Appendix D

Air Quality Impact Assessment-Recology Hay Road Landfill (June 2019)

Air Quality Impact Assessment
Recology Hay Road Landfill

Recology Hay Road
6426 Hay Road
Vacaville, CA 95687
415-875-1161

SCS ENGINEERS

01198193.05 Task 4 | June 4, 2019

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Abbreviations and Acronyms

AB – Assembly Bill

AQIA – Air Quality Impacts Assessment

AQMP – Air Quality Management Plan

ATC – Authority to Construct

BAAQMD – Bay Area Air Quality Management District

BACT – Best Available Control Technology

bgs – below ground surface

BSP – Bird Sanctuary Pond

°C – degrees Celsius

C&D – Construction and Demolition

CA – Current Actual

CAA – Clean Air Act (Federal)

CAAQS – California Ambient Air Quality Standard CAFE – Corporate Average Fuel Economy

CalEEMod – California Emissions Estimator Model

CalEPA – California Environmental Protection Agency

CAP – Criteria Air Pollutant

CAPCOA – California Air Pollution Control Officers Associated

CARB – California Air Resources Board

CAT – Climate Action Team

CCAA – California Clean Air Act

CCR – California Code of Regulations

CEC – California Energy Commission

CEQA – California Environmental Quality Act

CFR – Code of Federal Regulations

CH4 – Methane

CMHFP – Compostable Materials Handling Facility Permit

CO – Carbon Monoxide

CO_2 – Carbon Dioxide

CO_2e – Carbon Dioxide Equivalent

CP – Current Permitted

CPUC - California Public Utilities Commission

CUP – Conditional Use Permit

District – Yolo Solano Air Quality Management District

DM – Disposal Module

Abbreviations and Acronyms (Cont.)

DPM – Diesel Particulate Matter

EMFAC – CARB's Emission Factor

°F – degrees Fahrenheit

FP – Future Potential

GCCS – Landfill Gas Collection and Control System

GHG – Greenhouse Gas

GWP – Global Warming Potential

H_2S – Hydrogen Sulfide

HFCs – Hydrofluorocarbons

HP - Horsepower

HRA – Health Risk Assessment

IPCC – Intergovernmental Panel on Climate Change

JPO – Jepson Prairie Organics

LandGEM – Landfill Gas Emissions Model

LCFS – Low Carbon Fuel Standard

LFG – Landfill Gas

LFGTE – Landfill Gas to Energy

LMR – Landfill Methane Rule

MDV – Medium Duty Vehicles

MEI – Maximally Exposed Individual

MMT – Million Metric Tons

MPH – Miles per Hour

MPO – Metropolitan Planning Organization

MSW – Municipal Solid Waste

MT – Metric Tons

N2O – Nitrous Oxide

NAAQS – National Ambient Air Quality Standards

NESHAP – National Emission Standard for Hazardous Air Pollutants

NF_3 – Nitrogen Triflouride

NMOC – Non-methane Organic Compounds

NO_2 – Nitrogen Dioxide

NOAA – National Oceanic and Atmospheric Administration

NO_x – Nitrogen Oxides

Abbreviations and Acronyms (Cont.)

NSPS – New Source Performance Standard

O_3 – Ozone

OFFROAD – CARB's Off-road Emissions Model

Pb – Lead

PFCs – Perfluorocarbons

PM_{10} – Particulate Matter with an Aerodynamic Diameter of Less than 10 Microns (Respirable PM)

$PM_{2.5}$ – Particulate Matter with an Aerodynamic Diameter of Less than 2.5 Microns (Fine PM)

ppm – Parts per Million

ppmw – Parts per Million by Weight

RACT – Reasonably Available Control Technology

RHRLF – Recology Hay Road Landfill

ROG – Reactive Organic Gasses

SB – Senate Bill

SCS – SCS Engineers

SEIR – Subsequent Environmental Impact Report

SF_6 – Sulfur Hexafluoride

SFBAAB – San Francisco Bay Area Air Basin

SIP – State Implementation Plan

SO_2 – Sulfur Dioxide

So_x – Sulfur Oxides

SVAB – Sacramento Valley Air Basin

SWFP – Solid Waste Facility Permit

TAC – Toxic Air Contaminant

tpd – tons per day

tpy – tons per year

TRI – Trinity Consultants, Inc.

UNFCCC – United Nations Framework Convention on Climate Change

USEPA – United States Environmental Protection Agency

VMT – Vehicles Miles Traveled

VOC – Volatile Organic Compounds

YSAQMD – Yolo-Solano Air Quality Management District

1.0 EXECUTIVE SUMMARY

SCS Engineers (SCS) has prepared this Air Quality Impact Assessment (AQIA) on behalf of Recology Hay Road Landfill (RHRLF) for the modifications of the RHRLF described in Amendment No. 2 of the Conditional Use Permit (CUP) (proposed Project or Project). Note that some information in this Report was originally prepared by a former consultant, Trinity Consultants, Inc. (TRI) and has been reused, modified and updated accordingly in this AQIA. Given that, information reused from the previous TRI Report (TRI, 2018) is referenced within this document. Construction and operation of the Project are anticipated to begin as early as 2020.

The Project site lies within the existing RHRLF. RHRLF is a 640-acre property located at 6426 Hay Road (on the southwest corner of the intersection of Hay Road and State Route 113), in an unincorporated area of Solano County. The site is approximately six miles southeast of the City of Vacaville and eight miles south of the City of Dixon. The permitted landfill footprint is within approximately 256 acres of the entire 640-acre property, and is permitted to receive a total volume of 37 million cubic yards of municipal solid waste (MSW) over its lifetime (TRI, 2018).

The Project includes:

(1) <u>Disposal Area Expansion</u> - a lateral expansion of the landfill boundary into an approximately 24-acre triangular area adjacent to the existing landfill boundary. This expansion will result in temporary construction emissions associated with preparation of the area for waste acceptance. There are no increases in daily or annual emissions, on an ongoing basis, specifically attributable to this expansion.

(2) <u>Correction to Disposal Limits of Disposal Module-1</u> – a modification of the CUP to acknowledge that Disposal Module-1 (DM-1) extends beyond its originally defined disposal limits and an adjustment of the permitted disposal limit to reconcile the newly permitted disposal footprint. This correction will not affect air emissions, as the correction will not change the overall waste disposal capacity of the landfill.

(3) <u>Modification to Landfill Peak Tonnage Limit</u> – a revision of the peak daily limit, increasing to 3,400 tons per day (tpd), and establishment of a 7-day-average limit of 3,200 tpd of disposal; as compared to the current daily limit of 2,400 tpd. This modification will result in a potential increase in emissions due to an increase in landfilling activities on a daily and annual basis.

(4) <u>Construction and Demolition (C&D) Sorting Operation</u> – modification of existing landfilling operations to include a 150-foot by 300-foot area for the sorting of construction and demolition (C&D) materials, which would move around the site as needed to increase diversion of these materials. This operation will process up to 150 tpd of material for 260 days per year; material which is currently accepted at the RHRLF, and landfilled. This modification will enable RHRLF to divert a significant amount of material from the landfill for beneficial uses. This operation will generate a small amount of fugitive PM emissions as well as emissions from diesel engines that will power the operation.

(5) <u>Disposal of Friable Asbestos</u> – allowing receipt and disposal of friable asbestos within all existing disposal modules rather than limited to DM-1. This expansion of the area allowed for disposal will not affect current disposal limits, and will result in no potential increase in emissions.

(6) Modification of the Existing Soil Borrow Pit – increasing the footprint of the borrow pit by approximately six acres through deepening and widening the limits, thereby providing an additional 3.6 million cubic yards of soil for use in landfill construction and operation. This increase in available soil will not affect current rates of soil use at the landfill; and so will not result in an increase in emissions.

(7) Storage of Baled Recyclables – receipt and storage of baled recyclables at the existing Recyclable Storage Bunkers and in the northern portion of the Jepson Prairie Organics (JPO) composting facility. Based on the nature of the recyclables to be baled and stored, negligible emissions are expected from this activity.

The Project would result in the overall permitted waste disposal area increasing from 256 acres to 280.3 acres, thereby increasing the facility's disposal capacity by 8.8 million cubic yards and extending the facility's operations by at least five years, with additional years possible depending on the actual fill rate.

Increases in air emissions associated with the Project will result from Project construction emissions and landfill operational emissions. Operational emission sources include mobile source emissions (haul vehicles); landfill gas (LFG) emissions (fugitive/surface and flare), and the proposed C&D sorting operation emissions (dust and diesel engine).

Criteria air pollutants (CAP), greenhouse gases (GHG), and toxic air contaminants (TAC) have been quantified. CAPs include volatile organic compounds (VOC), nitrogen oxides (NOx), carbon monoxide (CO), sulfur oxides (So_x) and particulate emissions with diameter less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$). GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), as well as carbon dioxide equivalents (CO_2e).

During the Project's construction phase, air emissions will occur during the initial preparation of the expanded disposal area (including emissions from grading and geomembrane installation).

Upon commencement of Project operations, air emissions could increase due to (a) additional vehicles delivering MSW to the RHRLF under the increased peak daily and 7-day average MSW acceptance limits, (b) increase in on-site disposal received by the RHRLF, and (c) the new C&D sorting operation.

Emissions from both Project construction and Project operation were quantified and compared to applicable thresholds of significance.

Section 3 of this AQIA includes detailed discussions of the environmental setting of RHRLF, CAP and GHG, air quality, regulatory jurisdictions, and applicable regulations. Section 4 of this AQIA includes detailed discussions and presentations of Project emissions, California Environmental Quality Act (CEQA) significance criteria, and Evaluation of impacts and mitigation measures.

The following tables provide summaries of Project emissions and comparison to CEQA significance thresholds.

