	0.63	98.0%	0.0000	0.12	0.00	0.00	
513359	2-Methyl-2-butene	X		70.13	0.303	0.001	8.03	0.00	0.87	98.0%	0.0000	0.16	0.00	0.00	
75661	2-Methyl-2-propanethiol (tert-Butylm	X		90.19	0.325	0.001	11.08	0.01	1.20	98.0%	0.0000	0.22	0.00	0.00	
78784	2-Methylbutane	X		72.15	2.26	0.007	61.61	0.03	6.67	98.0%	0.0001	1.23	0.00	0.00	
592278	2-Methylheptane	X		114.23	0.716	0.004	30.90	0.02	3.35	98.0%	0.0001	0.62	0.00	0.00	
591764	2-Methylhexane	X		100.2	0.816	0.004	30.89	0.02	3.34	98.0%	0.0001	0.62	0.00	0.00	
107835	2-Methylpentane	X		86.18	0.688	0.003	22.40	0.01	2.43	98.0%	0.0001	0.45	0.00	0.00	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.005	40.88	0.02	4.42	98.0%	0.0001	0.82	0.00	0.00	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.005	42.20	0.02	4.57	98.0%	0.0001	0.84	0.00	0.00	
620144	3-Ethyltoluene	X		120.19	0.78	0.004	35.42	0.02	3.83	98.0%	0.0001	0.71	0.00	0.00	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.22	0.00	0.02	98.0%	0.0000	0.00	0.00	0.00	
589811	3-Methylheptane	X		114.23	0.763	0.004	32.93	0.02	3.56	98.0%	0.0001	0.66	0.00	0.00	
589344	3-Methylhexane	X		100.2	1.13	0.005	42.78	0.02	4.63	98.0%	0.0001	0.86	0.00	0.00	
96140	3-Methylpentane	X		86.18	0.74	0.003	24.10	0.01	2.61	98.0%	0.0001	0.48	0.00	0.00	
616444	3-Methylthiophene	X		98.17	0.0925	0.000	3.43	0.00	0.37	98.0%	0.0000	0.07	0.00	0.00	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	0.74	0.00	0.08	98.0%	0.0000	0.01	0.00	0.00	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.004	33.42	0.02	3.62	98.0%	0.0001	0.67	0.00	0.00	0.00
589537	4-Methylheptane	X		114.23	0.249	0.001	10.75	0.01	1.16	98.0%	0.0000	0.21	0.00	0.00	
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	1.29	0.00	0.14	98.0%	0.0000	0.03	0.00	0.00	0.00
67641	Acetone			58.08	6.7	0.017	147.04	0.07	15.92	98.0%	0.0003	2.94	0.00		
75058	Acetonitrile	X	X	41.05	0.556	0.001	8.62	0.00	0.93	98.0%	0.0000	0.17	0.00	0.00	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.40	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	0.00
71432	Benzene	X	X	78.11	2.4	0.008	70.83	0.04	7.67	98.0%	0.0002	1.42	0.00	0.00	0.00