Table 1-1: Summary of Project Construction Emissions and Significance

Activity	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SO_x	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
Maximum Daily Emissions	13.0	100.5	138.1	54.4	11.3	0.2	24,278	5.1	0.0	24,406
Significance Threshold	-	-	-	80	-	-	-	-	-	-
	Tons per Year						*Metric Tons per Year*			
Annual Emissions	0.7	5.5	7.8	2.8	0.6	0.0	950	0.3	0.0	957
Significance Thresholds	10	-	10	-	-	-	-	-	-	-

Table 1-2: Summary of Project Operational Emission Increases and Significance – Mobile Sources

Vehicle Category	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SO_x	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
Net Change in Maximum Daily Project Emissions	-6.7	-10.6	-54.8	-4.5	-4.3	0.4	36,105	1.5	0.3	36,229
San Francisco Bay Area Air Basin Significance Threshold	54	-	54	82	54	-	-	-	-	-
Sacramento Valley Air Basin Significance Threshold	-	-	-	80	-	-	-	-	-	-
	Tons						*Metric Tons*			
Net Change in Annual Project Emissions (2020)	-1.1	-1.8	-9.4	-0.8	-0.7	0.1	5,625	0.2	0.0	5,644
San Francisco Bay Area Air Basin Significance Threshold	10	-	10	15	10	-	-	-	-	-
San Francisco Bay Area Air Basin Significance Threshold	10	-	10	-	-	-	-	-	-	-

Table 1-3: Summary of Project Operational Stationary Source Emissions Increases and Significance

Activity	Pollutant									
	VOC[a]	CO	NO_x[a]	PM_{10}	$PM_{2.5}$	SO_x	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
Maximum Daily Increase	301	440	108	0.38	0.38	150	310,489	19,153	3.4	485,026
Mitigated Maximum Daily Emissions	54	440	54	0.38	0.38	0.0	310,489	19,153	3.4	485,026
Significance Threshold	-	-	-	80	-	-	-	-	-	-
	Tons per Year						*Metric Tons per Year*			
Annual Increase (Peak Year)	55	80.4	19.7	0.07	0.07	27.4	51,396	3,170	0.6	80,288
Mitigated Annual Increase	9.9	80.4	9.9	0.07	0.07	0.00	51,369	3,170	0.6	80,288
Significance Thresholds	10	-	10	-	-	-	-	-	-	-

Notes: (a) Assumption is that emission offsets would be provided for VOC and NOx to stay below significance thresholds.

As shown on the above tables, Project construction emissions are less than all applicable significance thresholds. Project operational mobile source emissions are also less than all applicable significance thresholds. Note that haul traffic occurs in two different air basins (Sacramento Valley and San Francisco Bay Area), each with different significance thresholds. Note also that emissions of most pollutants actually show decreases. These decreases are due to factoring in increasingly stringent diesel engine emissions requirements going forward.

Project operational emissions are also determined to be less than significant. For VOC and NOx, emission offsets are assumed to be provided as mitigation to keep Project emissions below respective significance thresholds. In accordance with the YSAQMD CEQA Handbook (YSAQMD, 2007), stationary sources complying with best available control technology (BACT) and emission offset requirements, as applicable, are usually considered as having less than significant air quality impact. As such, VOC and NOx emissions will have a less than significant impact after complying with YSAQMD offsetting requirements

It should be noted that the Project is expected to result in a potential minor increase in fugitive dust (PM) emissions associated with landfilling operations, such as handling and placing of waste and cover soil and dust derived from haul vehicles on roads. The increase in the peak daily waste limit and the establishment of a 7-day average daily limit, as previously described, will result in a potential increase in daily and annual fugitive dust emissions, respectively. Fugitive dust associated with landfilling operations is not included in the YSAQMD's current potential to emit inventory for the RHRLS. In addition, the proposed increases in daily and annual waste acceptance limits will be subject to YSAQMD permitting, including BACT requirements. RHRLF currently implements a regimen of daily watering of roads and other areas, as needed, to minimize fugitive dust. These routine measures are widely accepted as BACT for dust emissions at landfills. As such, we have not presented fugitive dust from landfill operations in this AQIA.

The primary air toxic associated with the Project is diesel particulate matter (DPM) from the vehicles delivering MSW to the RHRLF. These emissions are conservatively assumed to be equivalent to the PM_{10} emissions shown in Table 1-2. The table shows that PM emissions from haul traffic are expected to actually decline slightly as part of the Project, due to more stringent diesel engine standards. A portion of each additional trip will occur on site, or on roadways in close proximity to the landfill. The total number of truck trips is considered low compared to other source types with the propensity to cause “hot spots” due to diesel emissions from mobile sources (e.g., ports, distribution centers, and intermodal railyards). As shown in Figure 3.2, the nearest receptor to the Project is located more than one mile from landfilling activities. In addition, it should be noted that the Project does not include any changes in the existing truck routes. More importantly, and as previously noted, the trucks visiting the facility will be subject to California Air Resources Board (CARB) regulations, which require that nearly all heavy duty diesel vehicles visiting the RHRLF be equipped with the lowest diesel particulate matter (DPM)-emitting engines or be retrofitted with CARB-verified diesel emission control systems. Because of these rules, the lack of sensitive receptors in close proximity to the proposed Project, and the fact that there will be no change in truck routes, it is concluded there would be no substantial additional exposure of sensitive receptors to TACs will occur as a result of the Project. TAC impacts are discussed in more detail in Section 4.3.2.

Based on recent communications with Matt Jones of the YSAQMD, SCS understands that the District’s primary health risk concern from the Project is associated with exhaust emissions due to increased haul traffic, as discussed in the previous paragraph. As presented in this AQIA, there is a net decrease in emission from haul traffic, due to haul vehicles. It is SCS’ understanding that under those circumstances, the District would not require an HRA as part of the environmental review process. We wish to note that a potential increase in toxics emissions at the site from fugitive LFG may result as part of the Project. These emissions have been calculated and are included in the tables in Appendix D. If the District deems that an HRA is required as part of the YSAQMD permitting process, Recology will perform an HRA and include a summary report with the District application. It should be emphasized that YSAQMD will not permit any project for which project toxics emissions from on-site sources exceed any applicable health risk standard.

2.0 PROJECT DESCRIPTION

2.1 INTRODUCTION

This AQIA was prepared pursuant to the YSAQMD's *Handbook for Assessing and Mitigating Air Quality Impacts*, (YSAQMD CEQA Handbook) (YSAQMD, 2007), the *Solano County EIR Guidelines* (Solano County, 1999), the *California Environmental Quality Act* (CEQA)[1] and the California Natural Resources Agency's *CEQA Guidelines*.[2]

2.2 GENERAL PROJECT BACKGROUND

The RHRLF provides solid waste disposal services to both municipal and commercial customers in the San Francisco Bay Area and the Sacramento Valley. Currently, the site primarily serves Solano County, including the cities of Vacaville and Dixon and portions of the unincorporated County, as well as the City and County of San Francisco. The site has historically received waste from across the state.

The RHRLF site is a 640-acre property located at 6426 Hay Road (on the southwest corner of the intersection of Hay Road and State Route 113), in an unincorporated area of Solano County. The site lies approximately six miles southeast of the City of Vacaville and eight miles south of the City of Dixon (See Figure 2-1). The RHRLF consists of Assessor's parcel numbers 042-020-060, 042-020-280, and 042-020-020.

The permitted landfill footprint is within approximately 256 acres of the entire 640-acre property, and has a permitted lifetime volume of 37 million cubic yards (17 million megagrams) of MSW. The RHRLF contains specific subareas known as solid waste "disposal modules," (DM) and an 80-acre soil "borrow pit" area. Other areas of the site include the approximately 11-acre Recology Vacaville-Solano fleet maintenance shop (Vacaville Shop), an 18-acre Bird Sanctuary Pond (BSP), 95 acres of undeveloped open space, and approximately 180 acres of conservation area. The JPO composting operation is located on approximately 39 acres also within the 256-acre permitted landfill boundary. Adjacent to JPO is a 16-acre unimproved area that is currently used for the storage of recyclables. While the storage of recyclables does not constitute a change of use of the property or require an amendment to the CUP, this storage area will be delineated on facility permit maps in order to clarify that composting activities are not permitted in this area. The administrative adjustment of the facility permit maps in this way is therefore acknowledged in this AQIA; however, does not entail any change to the baseline conditions assessed herein.

Figure 2-1 shows the Regional Location and Figure 2-2, RHRLF Site Overview, shows the entire RHRLF property with the above-mentioned features labeled. Recology Hay Road, an integrated resource recovery company, owns and operates the Project site.

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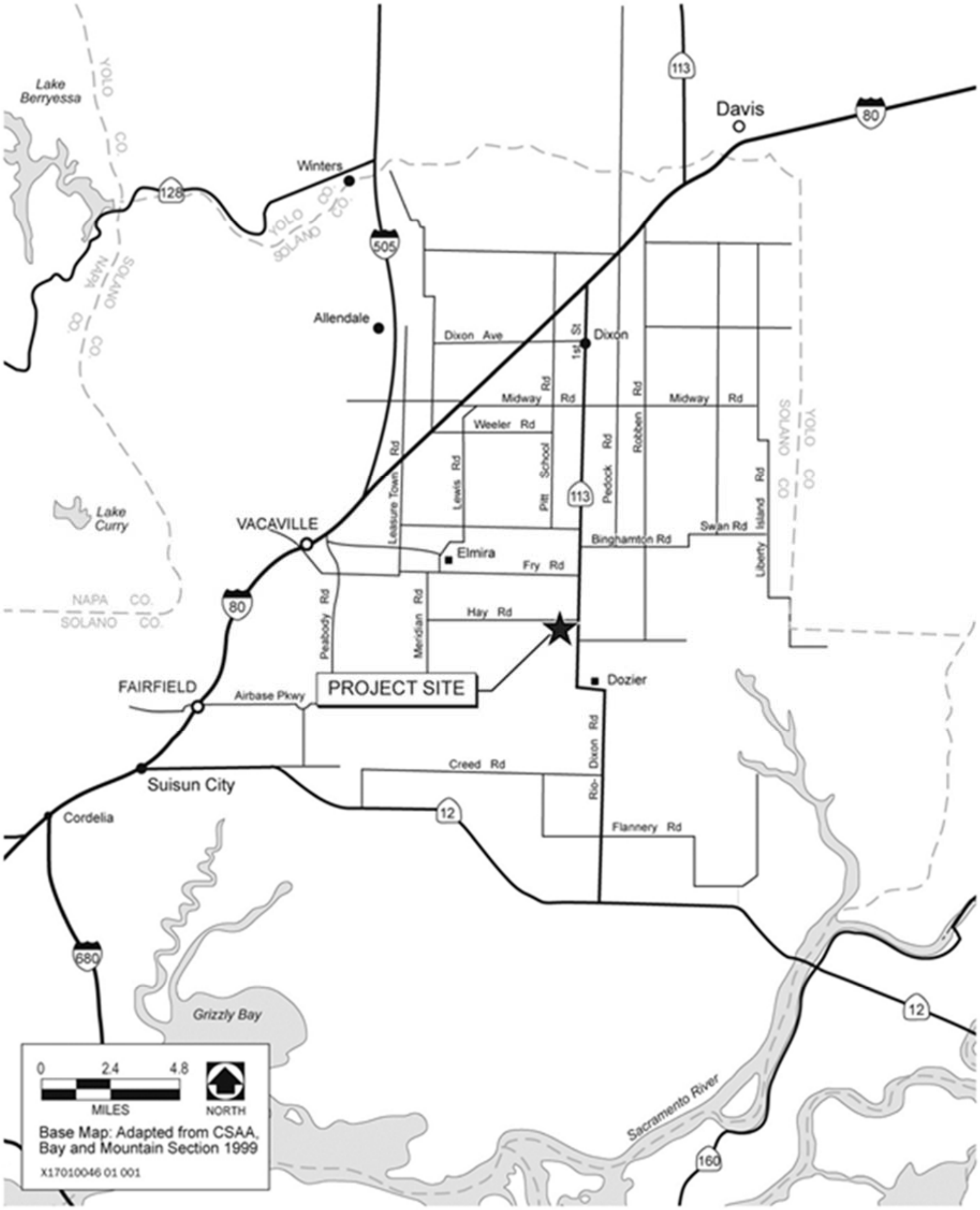
[1] Public Resources Code §§ 21000-21177