Table E.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2023

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	282	cfm
LFG Collected to Flares =	282	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	lb/yr	TPY	VOC (TPY)	HAP (TPY)
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	0.87	0.00	0.09	98.0%	0.0000	0.02	0.00	0.00	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.54	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	0.75	0.00	0.08	98.0%	0.0000	0.02	0.00	0.00	0.00
106978	Butane	X		58.12	6.22	0.016	136.60	0.07	14.79	98.0%	0.0003	2.73	0.00	0.00	
75150	Carbon disulfide	X	X	76.14	0.147	0.000	4.23	0.00	0.46	98.0%	0.0000	0.08	0.00	0.00	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.46	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.001	5.02	0.00	0.54	98.0%	0.0000	0.10	0.00	0.00	
463581	Carbonyl sulfide (Carbon oxysulfide	X	X	60.08	0.122	0.000	2.77	0.00	0.30	98.0%	0.0000	0.06	0.00	0.00	0.00
108907	Chlorobenzene	X		112.56	0.484	0.002	20.58	0.01	2.23	98.0%	0.0000	0.41	0.00	0.00	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.003	26.01	0.01	2.82	98.0%	0.0001	0.52	0.00	0.00	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.011	96.28	0.05	10.42	98.0%	0.0002	1.93	0.00	0.00	0.00
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.001	4.65	0.00	0.50	98.0%	0.0000	0.09	0.00	0.00	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.005	45.42	0.02	4.92	98.0%	0.0001	0.91	0.00	0.00	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.000	3.43	0.00	0.37	98.0%	0.0000	0.07	0.00	0.00	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.13	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.002	21.24	0.01	2.30	98.0%	0.0000	0.42	0.00	0.00	
24293 / 220703(	cis-1,4-Dimethylcyclohexane / trans-	X		112.21	0.248	0.001	10.51	0.01	1.14	98.0%	0.0000	0.21	0.00	0.00	
590181	cis-2-Butene	X		56.11	0.105	0.000	2.23	0.00	0.24	98.0%	0.0000	0.04	0.00	0.00	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	0.91	0.00	0.10	98.0%	0.0000	0.02	0.00	0.00	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.55	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
7642048	cis-2-Octene	X		112.21	0.22	0.001	9.33	0.00	1.01	98.0%	0.0000	0.19	0.00	0.00	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	1.27	0.00	0.14	98.0%	0.0000	0.03	0.00	0.00	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.57	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
110827	Cyclohexane	X		84.16	1.01	0.004	32.12	0.02	3.48	98.0%	0.0001	0.64	0.00	0.00	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.57	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.59	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.31	0.00	0.03	98.0%	0.0000	0.01	0.00	0.00	
124185	Decane	X		142.28	3.8	0.023	204.29	0.10	22.11	98.0%	0.0005	4.09	0.00	0.00	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	1.19	0.00	0.13	98.0%	0.0000	0.02	0.00	0.00	
74953	Dibromomethane (Methylene dibron	X		173.84	0.000835	0.000	0.05	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
106467	Dichlorobenzene	X	X	147	0.94	0.006	52.21	0.03	5.65	98.0%	0.0001	1.04	0.00	0.00	0.00
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.006	53.91	0.03	5.84	98.0%	0.0001	1.08	0.00	0.00	
75092	Dichloromethane (Methylene chlorid	X	X	84.93	6.15	0.023	197.36	0.10	21.36	98.0%	0.0005	3.95	0.00	0.00	0.00
352932	Diethyl sulfide	X		90.19	0.0862	0.000	2.94	0.00	0.32	98.0%	0.0000	0.06	0.00	0.00	
624920	Dimethyl disulfide	X		94.2	0.137	0.001	4.88	0.00	0.53	98.0%	0.0000	0.10	0.00	0.00	
75183	Dimethyl sulfide	X		62.14	5.66	0.015	132.90	0.07	14.38	98.0%	0.0003	2.66	0.00	0.00	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.002	14.22	0.01	1.54	98.0%	0.0000	0.28	0.00	0.00	
74840	Ethane	X		30.07	9.05	0.012	102.83	0.05	11.13	98.0%	0.0002	2.06	0.00	0.00	
64175	Ethanol	X		46.07	0.23	0.000	4.00	0.00	0.43	98.0%	0.0000	0.08	0.00	0.00	
141786	Ethyl acetate	X		88.11	1.88	0.007	62.59	0.03	6.77	98.0%	0.0001	1.25	0.00	0.00	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.001	4.65	0.00	0.50	98.0%	0.0000	0.09	0.00	0.00	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	1.06	0.00	0.11	98.0%	0.0000	0.02	0.00	0.00	
100414	Ethylbenzene	X	X	106.17	4.86	0.022	194.97	0.10	21.10	98.0%	0.0004	3.90	0.00	0.00	0.00
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.13	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	0.00
142825	Heptane	X		100.2	1.34	0.006	50.73	0.03	5.49	98.0%	0.0001	1.01	0.00	0.00	
110543	Hexane	X	X	86.18	3.1	0.012	100.95	0.05	10.93	98.0%	0.0002	2.02	0.00	0.00	0.00
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	0.86	0.00	0.09	98.0%	0.0000	0.02	0.00	0.00	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.020	179.20	0.09	19.40	98.0%	0.0004	3.58	0.00	0.00	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	2.06	0.00	0.22	98.0%	0.0000	0.04	0.00	0.00	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.42	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	
75332	Isopropyl mercaptan	X		76.16	0.175	0.001	5.04	0.00	0.55	98.0%	0.0000	0.10	0.00	0.00	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.002	19.53	0.01	2.11	98.0%	0.0000	0.39	0.00	0.00	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.01	0.00	0.00	0.0%	0.0000	0.01	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.0%	0.0000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.003	24.90	0.01	2.70	98.0%	0.0001	0.50	0.00	0.00	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.000	3.93	0.00	0.43	98.0%	0.0000	0.08	0.00	0.00	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.005	47.86	0.02	5.18	98.0%	0.0001	0.96	0.00	0.00	
96377	Methylcyclopentane	X		84.16	0.65	0.002	20.67	0.01	2.24	98.0%	0.0000	0.41	0.00	0.00	
91203	Naphthalene	X	X	128.17	0.107	0.001	5.18	0.00	0.56	98.0%	0.0000	0.10	0.00	0.00	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.000	3.45	0.00	0.37	98.0%	0.0000	0.07	0.00	0.00	
111842	Nonane	X		128.26	2.37	0.013	114.86	0.06	12.43	98.0%	0.0003	2.30	0.00	0.00	
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.002	18.76	0.01	2.03	98.0%	0.0000	0.38	0.00	0.00	
111659	Octane	X		114.23	1.08	0.005	46.61	0.02	5.05	98.0%	0.0001	0.93	0.00	0.00	
99876	p-Cymene (1-Methyl-4-Isopropylben	X		134.22	3.58	0.021	181.56	0.09	19.65	98.0%	0.0004	3.63	0.00	0.00	
109660	Pentane	X		72.15	4.46	0.014	121.59	0.06	13.16	98.0%	0.0003	2.43	0.00	0.00	
74986	Propane	X		44.1	15.5	0.029	258.28	0.13	27.96	98.0%	0.0006	5.17	0.00	0.00	
115071	Propene	X		42.08	3.32	0.006	52.79	0.03	5.71	98.0%	0.0001	1.06	0.00	0.00	
74997	Propyne	X		40.06	0.038	0.000	0.58	0.00	0.06	98.0%	0.0000	0.01	0.00	0.00	
135988	sec-Butylbenzene	X		134.22	0.0675	0.000	3.42	0.00	0.37	98.0%	0.0000	0.07	0.00	0.00	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.002	16.17	0.01	1.75	98.0%	0.0000	0.32	0.00	0.00	0.00
127184	Tetrachloroethylene (Perchloroethyl	X	X	165.83	2.03	0.015	127.20	0.06	13.77	98.0%	0.0003	2.54	0.00	0.00	0.00

Table E.3

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Flare HAP Emissions - 2023

Landfill Gas Flares - HAP Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Total LFG Collected =	282	cfm
LFG Collected to Flares =	282	cfm
Hours of Operation =	8,760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	Uncontrolled Emissions lb/yr	Uncontrolled Emissions TPY	mg/m3	Avg. Control [2]	Controlled Emissions lb/hr	Controlled Emissions lb/yr	Controlled Emissions TPY	VOC (TPY)	HAP (TPY)
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.003	26.40	0.01	2.86	98.0%	0.0001	0.53	0.00	0.00	
110021	Thiophene	X		84.14	0.349	0.001	11.10	0.01	1.20	98.0%	0.0000	0.22	0.00	0.00	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.117	1027.05	0.51	111.17	98.0%	0.0023	20.54	0.01	0.01	0.01
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	1.05	0.00	0.11	98.0%	0.0000	0.02	0.00	0.00	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.002	17.13	0.01	1.85	98.0%	0.0000	0.34	0.00	0.00	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.40	0.00	0.04	98.0%	0.0000	0.01	0.00	0.00	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.001	8.69	0.00	0.94	98.0%	0.0000	0.17	0.00	0.00	
624646	trans-2-Butene	X		56.11	0.104	0.000	2.20	0.00	0.24	98.0%	0.0000	0.04	0.00	0.00	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.09	0.00	0.01	98.0%	0.0000	0.00	0.00	0.00	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.66	0.00	0.07	98.0%	0.0000	0.01	0.00	0.00	
13389429	trans-2-Octene	X		112.21	0.241	0.001	10.22	0.01	1.11	98.0%	0.0000	0.20	0.00	0.00	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	0.92	0.00	0.10	98.0%	0.0000	0.02	0.00	0.00	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.49	0.00	0.05	98.0%	0.0000	0.01	0.00	0.00	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	1.18	0.00	0.13	98.0%	0.0000	0.02	0.00	0.00	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.005	41.11	0.02	4.45	98.0%	0.0001	0.82	0.00	0.00	0.00
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.001	12.87	0.01	1.39	98.0%	0.0000	0.26	0.00	0.00	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.000	3.19	0.00	0.35	98.0%	0.0000	0.06	0.00	0.00	0.00
1120214	Undecane	X		156.31	1.67	0.011	98.63	0.05	10.68	98.0%	0.0002	1.97	0.00	0.00	
85306269	Vinyl acetate	X	X	86.09	0.248	0.001	8.07	0.00	0.87	98.0%	0.0000	0.16	0.00	0.00	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.004	33.53	0.02	3.63	98.0%	0.0001	0.67	0.00	0.00	0.00
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.042	370.28	0.19	40.08	98.0%	0.0008	7.41	0.00	0.00	0.00
7647-01-0	HCl		X	35.45	74	0.113	991.22	0.50	107.29	0.0%	0.1132	991.22	0.50		0.50
															0.52