[2] California Code of Regulations (CCR) Title 14, Division 6, Chapter 3, §§ 15000 – 15387



Source: Doug Brown 2012

Figure 2-1: Regional Location

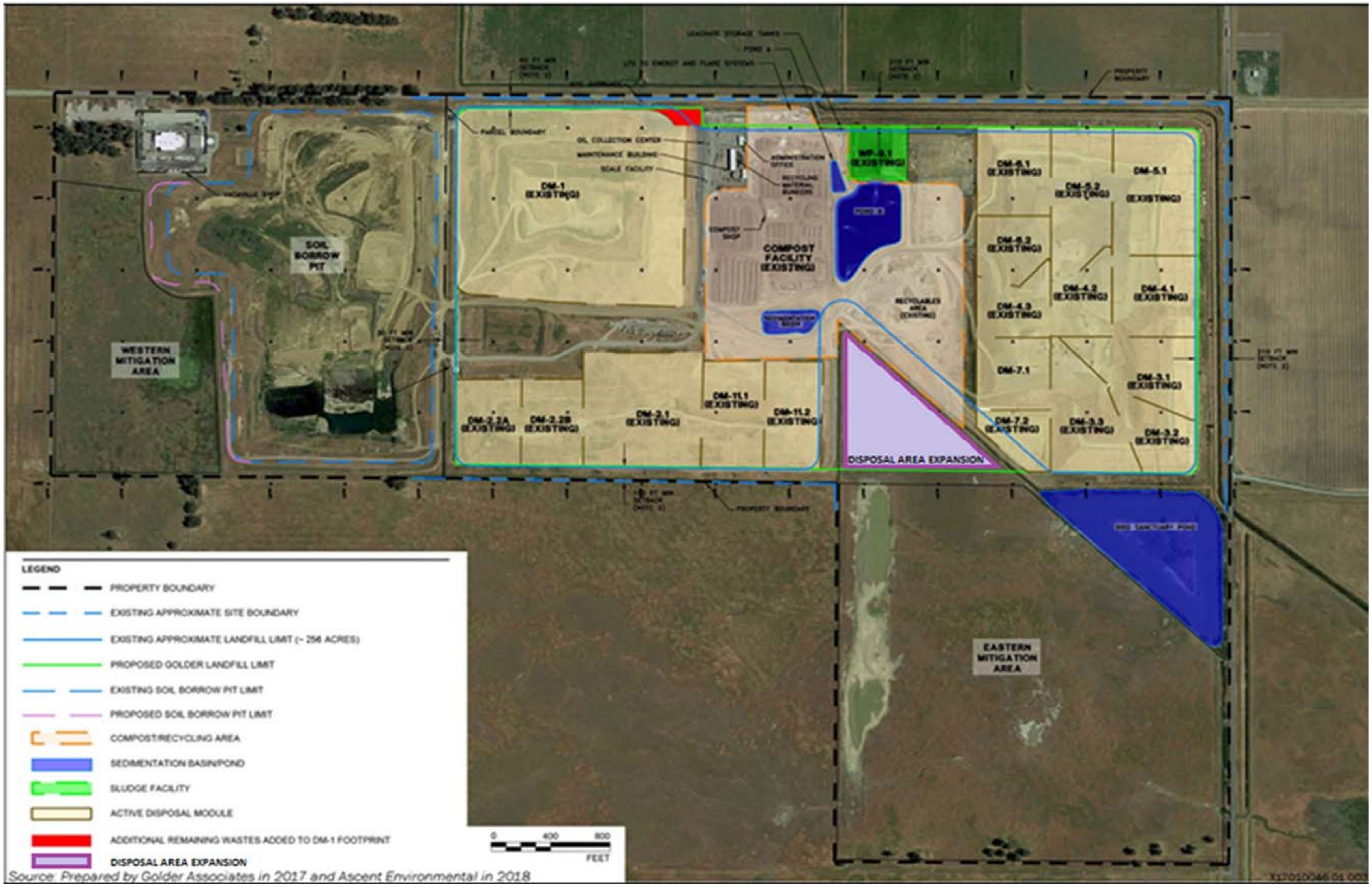


Figure 2-2: RHR Landfill Site Overview

The RHRLF is designated a Class II and Class III (nonhazardous) waste management facility and is currently authorized by its Solid Waste Facility Permit (SWFP) and CUP to currently accept a maximum of 2,400 tpd of MSW for disposal and 2,500 tons of friable asbestos per month. In 2016, the landfill received a total of 614,681 tons of MSW. Within that period, the landfill received a 7-day average peak of 1,682 tpd of MSW and a monthly peak of 1,041 tons of friable asbestos. On several occasions within the last few years, the MSW tonnage received by the landfill has reached the 2,400-tpd limit established within the SWFP and CUP. On such days, the RHRLF instructs haulers to proceed to other disposal locations that have not yet reached their daily limit for the day (TRI, 2018).

The JPO compost facility is located within the permitted boundary of the RHRLF. JPO operates under the same CUP as the RHRLF, but has a Compostable Materials Handling Facility Permit (CMHFP) that is separate from the landfill's SWFP. Solano County complies with legislative mandates from the State of California that require additional diversion from landfills, resulting in a higher demand for resource recovery, recycling, and composting. The JPO compost facility permit allows an average of 600 tpd of compostable green material, agricultural material, and food wastes, with a peak daily total tonnage of 750 tpd. In 2016, the JPO compost facility received an average of 275 tpd of compost feedstock with a peak daily total tonnage of 641 on June 1, 2017 (TRI 2018). The proposed project does not include any modifications to JPO.

PROJECT DESCRIPTION

Solano County is considering amending the existing CUP to reflect changes requested by Recology. The changes constitute the Project to be analyzed in a Subsequent Environmental Impact Report (SEIR), and are summarized below. Construction and operation of the Project are anticipated to begin as early as 2020.

2.2.1 Disposal Area Expansion

Lateral expansion of the RHRLF disposal area would occur within an approximately 24-acre triangular area (Triangle) (as shown on Figure 2-2), increasing the overall permitted waste disposal area from 256 acres to 280.3 acres. The Triangle is currently undeveloped open space and would be added to the permitted landfill boundary for landfill disposal uses. Inclusion of this area would increase the landfill's total disposal capacity by approximately 8.8 million cubic yards and extend the estimated life of the landfill by at least five years, depending on the actual rate of disposal. If waste is landfilled at the maximum proposed rate of 1,168,000 tons per year, then the life of the landfill would be extended by approximately five years. A slower fill rate would extend the site life further. The landfill's existing groundwater and LFG monitoring network, as well as its leachate collection system, would be modified to include the proposed expansion. No change in daily RHRLF operations would result directly from these changes; however, as noted in the previous discussion (Section 2.2) as well as in Section 2.2.3, an increase in the daily waste disposal limit is included as part of the Project. Temporary construction emissions will occur during preparation of the expanded disposal area.

2.2.2 Correction to Disposal Limits of Disposal Module (DM)-1

Recent test borings conducted at RHRLF show that DM-1, as delineated in Figure 2-2, extends beyond the geographic limits originally identified for disposal of waste in the CUP and SWFP. Historical disposal of waste within DM-1 occurred within a 0.3-acre area near the northeast corner of the module, and was not captured by the existing disposal limit. (This location is indicated by the red area identified in Figure 2-2). As part of the Project, the CUP would be modified to acknowledge that DM-1 extends beyond its originally defined disposal limits and that the permitted disposal limit would be adjusted to reconcile the newly understood disposal footprint (TRI, 2018).

2.2.3 Modification to Landfill Peak Tonnage Limit

The Project includes modification of the existing daily tonnage limit for the RHRLF by revising the peak daily limit, as well as establishing a 7-day-average limit. The existing CUP allows for 2,400 tpd of waste disposal. Occasionally, the landfill has received more than 2,400 tons of MSW; on a peak day in 2016, the landfill received 2,446 tons of MSW, requiring Recology to turn away trucks in order to comply with the limit of the CUP. As part of the Project, the CUP would be amended to allow for a peak daily limit of 3,400 tpd along with a 7-day-average limit of 3,200 tpd of disposal. Establishing a higher peak tonnage limit would allow the facility to accept additional waste on peak days without having to divert haulers to other facilities. This requested change is particularly timely, as each of the past three years has seen an influx of significant amounts of waste material associated with wildfires. This requested change will enable RHRLF to contribute to recovery efforts during future, likely similar fire events, without risking violations of its waste acceptance limits (TRI, 2018).

2.2.4 Construction and Demolition (C&D) Sorting Operation

The Project includes a modification of existing onsite operations to include a designated area for the sorting, separation, and processing of C&D materials. The RHRLF is already permitted to receive C&D waste. However, the proposed CUP modification would authorize the sorting of this waste stream, allowing for increased recovery of recyclable materials and greater diversion of materials from landfill disposal. The incoming C&D waste stream would be processed using portable equipment—primarily screens, sort lines, and a shredder—which could be moved within the site as the disposal areas shift within the landfill property. The footprint of the C&D sorting operation would be approximately 150 feet by 300 feet, which would include all equipment and stockpiled materials. The tonnage associated with the C&D sorting operation would be the same as existing conditions; as such, the annual tonnage limit of the landfill would not be affected by the C&D sorting operation.