Notes:

1 Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

2 Control efficiency of 98% applied for flares

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ \text{atm}) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L^*atm/K^*mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate}\ [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

(lb/yr) = (lb/hr) x (8,760 hours/yr)

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

(Controlled Emissions) = (Uncontrolled Emissions) x (100% - Average Control [%])

Table E.4

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive Emissions - 2023

Year	Total LFG Generated (cfm)	Collection Efficiency (%)	LFG to Collection System (cfm)	Fugitive LFG (cfm)	Fugitive LFG (ft^3/yr)	Fugitive LFG (m^3/yr)	Fugitive HAP Emissions (TPY)	Fugitive CH_4 Emissions (TPY)	Oxidized CO_2 Emissions (TPY)	Fugitive Biogenic CO_2 Emissions (TPY)	Total Anthropogenic GHG Emissions (TPY)
2023	375	75%	282	94	49,320,317	1,396,596	0.4	253.5	77.2	2,165.5	21,292

Notes:

Total landfill gas (LFG) Generated in average cubic feet per minute (cfm) from Methane Generation Model (according to 40 CFR 98, Subpart HH)
Collection efficiency of 95% assumed for gas collection system based on final cover applied to entire landfill area
LFG to Collection System = (Total LFG Generated) * (Collection Efficiency (%))
Fugitive LFG = (Total LFG Generated) * (100% - Collection Efficiency (%))
Fugitive LFG (ft^3/yr) = (Fugitive LFG (cfm)) * (60 minutes per hour) * (8,760 hours per year)
Fugitive LFG (m^3/yr) = (Fugitive LFG (ft^3/yr)) / (35.3147 cubic feet per cubic meter)
Total Fugitive HAP Emissions determined from sum of individual speciated HAPs (see Table E.5)
Fugitive CH_4 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.0423 lb CH4 / ft^3 CH_4] * [90% oxidation factor] / [2,000 lb/ton]
Oxidized CO_2 emissions (TPY) = [Fugitive LFG (ft^3/yr)] * [27% CH_4] * [0.116 lb CO_2 / ft^3 CH_4] * [10% oxidized] / [2,000 lb/ton]
Fugitive Biogenic emissions (TPY) = { [Fugitive LFG (ft^3/yr)] * [73% CO_2] * [0.116 lb CO_2 / ft^3 CO_2] / [2,000 lb/ton] } + Oxidized CO_2 Emissions
Total Fugitive Anthropogenic GHG Emissions (tons CO_2 equivalents / year) = [Fugitive CH4 Emissions (TPY)] * 84

Equations:

$$(mg/m^3) = \frac{(ppm) \times (\text{Molecular weight } (g / mol)) \times (1\ atm)}{(298.15\ K) \times (0.08206\ L{*}atm/K{*}mol)}$$ (assuming standard conditions of 1 atmosphere and 25° Celsius)

$$(lb/yr) = (\text{Fugitive LFG Emission rate } [m^3/year]) \times (mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg])$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table E.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2023