2.2.5 Disposal of Friable Asbestos

Currently, the landfill is permitted to receive up to 2,500 tons per month of friable asbestos. However, within the landfill property, disposal of this material is currently limited to DM-1, which is anticipated to reach its capacity and close in 2021. As part of the requested permit modifications, friable asbestos disposal is proposed within all existing disposal modules, except for DM-2.1. No modification of the monthly tonnage limit on friable asbestos disposal would occur. The modification only permits a change to the on-site disposal locations.

2.2.6 Modification of the Existing Soil Borrow Pit

As part of the proposed CUP modifications, the current dimensional limits of the existing soil borrow pit would be deepened and widened to accommodate the increased need for soil at the landfill. The existing borrow pit measures 80 acres with a current maximum excavation depth of 60 feet below ground surface (bgs). A modification to the previous B&J Drop Box Company Borrow Pit Plan is requested to allow RHRLF to increase the footprint of the borrow pit by approximately 6 acres, and deepen the borrow pit by an additional 68 feet. These changes will provide an additional 3.6 million cubic yards of soil for use in landfill construction and operation activities. The proposed expansion of the borrow pit would not extend past an existing topsoil berm located adjacent to the Western Conservation Area.

2.2.7 Proposed Storage of Baled Recycled Commodities

The Project includes a modification of existing onsite operations to include an area for the storage of baled recycled commodities, which would be located entirely within the existing landfill boundary. The RHRLF is already permitted to receive and store recyclables, but the proposed modification would authorize the storage of baled, single-stream recyclables for storage. Due to recent import restrictions imposed by China on importing recyclable materials, Recology proposes to temporarily store baled, single-stream recyclables until processing capabilities are improved to meet the new requirements and/or new markets are developed to accept the material. Stockpiles are proposed within a paved area near the northern boundary of the JPO area, with one additional area proposed inside an existing recycling bunker located east of the scale house, as shown on Figure 2-2. This operation would only occur on an as-needed basis (TRI, 2018). Based on the nature of the recyclable materials, it is assumed there would be no increase in emissions associated with this proposed change.

3.0 SETTING

3.1 INTRODUCTION

The Project site is located in an unincorporated area of Solano County approximately six miles southeast of the City of Vacaville and eight miles south of the City of Dixon, and straddling the boundary between the Sacramento Valley Air Basin (SVAB) and the San Francisco Bay Area Air Basin (SFBAAB). All portions of the Project are within the SVAB except for the soil borrow pit, which is located in the SFBAAB.

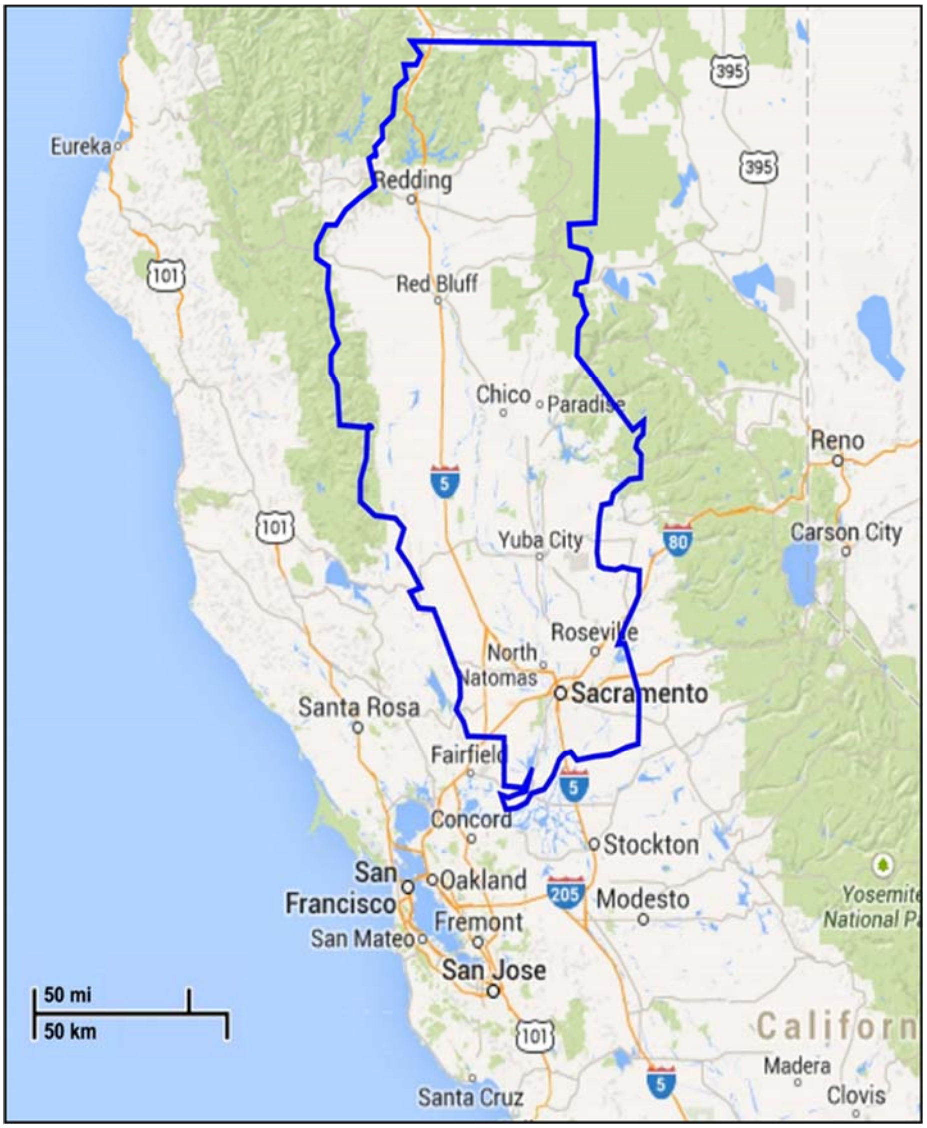
For the purposes of this AQIA, the Project will be evaluated as if it lies entirely within the SVAB under the jurisdiction of the YSAQMD except for the mobile source emissions assessment. This assumption is valid because (i) all Project elements except for the soil borrow pit modification lie within the SVAB, (ii) the soil borrow pit modifications lie immediately upwind of the SVAB, (iii) the SVAB generally exhibits poorer air quality with respect to the ambient air quality standards discussed under Section 3.2.2, and (iv) the facility's stationary source air permits to operate are issued by the YSAQMD. Mobile sources emissions were estimated and assigned to the likely air basin of origin and is described in further detail under Section 4.2.2.

The SVAB encompasses eleven counties, including all of Shasta, Tehama, Glenn, Colusa, Butte, Sutter, Yuba, Sacramento, and Yolo counties, as well as the westernmost portion of Placer County and the northeastern half of Solano County. The SVAB portions of the Project are within the jurisdiction of the YSAQMD. The YSAQMD's jurisdiction covers Yolo County and the northeast portion of Solano County.

3.2 ENVIRONMENTAL SETTING

3.2.1 Climate and Meteorology

The topography of the SVAB consists of North Coast Ranges on the west, and the Northern Sierra Nevada Mountains on the east. The intervening terrain is relatively flat. The SVAB has hot, dry summers and mild, rainy winters. During the year, the temperature may range from 20 to 115 degrees Fahrenheit (°F), with summer highs usually in the 90s and winter lows occasionally below freezing. Average annual rainfall is about 20 inches, and the rainy season generally occurs from November through March. Figure 3-1 depicts the SVAB jurisdictional boundaries.



MAP SOURCE: TRI, 2018.

Figure 3-1: Sacramento Valley Air Basin Boundaries

3.2.2 Regional Air Quality

National Ambient Air Quality Standards (NAAQS) are established by the U.S. Environmental Protection Agency (USEPA) for criteria pollutants, which are: ozone (O_3), PM_{10}, $PM_{2.5}$, CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb). These standards set maximum concentrations over different averaging periods—primarily to protect public human health and secondarily to protect public welfare (protect against decreased visibility as well as damage to animals, crops, vegetation, and buildings).

California Ambient Air Quality Standards (CAAQS) are established by the State of California and are in some cases more stringent than the NAAQS and include additional pollutants than only the criteria pollutants. Pollutants covered by the CAAQS include O_3, PM_{10}, $PM_{2.5}$, CO, NO_2, SO_2, Pb, sulfates, hydrogen sulfide (H2S), and vinyl chloride.

Air quality standards at the state and national level prescribe both a maximum allowable concentration of the pollutant and an averaging time for the measurement. The pollutant concentrations and exposure times are based on reviews of scientific studies that examine the impacts of pollutant exposure on human health, crops, animals, vegetation, and building materials. Some adverse effects result from short-term, high-concentration (acute) exposures while others may be caused from longer-term (chronic) exposures to more mildly-elevated concentrations. Some pollutants are known to cause harm from both acute and chronic exposures and have two air quality standards as a result. Table 3-1 summarizes the current CAAQS and NAAQS as well was YSAQMD's attainment status. Table 3-2 contains a summary of human health and environmental effects of the for the key criteria pollutants.

Table 3-1: Summary of Ambient Air Quality Standards and YSAQMD Attainment Status

Pollutant	Averaging Time	California Standard	Attainment Status (California)	Primary National Standard	Attainment Status (National)
O_3	1-hour	0.09 ppm	N	-	-
	8-hour	0.070 ppm	N	0.070 ppm	N
PM_{10}	24-hour	50 µg/m^3	N	150 µg/m^3	U
	Annual	20 µg/m^3	N	-	-
$PM_{2.5}$	24-hour	-	-	35 µg/m^3	A
	Annual	12 µg/m^3 – 3-year avg.	U	12.0 µg/m^3	N
CO	1-hour	20 ppm	A	35 ppm	A
	8-hour	9.0 ppm	A	9 ppm	A
NO_2	24-hour	0.18 ppm	A	100 ppb	A
	Annual	0.030 ppm	A	0.053 ppm	A
SO_2	1-hour	0.25 ppm	A	75 ppb	A
	24-hour	0.04 ppm	A	0.14 ppm	A
	Annual	-	-	0.030 ppm	A
Pb	30-day avg.	1.5 µg/m^3	A	-	-
	Quarterly Average	-	-	1.5 µg/m^3	A
	Rolling 3-Month Average	-	-	0.15 µg/m^3	A

Source: CARB, 2018.