Fugitive Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	282	cfm
Fugitive Emission Estimates =	94	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
71556	1,1,1-Trichloroethane	X	X	133.4	0.243	0.000	4.08	0.00	1.33	0.00
79345	1,1,2,2-Tetrachloroethane	X	X	167.85	0.535	0.001	11.31	0.01	3.67	0.01
87683	Hexachlorobutadiene	X	X	260.76	0.00349	0.000	0.11	0.00	0.04	0.00
76131	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	X		187.37	0.0672	0.000	1.59	0.00	0.51	
79005	1,1,2-Trichloroethane	X	X	133.4	0.158	0.000	2.65	0.00	0.86	0.00
75343	1,1-Dichloroethane	X	X	98.96	2.08	0.003	25.93	0.01	8.42	0.01
75354	1,1-Dichloroethene	X	X	96.94	0.16	0.000	1.95	0.00	0.63	0.00
526738	1,2,3-Trimethylbenzene	X		120.19	0.359	0.001	5.43	0.00	1.76	
120821	1,2,4-Trichlorobenzene	X	X	181.45	0.00551	0.000	0.13	0.00	0.04	0.00
95636	1,2,4-Trimethylbenzene	X		120.19	1.37	0.002	20.74	0.01	6.73	
106934	Ethylene dibromide	X	X	187.86	0.0048	0.000	0.11	0.00	0.04	0.00
76142	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114	X		170.92	0.106	0.000	2.28	0.00	0.74	
107062	1,2-Dichloroethane	X	X	98.96	0.159	0.000	1.98	0.00	0.64	0.00
540590	1,2-Dichloroethene	X		96.94	11.4	0.016	139.19	0.07	45.20	
78875	1,2-Dichloropropane	X	X	112.99	0.052	0.000	0.74	0.00	0.24	0.00
135013	1,2-Diethylbenzene	X		134.22	0.0199	0.000	0.34	0.00	0.11	
108678	1,3,5-Trimethylbenzene	X		120.19	0.623	0.001	9.43	0.00	3.06	
106990	1,3-Butadiene (Vinyl ethylene)	X	X	54.09	0.166	0.000	1.13	0.00	0.37	0.00
141935	1,3-Diethylbenzene	X		134.22	0.0655	0.000	1.11	0.00	0.36	
105055	1,4-Diethylbenzene	X		134.22	0.262	0.001	4.43	0.00	1.44	
123911	1,4-Dioxane (1,4-Diethylene dioxide)	X	X	88.11	0.00829	0.000	0.09	0.00	0.03	0.00
106989 / 513359	1-Butene / 2-Methylbutene	X		70.13	1.22	0.001	10.78	0.01	3.50	
106989 / 115117	1-Butene / 2-Methylpropene	X		56.11	1.1	0.001	7.77	0.00	2.52	
622968	1-Ethyl-4-methylbenzene (4-Ethyl toluene)	X		120.19	0.989	0.002	14.97	0.01	4.86	
622968 / 108678	1-Ethyl-4-methylbenzene (4-Ethyl toluene) + 1,3,5	X		120.19	0.579	0.001	8.76	0.00	2.85	
592767	1-Heptene	X		98.19	0.625	0.001	7.73	0.00	2.51	
592416 / 763291	1-Hexene / 2-Methyl-1-pentene	X		84.16	0.0888	0.000	0.94	0.00	0.31	
591491	1-Methylcyclohexene	X		96.17	0.0227	0.000	0.27	0.00	0.09	
693890	1-Methylcyclopentene	X		82.14	0.0252	0.000	0.26	0.00	0.08	
109671	1-Pentene	X		70.13	0.22	0.000	1.94	0.00	0.63	
107039	1-Propanethiol (n-Propyl mercaptan)	X		76.16	0.125	0.000	1.20	0.00	0.39	
464062	2,2,3-Trimethylbutane	X		100.2	0.00919	0.000	0.12	0.00	0.04	
540841	2,2,4-Trimethylpentane	X	X	114.23	0.614	0.001	8.83	0.00	2.87	0.00
3522949	2,2,5-Trimethylhexane	X		128.26	0.156	0.000	2.52	0.00	0.82	
75832	2,2-Dimethylbutane	X		86.18	0.156	0.000	1.69	0.00	0.55	
590352	2,2-Dimethylpentane	X		100.2	0.0608	0.000	0.77	0.00	0.25	
463821	2,2-Dimethylpropane	X		72.15	0.0274	0.000	0.25	0.00	0.08	
565753	2,3,4-Trimethylpentane	X		114.23	0.312	0.001	4.49	0.00	1.46	
79298	2,3-Dimethylbutane	X		86.18	0.167	0.000	1.81	0.00	0.59	
565593	2,3-Dimethylpentane	X		100.2	0.31	0.000	3.91	0.00	1.27	
589435	2,4-Dimethylhexane	X		114.23	0.222	0.000	3.19	0.00	1.04	
108087	2,4-Dimethylpentane	X		100.2	0.1	0.000	1.26	0.00	0.41	
592132	2,5-Dimethylhexane	X		114.23	0.166	0.000	2.39	0.00	0.78	
638028	2,5-Dimethylthiophene	X		112.19	0.0644	0.000	0.91	0.00	0.30	
78933	2-Butanone (Methyl ethyl ketone)	X		72.11	4.01	0.004	36.42	0.02	11.83	
760214	2-Ethyl-1-butene	X		84.16	0.0177	0.000	0.19	0.00	0.06	
872559	2-Ethylthiophene	X		112.19	0.0629	0.000	0.89	0.00	0.29	
611143	2-Ethyltoluene	X		120.19	0.323	0.001	4.89	0.00	1.59	
591786	2-Hexanone (Methyl butyl ketone)	X		100.16	0.613	0.001	7.73	0.00	2.51	
563462	2-Methyl-1-butene	X		70.13	0.179	0.000	1.58	0.00	0.51	
513440	2-Methyl-1-propanethiol (Isobutyl mercaptan)	X		90.19	0.17	0.000	1.93	0.00	0.63	
513359	2-Methyl-2-butene	X		70.13	0.303	0.000	2.68	0.00	0.87	
75661	2-Methyl-2-propanethiol (tert-Butylmercaptan)	X		90.19	0.325	0.000	3.69	0.00	1.20	
78784	2-Methylbutane	X		72.15	2.26	0.002	20.54	0.01	6.67	
592278	2-Methylheptane	X		114.23	0.716	0.001	10.30	0.01	3.35	
591764	2-Methylhexane	X		100.2	0.816	0.001	10.30	0.01	3.34	
107835	2-Methylpentane	X		86.18	0.688	0.001	7.47	0.00	2.43	
67630	2-Propanol (Isopropyl alcohol)	X		60.1	1.8	0.002	13.63	0.01	4.42	
15869940	3,6-Dimethyloctane	X		142.28	0.785	0.002	14.07	0.01	4.57	
620144	3-Ethyltoluene	X		120.19	0.78	0.001	11.81	0.01	3.83	
760203	3-Methyl-1-pentene	X		84.16	0.00699	0.000	0.07	0.00	0.02	
589811	3-Methylheptane	X		114.23	0.763	0.001	10.98	0.01	3.56	
589344	3-Methylhexane	X		100.2	1.13	0.002	14.26	0.01	4.63	
96140	3-Methylpentane	X		86.18	0.74	0.001	8.03	0.00	2.61	
616444	3-Methylthiophene	X		98.17	0.0925	0.000	1.14	0.00	0.37	
691372	4-Methyl-1-pentene	X		84.16	0.0233	0.000	0.25	0.00	0.08	
108101	4-Methyl-2-pentanone (MIBK)	X	X	100.16	0.883	0.001	11.14	0.01	3.62	0.01
589537	4-Methylheptane	X		114.23	0.249	0.000	3.58	0.00	1.16	