Notes: N = Nonattainment, A = Attainment, U = Unclassified

Table 3-2: Summary of Health and Environmental Effects of the Key Criteria Pollutants

Pollutant	Health Effects	Environmental Effects	Examples of Sources
O_3	Respiratory symptoms Worsening of lung disease leading to premature death Damage to lung tissue	Crop, forest, and ecosystem damage Damage to a variety of materials, including rubber, plastics, fabrics, paint and metals	Formed by chemical reactions of air pollutants in the presence of sunlight; common sources are motor vehicles, industries, and consumer products
PM_{10}	Premature death & hospitalization, primarily for worsening of respiratory disease	Reduced visibility and material soiling	Cars and trucks (especially diesel), fireplaces, wood stoves, windblown dust from roadways, agriculture, and construction activities
$PM_{2.5}$	Premature death Hospitalization for worsening of cardiovascular disease Hospitalization for respiratory disease Asthma-related emergency room visits Increased symptoms, increased inhaler usage	Reduced visibility and material soiling	Cars and trucks (especially diesel), fireplaces, wood stoves, windblown dust from roadways, agriculture, and construction activities
CO	Chest pain in patients with heart disease Headache Light-headedness Reduced mental alertness	None	Any source that burns fuel such as cars, trucks, construction and farming equipment, and residential heaters and stoves
NO_2	Lung irritation Enhanced allergic responses	Reacts to form acid precipitation and deposition	Any source that burns fuel such as cars, trucks, construction and farming equipment, and residential heaters and stoves
SO_2	Worsening of asthma: increased symptoms, increased medication usage, and emergency room visits	Reacts to form acid precipitation and deposition	Coal and oil burning power plants, refineries, and diesel engines
Pb	Impaired mental functioning in children Learning disabilities in children Brain and kidney damage	Soil and water pollutant	Metal smelters, resource recovery, leaded gasoline, lead paint

Source: CARB, 2018.

3.2.2.1 Ozone (O_3)

Ozone, or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between reactive organic gasses (ROG) (also called VOC) and NO_X in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of NO_X and ROG—often referred to as ozone precursors—are combustion processes (including motor vehicle engines); the evaporation of solvents, paints, and fuels; and biogenic sources. Mobile sources are the single largest source of O_3 precursors in the SVAB. Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. ROG emission rates from on-highway vehicles decline (on a grams per mile basis) as speeds increase up to about 50 miles per hour (mph), then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxides emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.

Ozone levels typically build up during the day and peak in the afternoon hours. Short term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, O_3 can aggravate existing respiratory diseases such as asthma, bronchitis and emphysema. Chronic exposure to high O_3 levels can permanently damage lung tissue. Ozone can also damage plants and trees, and materials such as rubber and fabrics.

3.2.2.2 Respirable and Fine Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter refers to a wide range of solid and/or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. $PM_{2.5}$ includes a subgroup of fine particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter, such as pollen, is naturally occurring. In the SVAB the majority of particulate matter is caused by combustion, industrial activity, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} is of concern because it bypasses the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs, which is why the United States Environmental Protection Agency (USEPA) and the state of California developed PM_{10} standards to apply only to these small particles. $PM_{2.5}$ poses an increased health risk because the fine particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for about half of particulates in the SVAB. Wood burning in fireplaces and stoves is another large source of fine particulates, especially during the winter season.

3.2.2.3 Carbon Monoxide (CO)

Carbon monoxide is an odorless, colorless gas. It is formed by the incomplete combustion of fuels. The single largest source of CO in the SVAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light-duty motor vehicle and begin to increase again at higher speeds. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

3.2.2.4 Nitrogen Dioxide (NO_2)

Nitrogen dioxide is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high ozone levels.

3.2.2.5 Sulfur Dioxide (SO_2)

Sulfur dioxide is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal and diesel. SO_2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

3.2.2.6 Lead (Pb)

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturers. Several decades ago, mobile sources were the main contributor to lead concentrations in the ambient air due to leaded gasoline. In the early 1970s, the USEPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The USEPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the USEPA's regulatory efforts, emissions of lead from the transportation sector, and levels of lead in the air have decreased dramatically.

3.2.3 Local Air Quality

The YSAQMD and neighboring air districts operate a regional air quality monitoring network that regularly measures the concentrations of the five major criteria air pollutants for which state or federal ambient air quality standards exist. Air quality conditions in California have improved significantly since the CARB was established in 1967, resulting in a reduction in ambient air quality concentrations and the number of days that the standards are exceeded.

Table 3-3 presents a summary of the last three years of monitoring data near the Project area. Nonetheless, exceedances of federal and state standards for O_3, and the state standard for PM_{10}, continue to occur.

Table 3-3: Existing Air Quality Monitoring Data in Proposed Project Area

Pollutant[a]	2014	2015	2016
Ozone (O_3) (1-hour)[b]			
Highest 1-Hour (ppm)	0.089	0.085	0.92
Days > 0.09 ppm (State)	0	0	0
Ozone (O_3) (8-hour)[b]			
Highest 8-hour State (ppm)	0.072	0.071	0.073
Days > 0.070 (National and State)[b]	1	1	1
Carbon Monoxide (CO) (1-hour)[c]			
Highest 1-Hour (ppm)	2.5	2.4	2.1
Hours > 20 ppm (State)	0	0	0
Carbon Monoxide (CO) (8-hour)[c]			
Highest 8-hour (ppm)	2.1	1.9	1.8
Days ≥ 9.0 ppm (State and National)	0	0	0
Respirable Particulate Matter (PM_{10}) (24-Hour)[d]			
Highest 24-hour (State) (µg/m^3)	29.8	42.5	24.7
Days > 50 µg/m^3 (State)	0	ND	ND
Respirable Particulate Matter (PM_{10}) (Annual)[d]			
Annual Average (State) (µg/m^3)	11.4	ND	ND
Fine Particulate Matter ($PM_{2.5}$) (24-Hour)[f]			
98th Percentile 24-hour (National) (ug/m^3)	14.6	29.4	16.4
Days > 35 ug/m^3 (National)	0	0	0
Fine Particulate Matter ($PM_{2.5}$) (Annual)[c]			
Annual Average ug/m^3 (State & National)	5.9	7.5	6.4
Nitrogen Dioxide (NO_2) (1-Hour)[g]			
Highest 1-hour (State & National) (ppm)	0.042	0.031	0.038
Days > 0.18 ppm (State) or 0.10 ppm (National)	0	0	0
Nitrogen Dioxide (NO_2) (Annual)[d]			
Annual Average (State & National) ppm	0.005	0.005	ND
Sulfur Dioxide (SO_2) (1-Hour)[c]			
Highest 1-hour (State & National) (ppm)	0.002	0.002	ND[e]
Days > 0.025 ppm (State)	0	0	ND[e]
Sulfur Dioxide (SO_2) (24-Hour)[c]			
Highest 24-hour (State) (ppm)	0.001	0.001	0.001
Days > 0.040 ppm (State)	0	0	0

a. Data not provided for Pb, H_2S, Vinyl Chloride, or Visibility Reducing Particles as these pollutants are not currently monitored within the SVAB. All other data obtained from CARB's iADAM website (CARB 2018).
b. Data derived from the Vacaville-Ulatis Drive monitoring station.
c. Data derived from the Vallejo-Tuolumne Street monitoring station. CO and SO_2 levels were not monitored in the SVAB during 2014-2016.
d. Data derived from the Vacaville-Merchant Street monitoring station.
e. Insufficient (or no) data available to determine the value.
f. Data derived from the Woodland-Gibson Road Monitoring Station
g. Data derived from the Davis-UCD Monitoring Station

3.2.4 Sensitive Land Uses in the Proposed Project Area

For the purposes of this AQIA, sensitive receptors are considered locations with people who are more sensitive to the effects of air pollutants. The reasons for increased sensitivity include preexisting health problems, proximity to emissions sources, or duration of exposure to air pollutants. Schools, hospitals, and convalescent homes are considered to be sensitive receptors because children, elderly people, and the infirm are more susceptible to respiratory distress and other air quality-related health problems than the general public. Residential areas are also considered sensitive to poor air quality because people usually stay home for extended periods of time which results in greater exposure to ambient air quality. Recreational uses, such as a parks and hiking trails, are also considered sensitive due to the greater exposure to ambient concentrations of pollutants because vigorous exercise associated with some forms of recreation places a high demand on the human respiratory system.

Figure 3-2 depicts the nearest sensitive receptors within a two-mile distance of the Project. Three rural residences are located within a two-mile radius of the property; two of the residences are located approximately 1.5 miles to the west, one residence is located approximately 1.25 miles to the south, and one residence is located approximately 1.0 mile to the north of the Project boundary. There are no schools, hospitals, daycare centers, or senior centers identified within two miles of the Project.