Table E.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2023

Fugitive Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	282	cfm
Fugitive Emission Estimates =	94	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
75070	Acetaldehyde	X	X	44.05	0.0774	0.000	0.43	0.00	0.14	0.00
67641	Acetone			58.08	6.7	0.006	49.01	0.02	15.92	
75058	Acetonitrile	X	X	41.05	0.556	0.000	2.87	0.00	0.93	0.00
107131	Acrylonitrile	X	X	53.06	0.02	0.000	0.13	0.00	0.04	0.00
71432	Benzene	X	X	78.11	2.4	0.003	23.61	0.01	7.67	0.01
100447	Benzyl chloride	X	X	126.58	0.0181	0.000	0.29	0.00	0.09	0.00
75274	Bromodichloromethane	X		163.83	0.00878	0.000	0.18	0.00	0.06	
74839	Bromomethane (Methyl bromide)	X	X	94.94	0.021	0.000	0.25	0.00	0.08	0.00
106978	Butane	X		58.12	6.22	0.005	45.53	0.02	14.79	
75150	Carbon disulfide	X	X	76.14	0.147	0.000	1.41	0.00	0.46	0.00
56235	Carbon tetrachloride	X	X	153.82	0.00798	0.000	0.15	0.00	0.05	0.00
75730	Carbon tetrafluoride (Freon 14)	X		88	0.151	0.000	1.67	0.00	0.54	
463581	Carbonyl sulfide (Carbon oxysulfide)	X	X	60.08	0.122	0.000	0.92	0.00	0.30	0.00
108907	Chlorobenzene	X		112.56	0.484	0.001	6.86	0.00	2.23	
75456	Chlorodifluoromethane (Freon 22)	X	X	86.47	0.796	0.001	8.67	0.00	2.82	0.00
75003	Chloroethane (Ethyl chloride)	X	X	64.51	3.95	0.004	32.09	0.02	10.42	0.02
74873	Chloromethane (Methyl chloride)	X	X	50.49	0.244	0.000	1.55	0.00	0.50	0.00
156592	cis-1,2-Dichloroethene	X		96.94	1.24	0.002	15.14	0.01	4.92	
2207014	cis-1,2-Dimethylcyclohexane	X		112.21	0.081	0.000	1.14	0.00	0.37	
10061015	cis-1,3-Dichloropropene	X		110.97	0.00303	0.000	0.04	0.00	0.01	
638040	cis-1,3-Dimethylcyclohexane	X		112.21	0.501	0.001	7.08	0.00	2.30	
24293 / 220703	cis-1,4-Dimethylcyclohexane / trans-1,3-Dimethylc	X		112.21	0.248	0.000	3.50	0.00	1.14	
590181	cis-2-Butene	X		56.11	0.105	0.000	0.74	0.00	0.24	
6443921	cis-2-Heptene	X		98.19	0.0245	0.000	0.30	0.00	0.10	
7688213	cis-2-Hexene	X		84.16	0.0172	0.000	0.18	0.00	0.06	
7642048	cis-2-Octene	X		112.21	0.22	0.000	3.11	0.00	1.01	
627203	cis-2-Pentene	X		70.13	0.0479	0.000	0.42	0.00	0.14	
922623	cis-3-Methyl-2-pentene	X		84.16	0.0179	0.000	0.19	0.00	0.06	
110827	Cyclohexane	X		84.16	1.01	0.001	10.71	0.01	3.48	
110838	Cyclohexene	X		82.14	0.0184	0.000	0.19	0.00	0.06	
287923	Cyclopentane	X		70.13	0.0221	0.000	0.20	0.00	0.06	
142290	Cyclopentene	X		68.12	0.0121	0.000	0.10	0.00	0.03	
124185	Decane	X		142.28	3.8	0.008	68.10	0.03	22.11	
124481	Dibromochloromethane	X		208.28	0.0151	0.000	0.40	0.00	0.13	
74953	Dibromomethane (Methylene dibromide)	X		173.84	0.000835	0.000	0.02	0.00	0.01	
106467	Dichlorobenzene	X	X	147	0.94	0.002	17.40	0.01	5.65	0.01
75718	Dichlorodifluoromethane (Freon 12)	X		120.91	1.18	0.002	17.97	0.01	5.84	
75092	Dichloromethane (Methylene chloride)	X	X	84.93	6.15	0.008	65.79	0.03	21.36	0.03
352932	Diethyl sulfide	X		90.19	0.0862	0.000	0.98	0.00	0.32	
624920	Dimethyl disulfide	X		94.2	0.137	0.000	1.63	0.00	0.53	
75183	Dimethyl sulfide	X		62.14	5.66	0.005	44.30	0.02	14.38	
112403	Dodecane (n-Dodecane)	X		170.33	0.221	0.001	4.74	0.00	1.54	
74840	Ethane	X		30.07	9.05	0.004	34.28	0.02	11.13	
64175	Ethanol	X		46.07	0.23	0.000	1.33	0.00	0.43	
141786	Ethyl acetate	X		88.11	1.88	0.002	20.86	0.01	6.77	
75081	Ethyl mercaptan (Ethanediol)	X		62.14	0.198	0.000	1.55	0.00	0.50	
624895	Ethyl methyl sulfide	X		76.16	0.0367	0.000	0.35	0.00	0.11	
100414	Ethylbenzene	X	X	106.17	4.86	0.007	64.99	0.03	21.10	0.03
50000	Formaldehyde	X	X	30.03	0.0117	0.000	0.04	0.00	0.01	0.00
142825	Heptane	X		100.2	1.34	0.002	16.91	0.01	5.49	
110543	Hexane	X	X	86.18	3.1	0.004	33.65	0.02	10.93	0.02
496117	Indane (2,3-Dihydroindene)	X		34.08	0.0666	0.000	0.29	0.00	0.09	
75285	Isobutane (2-Methylpropane)	X		58.12	8.16	0.007	59.73	0.03	19.40	
538932	Isobutylbenzene	X		134.22	0.0407	0.000	0.69	0.00	0.22	
78795	Isoprene (2-Methyl-1,3-butadiene)	X		68.12	0.0165	0.000	0.14	0.00	0.05	
75332	Isopropyl mercaptan	X		76.16	0.175	0.000	1.68	0.00	0.55	
98828	Isopropylbenzene (Cumene)	X	X	120.19	0.43	0.001	6.51	0.00	2.11	0.00
7439976	Mercury (total)	X	X	200.59	0.000122	0.000	0.00	0.00	0.00	0.00
7439976	Mercury (elemental)	X	X	200.59	0.000077	0.000	0.00	0.00	0.00	0.00
51176126	Mercury (monomethyl)	X	X	216.63	0.000000384	0.000	0.00	0.00	0.00	0.00
627441	Mercury (dimethyl)	X	X	258.71	0.00000253	0.000	0.00	0.00	0.00	0.00
74931	Methanethiol (Methyl mercaptan)	X		48.11	1.37	0.001	8.30	0.00	2.70	
1634044	Methyl tert-butyl ether (MTBE)	X	X	88.15	0.118	0.000	1.31	0.00	0.43	0.00
108872	Methylcyclohexane	X		98.19	1.29	0.002	15.95	0.01	5.18	
96377	Methylcyclopentane	X		84.16	0.65	0.001	6.89	0.00	2.24	
91203	Naphthalene	X	X	128.17	0.107	0.000	1.73	0.00	0.56	0.00
104518	n-Butylbenzene	X		134.22	0.068	0.000	1.15	0.00	0.37	
111842	Nonane	X		128.26	2.37	0.004	38.29	0.02	12.43	

Table E.5

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Estimated Fugitive HAP Emissions - 2023

Fugitive Emission Estimates

Average LFG Generated =	375	cfm
Average LFG Collection Efficiency =	75%	
Average LFG Collected =	282	cfm
Fugitive Emission Estimates =	94	cfm
Hours of Operation =	8760	

CAS #	LFG Constituent	VOC?	HAP?	Molecular Weight	AP-42 Median [1] ppmv	Uncontrolled Emissions lb/hr	lb/yr	TPY	mg/m3	HAP (TPY)
103651	n-Propylbenzene (Propylbenzene)	X		120.19	0.413	0.001	6.25	0.00	2.03	
111659	Octane	X		114.23	1.08	0.002	15.54	0.01	5.05	
99876	p-Cymene (1-Methyl-4-Isopropylbenzene)	X		134.22	3.58	0.007	60.52	0.03	19.65	
109660	Pentane	X		72.15	4.46	0.005	40.53	0.02	13.16	
74986	Propane	X		44.1	15.5	0.010	86.09	0.04	27.96	
115071	Propene	X		42.08	3.32	0.002	17.60	0.01	5.71	
74997	Propyne	X		40.06	0.038	0.000	0.19	0.00	0.06	
135988	sec-Butylbenzene	X		134.22	0.0675	0.000	1.14	0.00	0.37	
100425	Styrene (Vinylbenzene)	X	X	104.15	0.411	0.001	5.39	0.00	1.75	0.00
127184	Tetrachloroethylene (Perchloroethylene)	X	X	165.83	2.03	0.005	42.40	0.02	13.77	0.02
109999	Tetrahydrofuran (Diethylene oxide)	X		72.11	0.969	0.001	8.80	0.00	2.86	
110021	Thiophene	X		84.14	0.349	0.000	3.70	0.00	1.20	
108883	Toluene (Methyl benzene)	X	X	92.14	29.5	0.039	342.35	0.17	111.17	0.17
156605	trans-1,2-Dichloroethene	X		96.94	0.0287	0.000	0.35	0.00	0.11	
6876239	trans-1,2-Dimethylcyclohexane	X		112.21	0.404	0.001	5.71	0.00	1.85	
10061026	trans-1,3-Dichloropropene	X		110.97	0.00943	0.000	0.13	0.00	0.04	
2207047	trans-1,4-Dimethylcyclohexane	X		112.21	0.205	0.000	2.90	0.00	0.94	
624646	trans-2-Butene	X		56.11	0.104	0.000	0.73	0.00	0.24	
14686136	trans-2-Heptene	X		98.19	0.0025	0.000	0.03	0.00	0.01	
4050457	trans-2-Hexene	X		84.16	0.0206	0.000	0.22	0.00	0.07	
13389429	trans-2-Octene	X		112.21	0.241	0.000	3.41	0.00	1.11	
646048	trans-2-Pentene	X		70.13	0.0347	0.000	0.31	0.00	0.10	
616126	trans-3-Methyl-2-pentene	X		84.16	0.0155	0.000	0.16	0.00	0.05	
75252	Tribromomethane (Bromoform)	X	X	252.73	0.0124	0.000	0.39	0.00	0.13	0.00
79016	Trichloroethylene (Trichloroethene)	X	X	131.39	0.828	0.002	13.70	0.01	4.45	0.01
91315616	Trichlorofluoromethane (Freon 11)	X		137.37	0.248	0.000	4.29	0.00	1.39	
8013545	Trichloromethane (Chloroform)	X	X	119.38	0.0708	0.000	1.06	0.00	0.35	0.00
1120214	Undecane	X		156.31	1.67	0.004	32.88	0.02	10.68	
85306269	Vinyl acetate	X	X	86.09	0.248	0.000	2.69	0.00	0.87	0.00
75014	Vinyl chloride (Chloroethene)	X	X	62.5	1.42	0.001	11.18	0.01	3.63	0.01
8026093	Xylenes (o-, m-, p-, mixtures)	X	X	106.17	9.23	0.014	123.43	0.06	40.08	0.06
										0.44

Notes:

[1] Concentration of individual VOCs and HAPs were referenced from AP-42, Chapter 2.4 Municipal Solid Waste Landfill Draft Section (October 2008)

Equations:

$$(mg/m^3) = \frac{(\text{Molecular weight}) \times (1\ \text{atm}) \times (\text{Median ppmv})}{(298.15\ K) \times (0.08206\ L^*atm/K^*mol)}$$

$$(lb/hr) = \frac{(mg/m^3) \times (2.205 \times 10^{-6}\ [lb/mg]) \times (\text{Fugitive LFG Emission rate } [ft^3/min]) \times (60\ min/hr)}{(35.3147\ ft^3/m^3)}$$

$$(lb/yr) = (lb/hr) \times (8{,}760\ hours/yr)$$

$$(TPY) = \frac{(lb/yr)}{(2{,}000\ lb/ton)}$$

Table E.6

Emissions Inventory
Dunn Facility
Waste Connections
Summary of Propane Heating Emissions

Maximum propane combusted per year **11.489** 10^3 gallons

Emission Calculations:					
				Lbs/yr	Tons/yr
PM=	0.70 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**8.042**	**0.00402**
SO_{X} =	0.1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**1.149**	**0.00057**
NO_{X} =	13 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**149.351**	**0.07468**
VOC =	1 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**11.489**	**0.00574**
CO =	7.5 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**86.164**	**0.04308**
CO_2 =	12,500 lb. X / 10^3 gal	11.488525 10^3 gal propane	=	**143,607**	**71.80328**

* Emissions factors from AP-42 7/2008, section 1.5 (Assume a sulfur content of 1%)

Attachment F

CLCPA Leachate Tank Calculations

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification	LEACHATE TANK
City	Rensselaer
State	New York
Company	Waste Connections Dunn Landfill
Type of Tank	Vertical Fixed Roof Tank
Description	Leachate storage tank

Tank Dimensions

Shell Length (ft)	14.83
Diameter (ft)	61.63
Liquid Height (ft)	14.00
Avg. Liquid Height (ft)	7.00
Volume (gal)	312,412
Turnovers	25.61
Net Throughput (gal/yr)	8,000,000
Is tank heated (y/n)	N

Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albany, New York (Avg Atmospheric Pressure = 14.37 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Vertical Fixed Roof Tank
Rensselaer, New York
CALCULATED VALUES