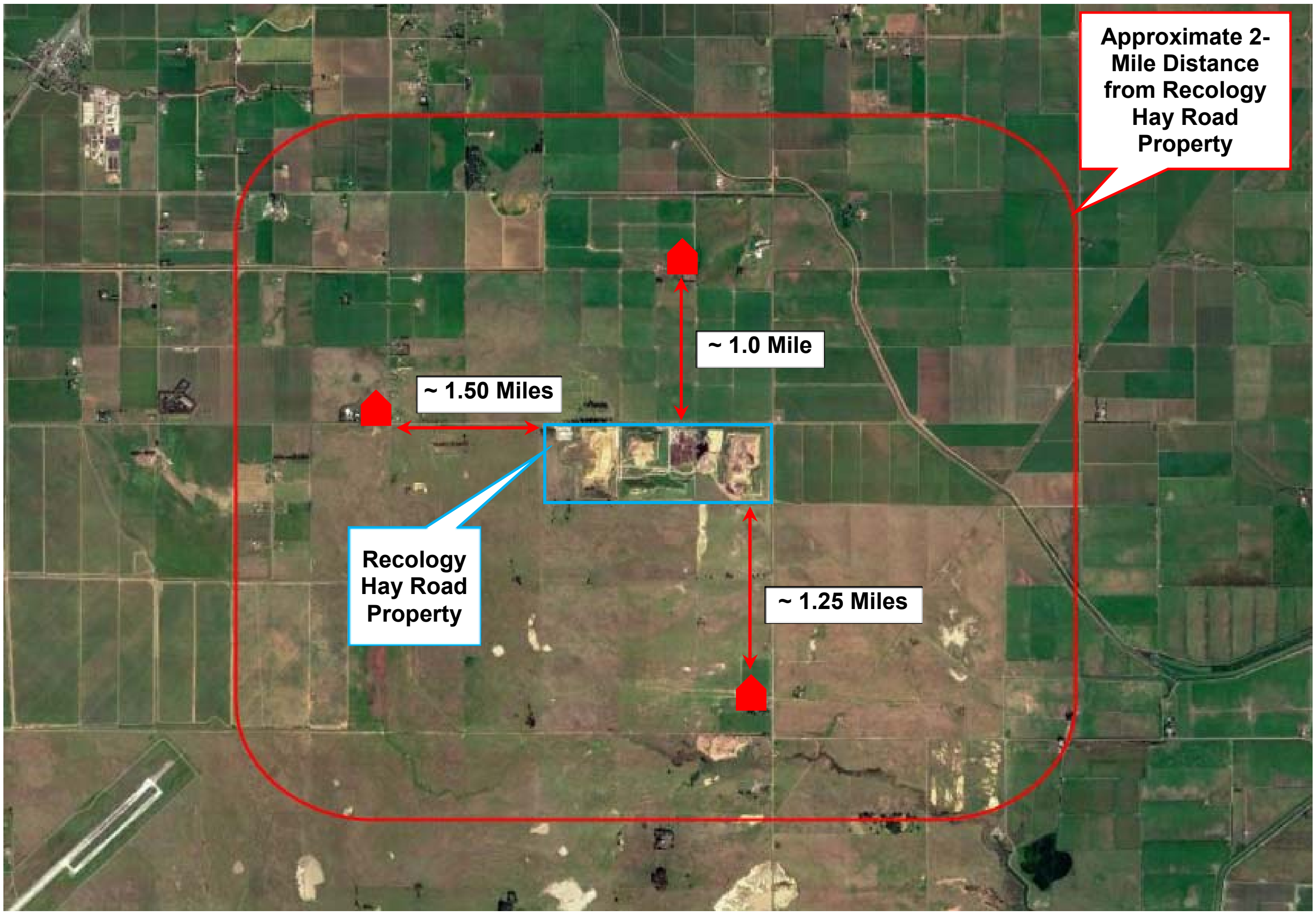


Figure 3-2: Sensitive Receptors within Two Miles of the Recology Hay Road Property

3.2.5 Greenhouse Gasses

GHGs comprise a set of compounds whose presence in the atmosphere is associated with the differential absorption of incoming solar radiation and outgoing radiation from the surface of the earth. In theory, GHGs in the atmosphere affect the global energy balance of the atmosphere-ocean-land system, and thereby affect climate change. More specifically, GHGs absorb strongly the long-wave radiation emitted by the earth, and hence are capable of warming the atmosphere. Regulated GHGs in California are CO_2, CH_4, N_2O, sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen triflouride (NF_3). Other GHGs, such as water vapor, are not regulated.

In order to attempt to quantify the impact of specific GHGs, each gas is assigned a global warming potential (GWP). Individual GHG compounds have varying global warming potential and atmospheric lifetimes. The GWP of a GHG is a measure of how much a given mass of a GHG is estimated to contribute to global warming, relative to CO_2, which is assigned a GWP of 1.0.

The GWP is used determine the CO_2e mass of each GHG. The calculation of the CO_2e is the accepted methodology for comparing GHG emissions since it normalizes various GHG emissions to a consistent reference gas, CO_2. For example, CH_4's GWP of 25 indicates that the global warming effect of CH_4 is 25 times greater than that of CO_2 on a molecule per molecule basis. Carbon dioxide equivalent is the mass emissions of an individual GHG multiplied by its GWP.

The physical properties and sources of GHGs are described in Table 3-4.

Table 3-4: Global Warming Potentials, Properties, Sources of Greenhouse Gases

Constituent	Global Warming Potential	Description and Physical Properties	Sources
Carbon Dioxide (CO_2)	1	CO_2 is an odorless, colorless, naturally-occurring GHG.	CO_2 is emitted from natural and anthropocentric (human) sources. Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic out gassing. Anthropogenic sources are from burning coal, oil, natural gas, and wood.
Methane (CH_4)	25	CH_4 is an organic, colorless, naturally-occurring, flammable gas. Its atmospheric concentration is less than $CO_2$and its lifetime in the atmosphere is brief (10-12 years) compared to other GHGs.	CH_4 has both natural and anthropogenic sources. It is released as part of the biological processes in low oxygen environments, such as in swamplands or in rice production (at the roots of the plants). Over the last 50 years, human activities such as growing rice, raising cattle, using natural gas, and mining coal have added to the atmospheric concentration of CH_4. Other anthropogenic sources include fossil-fuel and biomass combustion, as well as landfilling and wastewater treatment.
Nitrous Oxide (N_2O)	298	N_2O, commonly referred to as "laughing gas," is a colorless, nonflammable GHG. It is a powerful oxidizer and breaks down readily in the atmosphere.	Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. It is used as an aerosol spray propellant, e.g., in whipped cream bottles. It is also used in potato chip bags to keep chips fresh. It is used in rocket engines and in race cars.
Hydrofluorocarbons (HFCs)	92 - 14,900	HFCs are synthetic man-made chemicals that form one of the GHGs with the highest global warming potential	HFCs are man-made for applications such as automobile air conditioners and refrigerants.

Constituent	Global Warming Potential	Description and Physical Properties	Sources
Perfluorocarbons (PFCs)	6,288 - 17,700	PFCs colorless, non-flammable, dense gasses that have stable molecular structures and do not break down through the chemical processes in the lower atmosphere. Because of this, PFCs have very long lifetimes, between 10,000 and 50,000 years.	The two main sources of PFCs are primary aluminum production and semiconductor manufacture.
Sulfur Hexafluoride (SF_6)	22,800	SF_6 is an inorganic, odorless, colorless, nontoxic, nonflammable gas.	SF_6 is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.
Nitrogen Triflouride (NF_3)	17,200	NF_3 is an inorganic, colorless, odorless, nonflammable gas.	NF_3 is used primarily in the plasma etching of silicon wafers

Source: GHGRP, 2014

There is growing concern about GHG emissions and their adverse impacts on the world's climate and on our environment. These concerns relate to the change in the average weather of the earth that may be measured by changes in wind patterns, storms, precipitation, and temperature.

Throughout history, climate has been changing due to forces unrelated to human activity, including solar energy input variation, volcanic activity, and changing concentrations of key atmospheric constituents such as CH_4 and CO_2. These climate changes resulted in ice ages and warm interglacial periods, accompanied by large differences in snow and ice cover and associated changes in ecological systems.

Large-scale combustion of fossil fuels (i.e., coal, oil, and natural gas) by humans beginning in the 19th century resulted in significant increases in emissions of GHG. The resulting increase in atmospheric levels of CO_2 has been recorded in long-term records at monitoring stations such as Mauna Loa, Hawaii, where measured background ambient CO_2 levels have increased from 285 parts per million (ppm) in 1877 (Stanhill, 1984) to the current level of 410 ppm (National Oceanic and Atmospheric Administration [NOAA], 2018). Simultaneously, average surface temperatures have been increasing at many locations around the world. Many climate scientists have concluded that it is extremely likely that human influence has been the dominant cause of this change in global average temperature (Intergovernmental Panel on Climate Change [IPCC], 2013).

3.2.6 GHG Emissions Inventory

An emissions inventory that identifies and quantifies the primary human-generated sources and sinks of GHGs is a tool for addressing climate change. This section summarizes information on global, national, and state GHG emissions inventories. However, because some GHGs persist for a long time in the atmosphere and accumulate over time, they are generally well mixed and their impact on the atmosphere and climate change cannot be tied to a specific emission point.

- **Global Emissions.** Worldwide emissions of GHGs in 2010 totaled 49 billion metric tons (MT) of CO_2e per year (IPCC, 2015). Global estimates are based on country inventories developed as part of the programs of the Intergovernmental Panel on Climate Change (IPCC).

- **United States Emissions.** In 2005, the United States emitted approximately 7.34 billion MT of CO_2e, or approximately 25 tons per year, per person. Of the six major sectors—electric power industry, transportation, industry, agriculture, commercial, and residential—the electric power industry and transportation sectors combined account for approximately 58% of the GHG emissions; the majority of the electric power industry and all of the transportation emissions are generated from direct fossil fuel combustion. Between 1990 and 2005, total United States GHG emissions rose approximately 15.2% (USEPA, 2019).

- **State of California Emissions.** According to CARB emission inventory estimates, California emitted approximately 429 million metric tons (MMT) of CO2e emissions in 2016 (CARB, 2018). This large number is due primarily to the sheer size of California compared to other states. Per capita GHG emissions have declined from 2000 to 2016. GHG emissions from the transportation and electricity sectors are approximately 41% and 16% of California inventory, respectively. The industrial sector contributes approximately to be 23%. Landfill emissions are included in the industrial sector emissions and contribute approximately 2.0% of the California's GHG emissions.

CARB is responsible for developing the California GHG Emission Inventory. This inventory estimates the volume of GHGs emitted to and removed from the atmosphere by human activities within the State of California and supports the Assembly Bill (AB) 32 Climate Change Program. CARB's current GHG emission inventory covers the years 1990–2016 and is based on fuel use, equipment activity, industrial processes, and other relevant data (e.g., housing, landfill activity, and agricultural land area).

CARB staff has projected statewide unregulated GHG emissions for 2020, which represent the emissions will be slightly lower than the target 2020 GHG emission rate of 431 $MTCO_2e$.

3.2.7 Effects of Global Climate Change

The Intergovernmental Panel on Climate Change (IPCC) has produced several trajectories of GHGs emission reductions believed to be needed to stabilize global temperatures and climate change impacts. In its Fifth Assessment Report, the IPCC predicted that the global mean temperature change from 1990 to 2100, could range from 1.1 degree Celsius (°C) to 6.4 °C (8 to 10.4 °Fahrenheit). Global average temperatures and sea levels are expected to rise under all scenarios (IPCC, 2014). The IPCC concluded that global climate change was largely the result of human activity, mainly the burning of fossil fuels.

The effects from global climate change may arise from temperature increases, climate sensitive diseases, extreme weather events, and degradation of air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems. Heat-related problems include heat rash and heat stroke, drought, etc. In addition, climate-sensitive diseases may increase, such as those spread by mosquitoes and other disease-carrying insects. Such diseases include malaria, dengue fever, yellow fever, and encephalitis. Extreme events such as flooding and hurricanes can displace people and agriculture. Global warming may also contribute to air quality problems from increased frequency of smog and particulate air pollution.

According to the 2006 California Climate Action Team (CAT) Report, several climate change effects can be expected in California over the course of the next century (California Environmental Protection Agency [CalEPA], 2006). These are based on trends established by the IPCC and are summarized below.

- A diminishing Sierra Nevada snowpack, declining by 70% to 90%, and thereby threatening the state's water supply.

- A rise in sea levels, resulting in the displacement of coastal businesses and residences. During the past century, sea levels along California's coast have risen about seven inches. If emissions continue unabated and temperatures rise into the higher anticipated warming range, sea level is expected to rise an additional 22 to 35 inches by the end of the century. Sea level rises of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats. (Note: This condition would not affect the Project area as it is a significant distance away from coastal areas.)

- An increase in temperature and extreme weather events. Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in California. More heat waves can exacerbate chronic disease or heat-related illness.

- Increased risk of large wildfires if rain increases as temperatures rise. Wildfires in the grasslands and chaparral ecosystems of southern California are estimated to increase by approximately 30% toward the end of the 21st century because more winter rain will stimulate the growth of more plant fuel available to burn in the fall. In contrast, a hotter, drier climate could promote up to 90% more northern California fires by the end of the century by drying out and increasing the flammability of forest vegetation.

- Increasing temperatures from 8 to 10.4 °F under the higher emission scenarios, leading to a 25% to 35% increase in the number of days that ozone pollution levels are exceeded in most urban areas.

- Increased vulnerability of forests due to forest fires, pest infestation, and increased temperatures.

- Reductions in the quality and quantity of certain agricultural products. The crops and products likely to be adversely affected include wine grapes, fruit, nuts, and milk.

- Exacerbation of air quality problems. If temperatures rise to the medium warming range, there could be 75% to 85% more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions. This is more than twice the increase expected if rising temperatures remain in the lower warming range. This increase in air quality problems could result in an increase in asthma and other health-related problems.

- A decrease in the health and productivity of California's forests. Climate change can cause an increase in wildfires, an enhanced insect population, and establishment of non-native species.

- Increased electricity demand, particularly in the hot summer months.

- Increased ground-level ozone formation due to higher reaction rates of ozone precursors.

3.3 EXISTING POLICIES AND REGULATION – AIR QUALITY

3.3.1 Federal Regulatory Authority

The USEPA has responsibility for enforcing, on a national basis, the requirements of many of the country's environmental laws. California is under the jurisdiction of USEPA Region 9, which has its offices in San Francisco. Region 9 is responsible for the local administration of USEPA programs for California, Arizona, Nevada, Hawaii, and certain Pacific trust territories. USEPA's activities relative to the California air pollution control program focus principally on reviewing California's submittals for the State Implementation Plan (SIP). The SIP is required by the federal Clean Air Act to demonstrate how all areas of the state will meet the national ambient air quality standards within the federally specified deadlines.

The Federal Clean Air Act (CAA) establishes federal requirement for USEPA to develop and adopt air quality standards, the NAAQS (see Table 3.1) and specifies future dates for achieving air quality compliance. The CAA further mandates that states submit and implement SIPs for those areas not meeting these standards. The SIPs must include air pollution control measures that demonstrate how the NAAQS will be met. The 1990 amendment to the CAA requires that areas not meeting NAAQS demonstrate reasonable further progress toward attainment and incorporate sanctions for failure to attain or meet specific attainment milestones. Each state is required to adopt an implementation plan outlining pollution control measures to attain the federal standards in nonattainment areas of the state. CARB is responsible for incorporating air quality management plans for local air basins into a SIP, which is then reviewed and approved by the USEPA.

In addition to the requiring the establishment of NAAQS and the development and maintenance of SIPs, the CAA authorizes USEPA to establish regulations on certain categories of stationary sources of air pollution. Specifically, Section 111 of the CAA authorizes USEPA to establish standards of performance for new and existing sources, commonly referred to New Source Performance Standards (NSPSs).[3] Under this authority, USEPA has promulgated its Standards of Performance for Municipal Solid Waste Landfills, found at 40 Code of Federal Regulations (CFR) 60, Subpart WWW. NSPS Subpart WWW requires that a MSW landfill exceeding certain size and emission thresholds install and operate a LFG collection and control system (GCCS), conduct performance testing, and comply with administrative reporting, recordkeeping, and notification requirements.

Similarly, Section 112 of the CAA authorizes USEPA to establish emission standards for listed hazard air pollutants, commonly referred to as National Emission Standards for Hazardous Air Pollutants (NESHAPs).

Under this authority, USEPA has established its NESHAP: Municipal Solid Waste Landfills, found in 40 CFR 63, Subpart AAAA. NESHAP Subpart AAAA incorporates the requirements of NSPS Subpart WWW by references as well as expanding its applicability.

[3] The majority of regulations promulgated under Section 111 of the CAA apply to newly constructed or reconstructed sources after a specified date; however, other regulations apply to affected stationary sources regardless of when construction occurred.

3.3.2 State of California Regulatory Authority

CARB is responsible for ensuring implementation of the California Clean Air Act (CCAA) and for regulating emissions from consumer products and motor vehicles. The CCAA mandates achievement of the maximum degree of emissions reductions possible from vehicular and other mobile sources in order to attain CAAQS by the earliest practical date. CARB established the CAAQS for all pollutants for which the federal government has NAAQS. Additional standards for sulfates, visibility-reducing particles, hydrogen sulfide, and vinyl chloride have been established; however, they are not considered to be a regional air quality problem at this time. Hydrogen sulfide and vinyl chloride are not measured at any monitoring stations in the SVAB. Generally, the CAAQS are generally equal or more stringent than the NAAQS.

3.3.3 Local Regulatory Authority

The 1976 Lewis Air Quality Management Act established the YSAQMD and other air districts throughout the state. Significant authority for air quality control within them has been granted to local air districts to regulate stationary source emissions and develop locally-applicable air quality management plans (AQMPs). Air quality management districts, such as the YSAQMD, regulate air emissions from commercial, industrial, and institutional stationary sources. All air pollution control districts have been formally designated as either attainment or nonattainment for each AAQS. Serious nonattainment areas are required to prepare AQMPs that include specified emission reduction strategies in an effort to meet clean air goals. These plans are required to include the following components:

- Application of Best Available Retrofit Control Technology to existing sources;
- Control programs for area sources (e.g., architectural coatings and solvents) and indirect sources (e.g., motor vehicle use generated by residential and commercial development);
- A district permitting system designed to allow no net increase in emissions from any new or modified permitted sources of emissions;
- Implementation of reasonably available transportation control measures and assurance of a substantial reduction in growth rate of vehicle trips and miles traveled;
- Significant use of low-emissions vehicles by fleet operators;
- Sufficient control strategies to achieve annual reduction in emissions for ROGs, NOx, CO, PM_{10}, and $PM_{2.5}$. However, air basins may use alternative emissions reduction strategies that achieve a reduction under certain circumstances.

The YSAQMD works individually and with the other air districts in the Sacramento region to develop plans for attaining the standards by the established deadlines. YSAQMD is included in the Sacramento Valley Federal Nonattainment Area established by the USEPA. The CAA requires areas not meeting health standards to develop strategies to achieve those standards by federal deadlines. The air districts of the Sacramento region work together to develop these plans and update them as required. As a nonattainment area for the federal ozone standard, the Sacramento region is also required to prepare various planning documents on an ongoing basis. These documents include Milestone Reports and Reasonable Further Progress Plans. The CAA, Part D, Section 182(b)(2) requires ozone nonattainment areas to implement reasonably available control technology (RACT) for certain categories of sources. The YSAQMD's draft RACT analysis was approved by the YSAQMD's Board of Directors on September 13, 2017 (YSAQMD, 2017). The primary purpose of the draft RACT is to bring the area into compliance with federal and state air quality standards.

Although the YSAQMD generally does not experience unhealthy levels of particulates, the USEPA has included the YSAQMD in the Sacramento Federal Non-Attainment Area for fine particulate pollution. In order to show attainment of the 24-hour fine particulate standard, an area must demonstrate that it has met the standard during three consecutive years. The Sacramento region was able to show that the standard had been achieved during the 2010-2012 period. The YSAQMD and the other air districts of the region subsequently submitted a request to the USEPA for a re-designation to attainment of the standard. The Sacramento region air districts also developed and submitted a “clean data finding” and a maintenance plan to USEPA. The clean data finding demonstrates that the standard has been met during a given three-year period, and the maintenance plan demonstrates how the standard will continue to be met in future years.

Failure to comply with any applicable YSAQMD rules would trigger enforcement action. The RHRLF is subject to the following YSAQMD prohibitory rules. Other rules may also apply.

- YSAQMD Rule 2.3 – Ringelmann Chart: Restricts emissions from stationary diesel equipment from exceeding 20% opacity for more than three minutes in any one hour.
- YSAQMD Rule 2.5 – Nuisance: Restricts discharge from any source quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public or which endanger the comfort, repose, health, or safety of any such persons or the public or which cause to have a natural tendency to cause injury or damage to business or property.
- YSAQMD Rule 2.8 – Open Burning: Limits emissions to the atmosphere from open burning.
- YSAQMD Rule 2.11 – Particulate Matter: Limits release or discharge into the atmosphere, from any source, particulate matter in excess of 0.3 grains per cubic foot of exhaust volume as calculated standard conditions.
- YSAQMD Rule 2.32 – Stationary Internal Combustion Engines: Limits emissions of NOx and CO from stationary internal combustion engines with greater than 50 horsepower.

3.3.4 Toxic Air Contaminants Regulations – Air Quality

The Air Toxics “Hot Spots” Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources through reporting of toxic emissions. Under AB 2588, TAC emissions from individual facilities are quantified and prioritized based on emission levels and the types of pollutant emissions. “High-priority” facilities are required to perform a Health Risk Assessment (HRA) and, if specific thresholds are violated, are required to communicate the results to the public in the form of public notices and meetings. Depending on the risk levels determined, facilities are required to implement varying levels of risk reduction measures. The YSAQMD implements AB 2588 through rule requirements, and is responsible for prioritizing facilities that emit air toxics, reviewing HRAs, and overseeing the implementation of risk reduction measures. Pursuant to the requirements of AB 2588, the YSAQMD publishes an air toxics emissions inventory detailing TAC emissions for facilities within its jurisdiction.

3.3.5 County General Plan Policies – Air Quality

The Solano County General Plan Public Health and Safety Element (Solano County 2015) contains an Air Resources discussion that identifies general goals and policies designed to address air quality. The Air Resources discussion discusses transportation and circulation, land use, and health elements to help improve air quality in the area. The discussion includes air resources goals and policies to help address the air quality issues. Policies directly applicable to the CEQA review of the Project are as follows:

- Policy HS.P-43 – Support land use, transportation management, infrastructure and environmental planning programs that reduce vehicle emissions and improve air quality.