		Daily Liquid Surface Temperature (deg F)			**Liquid Bulk Temp**	**Vapor Pressure** (psia)			**Vapor Mol Weight**	**Liquid Mass Fraction**	**Vapor Mass Fraction**	**Mol Weight**	**Basis for Vapor Pressure**	**Table 7.1-3**				Leachate Concentration [1]
Mixture/Component	**Month**	*Avg.*	*Min*	*Max*	*(deg F)*	*Avg.*	*Min*	*Max*	*g/mol*	**Fraction**	**Fraction**	*g/mol*	**Calculations**	**A**	**B**	**C**	MW_i (g/mol)	(ug/L)
Total Leachate	All	50.10	-	-	48.52	0.3384	-	-	18.0000	-	-	18.04	-	-	-	-	-	-
Acetone						2.2557	-	-	58.0800	0.0000	0.0000	58.08	Option 2: A=7.117 B=1210.595 C=229.664	7.1170	1210.595	229.66	58.08	200
Benzene						0.8816	-	-	78.1100	0.0000	0.0000	78.11	Option 2: A=6.905 B=1211.033 C=220.79	6.9050	1211.033	220.79	78.11	10
Cresol (-m)						0.0008	-	-	108.1000	0.0000	0.0000	108.10	Option 2: A=7.508 B=1856.36 C=199.07	7.5080	1856.360	199.07	108.10	92
Cresol (-p)						0.0003	-	-	108.1000	0.0000	0.0000	108.10	Option 2: A=7.035 B=1511.08 C=161.85	7.0350	1511.080	161.85	108.10	92
Ethylene dichloride						0.7076	-	-	98.9700	0.0000	0.0000	98.97	Option 2: A=7.025 B=1272.3 C=222.9	7.0250	1272.300	222.90	98.97	10
Dioxane (1,4)						0.3224	-	-	88.1000	0.0000	0.0000	88.10	Option 2: A=7.431 B=1554.68 C=240.34	7.4310	1554.680	240.34	88.10	64
Ethyl chloride						13.4957	-	-	64.5200	0.0000	0.0000	64.52	Option 2: A=6.986 B=1030.01 C=238.61	6.9860	1030.010	238.61	64.52	10
Ethylbenzene						0.0762	-	-	106.1700	0.0000	0.0000	106.17	Option 2: A=6.975 B=1424.255 C=213.21	6.9750	1424.255	213.21	106.17	10
Methyl ethyl ketone						0.8053	-	-	72.1000	0.0000	0.0000	72.10	Option 2: A=6.8645 B=1150.207 C=209.246	6.8645	1150.207	209.25	72.10	100
Methylene chloride						4.4390	-	-	84.9400	0.0000	0.0000	84.94	Option 2: A=7.409 B=1325.9 C=252.6	7.4090	1325.900	252.60	84.94	17
Toluene						0.2407	-	-	92.1300	0.0000	0.0000	92.13	Option 2: A=6.954 B=1344.8 C=219.48	6.9540	1344.800	219.48	92.13	10
Trichloroethylene						0.6033	-	-	131.4000	0.0000	0.0000	131.40	Option 2: A=6.518 B=1018.6 C=192.7	6.5180	1018.600	192.70	131.40	10
Phenol						0.0017	-	-	94.1330	0.0000	0.0000	94.13		7.1330	1516.790	174.95	94.13	25
									check:	**1.0000**	**1.0000**							

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification	LEACHATE TANK
City	Rensselaer
State	New York
Company	Waste Connections Dunn Landfill
Type of Tank	Vertical Fixed Roof Tank
Description	Leachate storage tank

Tank Dimensions

Shell Length (ft)	14.83
Diameter (ft)	61.63
Liquid Height (ft)	14.00
Avg. Liquid Height (ft)	7.00
Volume (gal)	312,412
Turnovers	25.61
Net Throughput (gal/yr)	8,000,000
Is tank heated (y/n)	N

Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albany, New York (Avg Atmospheric Pressure = 14.37 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Vertical Fixed Roof Tank
Rensselaer, New York

Annual Emission Calculations	**AP-42 EQUATIONS**		**CALCULATIONS**				
Standing Losses (lb)	$L_S = 365\ V_V\ W_V\ K_E\ K_S$	L_S =	284.3364	lbs			
V_V = Vapor Space Volume (cu ft)		V_V =	25277.0386	cu ft			
W_V = Vapor Density (lb/cu ft)		W_V =	0.0011	lb / cu ft			
K_E = Vapor Space Expansion Factor		K_E =	0.0319				
K_S = Vented Vapor Saturation Factor		K_S =	0.8681				
Tank Vapor Space Volume							
V_V = Vapor Space Volume	$V_V = [(Pi/4)\ D^2]\ H_{VO}$	V_V =	25277.0386	cu ft			
D = Tank Diameter							
H_{VO} = Vapor Space Outage	$H_{VO} = H_S - H_L + H_{RO}$	H_{VO} =	8.4728	ft			$H_{VO} = H_E/2$ for horizontal tank
Hs = Tank Shell Length							
H_L = Average Liquid Height							
Roof Outage							
Roof Outage (Cone Roof)							
Roof Outage	$H_{RO} = 1/3\ H_R$	H_{RO} =	0.6420	ft			
Roof Height							
S_R = Roof Slope	$H_R = S_R{*}R_S$	H_R =	1.9260	ft			
R_S = Shell Radius							
Vapor Density							
W_V = Vapor Density	$W_V = M_v\ P_{VA}\ /\ R\ T_{LA}$	W_V =	0.0011	lb / cu ft			0 deg F = 459.67 R
M_V = Vapor Molecular Weight		M_V =	18.0000	lb/lb-mole			
Vapor Pressure at Daily Average Liquid Surface Temperature							
T_{LA} = Daily Avg. Liquid Surface Temp	$T_{LA} = 0.44\ T_{AA} + 0.56\ T_B + 0.0079{*}alpha{*}I$	T_{LA} =	509.7659	R =	10.05	deg C	
T_{AA} = Daily Average Ambient Temp	$T_{AA} = T_{AX} + T_{AN}\ /\ 2$	T_{AA} =	48.5000	deg F =	508.17	R	
Ideal Gas Constant R							
T_B = Liquid Bulk Temperature	$T_B = T_{AA} + 6\ alpha - 1$	T_B =	508.19	R			
Tank Paint Solar Absorptance (Shell)			0.17				As per Table 7.1-6: White/Good = .17
Tank Paint Solar Absorptance (Roof)			0.17				
I = Daily Total Solar Insulation Factor			1,180.000	Btu/sqft d			I_{AVG} = 1,180 Btu/ft^2-d as per sources mentioned on page 6-5 of TANKS user manual

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

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Paint Characteristics

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Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albany, New York (Avg Atmospheric Pressure = 14.37 psia)

Vapor Space Expansion Factor

As per sources listed on page 6-5 of TANKS user manual:

K_E = Vapor Space Expansion Factor	K_E = [delta T_V/T_{LA}]+ [(deltaP_V-delta P_B)/(P_A-P_{VA})]	K_E =	0.0319		T_{AX} =	517.07
delta T_V = Daily Vapor Temperature Range	delta T_V = 0.72(T_{AX}-T_{AN})+0.028*alpha*I]	delta T_V =	18.4328	R	T_{AN} =	499.27
delta P_V = Daily Vapor Pressure Range	R T_{LX} W_V / M_V = P_{VX}	delta P_V =	0.0000	psia		
delta P_B = Breather Vent Press. Setting Range		delta P_B =	0.06	psia		
Vapor Pressure at Daily Average Liquid Surface Temperature						
Vapor Pressure at Daily Minimum Liquid Surface Temperature						
Vapor Pressure at Daily Maximum Liquid Surface Temperature						
Daily Avg. Liquid Surface Temp.			509.7659	R		
Daily Min. Liquid Surface Temp	T_{LN} = T_{LA} - 0.25 delta T_V	T_{LN} =	505.1577	R		
Daily Max. Liquid Surface Temp	T_{LX} = T_{LA} + 0.25 delta T_V	T_{LX} =	514.3741	R		
delta T_A = Daily Ambient Temp. Range		delta T_A =	17.8000	R		

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

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Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albany, New York (Avg Atmospheric Pressure = 14.37 psia)

Vented Vapor Saturation Factor				
Vented Vapor Saturation Factor	$K_S = 1/[1+ (.053*P_{VA}*H_{VO})]$	$K_S =$	0.8681	
Vapor Pressure at Daily Average Liquid Surface Temperature				
Vapor Space Outage				
Working Losses	$L_W = 0.0010\ M_V\ P_{VA}\ Q\ K_N\ K_P$	$L_W =$	1160.2311	lbs
M_V = Vapor Molecular Weight		$M_V =$	18.0000	lb/lb-mole
P_{VA} = Vapor Pressure at Daily Average Liquid Surface Temperature				
Q = Annual Net Throughput	1 bbl/yr = 42 US gal/yr	Q =	190,476.19	bbl/yr
Annual Turnovers		N =	25.6072	
K_N = Turnover Factor	$K_N = (180 + N)/6N$	$K_N =$	1.0000	
Maximum Liquid Volume				
Maximum Liquid Height				
Tank Diameter				
K_P = Working Loss Product Factor		$K_P =$	1.00	
Total Losses		$L_T =$	1444.5675	lbs

Q = annual net throughput = tank capacity [bbl] * annual turnover rate, bbl/yr
K_N = working loss turnover (saturation) factor, dimensionless; see Figure 7.1-18
for turnovers >36, $K_N = (180 + N)/6N$
for turnovers <36, $K_N = 1$
K_P = working loss product factor, dimensionless
for crude oils $K_P = 0.75$

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification	LEACHATE TANK
City	Rensselaer
State	New York
Company	Waste Connections Dunn Landfill
Type of Tank	Vertical Fixed Roof Tank
Description	Leachate storage tank

Tank Dimensions

Shell Length (ft)	14.83
Diameter (ft)	61.63
Liquid Height (ft)	14.00
Avg. Liquid Height (ft)	7.00
Volume (gal)	312,412
Turnovers	25.61
Net Throughput (gal/yr)	8,000,000
Is tank heated (y/n)	N

Paint Characteristics

Shell Color/Shade	White/White
Shell Condition	Good
Roof Color/Shade	White/White
Roof Condition	Good

Roof Characteristics

Type	Cone
Height (ft)	0.00
Slope (ft/ft) Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig)	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Albany, New York (Avg Atmospheric Pressure = 14.37 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Vertical Fixed Roof Tank
Rensselaer, New York

CALCULATED VALUES

	Losses (lbs)		
Components	*Working Loss*	*Breathing Loss*	*Total Emissions*
Total Leachate	1160.23110	284.33644	1444.56753
Trichloroethane (1,1,1)	0.00000	0.00000	0.00000
Trichloroethane (1,1,2)	0.00000	0.00000	0.00000
Vinylidene chloride	0.00000	0.00000	0.00000
Tetrachloroethane (1,1,2,2)	0.00000	0.00000	0.00000
Methyl ethyl ketone	0.00028	0.00007	0.00034
Methyl isobutyl ketone	0.00000	0.00000	0.00000
Acetone	0.00155	0.00038	0.00193
Methylene chloride	0.00026	0.00006	0.00032
Trichloroethylene	0.00002	0.00001	0.00003
Cresol (-o)	0.00000	0.00000	0.00000
Cresol (-m)	0.00000	0.00000	0.00000
Ethylene dichloride	0.00002	0.00001	0.00003
Dioxane (1,4)	0.00007	0.00002	0.00009
Acetonitrile	0.00000	0.00000	0.00000
Acrylonitrile	0.00000	0.00000	0.00000
Benzene	0.00003	0.00001	0.00004
Chlorobenzene	0.00000	0.00000	0.00000
Ethyl chloride	0.00046	0.00011	0.00058
Chloroform	0.00000	0.00000	0.00000
Diethyl ether	0.00000	0.00000	0.00000
Ethylbenzene	0.00000	0.00000	0.00000
Iso-butyl alcohol	0.00000	0.00000	0.00000
Tetrachloroethylene	0.00000	0.00000	0.00000
Toluene	0.00001	0.00000	0.00001
Dichloroethylene (-trans-1,2)	0.00000	0.00000	0.00000
Phenol	0.00000	0.00000	0.00000
Benzoic Acid	0.00000	0.00000	0.00000
Xylenes (mixed isomers)	0.00000	0.00000	0.00000
Cyclohexanone	0.00000	0.00000	0.00000
Cresol (-p)	0.00000	0.00000	0.00000
Aniline	0.00000	0.00000	0.00000
Dimethyl phthalate	0.00000	0.00000	0.00000
Pyridine	0.00000	0.00000	0.00000
Methyl alcohol	0.00000	0.00000	0.00000
Butanol-(1)	0.00000	0.00000	0.00000
Water	1160.22840	284.33577	1444.56417