- Policy HS.P-44 – Minimize health impacts from sources of toxic air contaminants, both stationary (e.g., refineries, manufacturing plants) as well as mobile sources).

3.4 EXISTING POLICIES AND REGULATIONS – GHGs

3.4.1 International Regulation – GHG

IPCC. In 1988, the United Nations created the IPCC to provide independent scientific information regarding climate change to policymakers. The IPCC does not conduct research itself, but rather compiles information from a variety of sources into reports regarding climate change and its impacts. The IPCC has thereafter periodically released reports on climate change, and in 2014 released its Fifth Assessment Report, which concluded that "[w]arming of the climate system is unequivocal," and that "anthropogenic GHG emissions … are extremely likely to have been the dominant cause of the observed warming since the mid-20th century" (IPCC, 2014).

UNFCC. On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change (Convention). Under the Convention, governments gather and share information on GHGs, national policies, and best practices; launch national strategies for addressing GHGs and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change.

Kyoto Protocol. The Kyoto Protocol is an international agreement linked to the Convention (discussed above). The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialized countries and the European community for reducing GHGs an average of 5% against 1990 levels over the five-year period from 2008–2012. The Convention encouraged industrialized countries to stabilize emissions; however, the Protocol commits them to doing so. Developed countries have contributed more emissions over the last 150 years than underdeveloped countries; therefore, the Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." The United States has not entered into force of the Kyoto Protocol.

Paris Agreement. The Paris Agreement builds on the UNFCCC and aims to increase global response to climate change and aims to keep global temperature increase below two (2) degrees Celsius above pre-industrial levels. Unlike the Kyoto Protocol, the Paris Agreement is not a binding agreement. The U.S. was a party to the Paris Agreement when it became effective in 2016, but submitted a notification to the UNFCCC that it intended to withdraw from the Paris Agreement on August 4, 2017. The earliest possible effective withdrawal date for the U.S. is November 4, 2019, so the U.S. is party to the Paris Agreement as of this writing.

3.4.2 Federal Regulations and Standards – GHG

Corporate Average Fuel Economy (CAFE) Act 1975 - Clean Vehicles. Congress first passed the CAFE law in 1975 to increase the fuel economy of cars and light-duty trucks. The law has become more stringent over time. On October 25, 2010, the USEPA and the U.S. Department of Transportation proposed the first national standards to reduce GHGs and improve fuel efficiency of heavy-duty trucks and buses, which effectively lowers GHG emissions from heavy duty vehicles associated with the site.

Consolidated Appropriations Act of 2008 - Mandatory Reporting of GHG. The Consolidated Appropriations Act of 2008, passed in December 2007, requires the establishment of mandatory GHG reporting requirements. On September 22, 2009, the USEPA issued the Final Mandatory Reporting of GHGs rule. The rule requires reporting of GHG emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions, are required to submit annual reports to the USEPA.

Federal Regulation of Climate Change. The United States has historically had a voluntary approach to reducing GHG emissions. However, on April 2, 2007, the U.S. Supreme Court ruled that the USEPA has the authority to regulate CO_2 emissions under the CAA. While there currently are no adopted Federal regulations for the control or reduction of GHG emissions, the USEPA commenced several actions in 2009 that are required to implement a regulatory approach to global climate change, as mentioned in the sections above.

3.4.3 State Regulations and Standards – GHG

California AB 1493 - Pavley Regulations and Fuel Efficiency Standards. California AB 1493, enacted on July 22, 2002, required CARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light-duty trucks. The standards were phased in during the 2009 through 2016 model years. The standards have resulted in about a 30% reduction in fuel consumption compared with the 2002 fleet.

Executive Order S-01-07 - Low Carbon Fuel Standard. Executive Order S-01-07, signed on January 18, 2007, mandates that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10% by 2020. In response, a Low Carbon Fuel Standard (LCFS) was adopted and the Secretary for Environmental Protection to coordinate the actions of the California Energy Commission, CARB, the University of California, and other agencies were directed to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. The Low Carbon Fuel Standard requires producers of petroleum-based fuels to reduce the carbon intensity of their fuels by 10% total reduction by 2020. Petroleum importers, refiners, and wholesalers can either develop their own low carbon fuel products or buy LCFS credits from other companies that develop and sell low carbon alternative fuels, such as biofuels, electricity, natural gas, or hydrogen. Several legal challenges have delayed implementation of the LCFS.

Executive Order S-3-05. Executive Order S-3-05 was signed by the Governor in 2005 proclaiming California is vulnerable to the impacts of climate change. It states that increased temperatures could reduce the Sierra Nevada's snowpack, worsen California's air quality problems, and potentially cause a rise in sea levels. The Executive Order establishes total GHG emission targets including emissions reductions to the 2000 level by 2010, and the 1990 level by 2020, and to 80% below the 1990 level by 2050. The 2050 reduction goal represents what scientists believe is necessary to reach levels that will stabilize the climate. The 2020 goal was established to be an aggressive, but achievable, midterm target.

AB 32. California's major initiative for reducing GHG emissions is outlined in AB 32, the California Global Warming Solutions Act of 2006, passed by the Legislature on August 31, 2006. This effort aims at reducing GHG emissions to 1990 levels by 2020. CARB has established the level of GHG emissions in 1990 at 427 MMT CO_2e. The emissions target of 427 MMT requires the reduction of 169 MMT from the state's projected business-as-usual 2020 emissions of 596 MMT. AB 32 requires CARB to prepare a Scoping Plan that outlines the main state strategies for meeting the 2020 deadline and to reduce GHGs that contribute to global climate change.

AB 32 requires the CARB and the Climate Action Team[4] to take the following actions:

- Adopt a list of discrete early action measures by July 1, 2007, that can be implemented before January 1, 2010;
- Establish a statewide GHG emissions cap for 2020 based on 1990 emissions and adopt mandatory reporting rules for significant sources of GHG by January 1, 2008;
- Indicate how emission reductions will be achieved from significant GHG sources via regulations, market mechanisms, and other actions by January 1, 2009; and
- Adopt regulations by January 1, 2011, to achieve the maximum technologically feasible and cost-effective reductions in GHG, including provisions for using both market mechanisms and alternative compliance mechanisms.

In June 2007, CARB approved a list of 37 early action measures, including three discrete early action measures (Low Carbon Fuel Standard, Restrictions on High Global Warming Potential Refrigerants, and Landfill Methane Capture). Discrete early action measures are measures that were required to be adopted as regulations and made effective no later than January 1, 2010, the date established by Health and Safety Code Section 38560.5. CARB adopted additional early action measures in October 2007 that tripled the number of discrete early action measures (CARB, 2007a). These measures relate to truck efficiency, port electrification, reduction of perfluorocarbons from the semiconductor industry, reduction of propellants in consumer products, proper tire inflation, and SF_6 reductions from the non-electricity sector. The combination of early action measures is estimated to reduce statewide GHG emissions by nearly 16 MMT of CO_2e (CARB, 2007b).

CARB AB 32 Scoping Plan. CARB adopted the initial Climate Change Scoping Plan (Scoping Plan) in 2008, which outlines actions recommended to obtain that goal. The Scoping Plan calls for an "ambitious but achievable" reduction in California's GHG emissions, cutting approximately 30% from BAU emission levels projected for 2020, or about 10% from today's levels. On a per-capita basis, that means reducing annual emissions of 14 tons of CO_2per person in California down to about 10 tons per person by 2020. The First Update to the Climate Change Scoping Plan was released on May 15, 2014, and built upon the initial Scoping Plan with new recommendations.

The Scoping Plan contains the following 18 strategies to reduce the state's emissions (CARB, 2008):

1. *California Cap-and-Trade Program Linked to Western Climate Initiative.* Implement a broad-based California Cap-and-Trade program to provide a firm limit on emissions. Link the California

[4] The Climate Action Team is a consortium of representatives from state agencies who have been charged with coordinating and implementing GHG emission reduction programs that fall outside of CARB's jurisdiction.

cap-and-trade program with other Western Climate Initiative Partner programs to create a regional market system to achieve greater environmental and economic benefits for California. Ensure California's program meets all applicable AB 32 requirements for market-based mechanisms.

2. *California Light-Duty Vehicle GHG Standards.* Implement adopted standards and planned second phase of the program. Align zero-emission vehicle, alternative and renewable fuel and vehicle technology programs with long-term climate change goals.

3. *Energy Efficiency.* Maximize energy efficiency building and appliance standards; pursue additional efficiency including new technologies, policy, and implementation mechanisms. Pursue comparable investment in energy efficiency from all retail providers of electricity in California.

4. *Renewable Portfolio Standard.* Achieve 33% renewable energy mix statewide. Renewable energy sources include (but are not limited to) wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas.

5. *Low Carbon Fuel Standard.* Develop and adopt the Low Carbon Fuel Standard.

6. *Regional Transportation-Related GHG Targets.* Develop regional GHG emissions reduction targets for passenger vehicles. This measure refers to Senate Bill (SB 375).

7. *Vehicle Efficiency Measures.* Implement light-duty vehicle efficiency measures.

8. *Goods Movement.* Implement adopted regulations for the use of shore power for ships at berth. Improve efficiency in goods movement activities.

9. *Million Solar Roofs Program.* Install 3,000 MW of solar-electric capacity under California's existing solar programs.

10. *Medium/Heavy-Duty Vehicles.* Adopt medium- and heavy-duty vehicle efficiency measures.

11. *Industrial Emissions.* Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce GHG emissions and provide other pollution reduction co-benefits. Reduce GHG emissions from fugitive emissions from oil and gas extraction and gas transmission. Adopt and implement regulations to control fugitive CH_4 emissions and reduce flaring at refineries.

12. *High Speed Rail.* Support implementation of a high-speed rail system.

13. *Green Building Strategy.* Expand the use of green building practices to reduce the carbon footprint of California's new and existing inventory of buildings.

14. *High Global Warming Potential Gases.* Adopt measures to reduce high global warming potential gases.

15. *Recycling and Waste.* Reduce CH_4 emissions at landfills. Increase waste diversion, composting, and commercial recycling. Move toward zero-waste.

16. *Sustainable Forests.* Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation.

17. *Water.* Continue efficiency programs and use cleaner energy sources to move and treat water.

18. *Agriculture.* In the near-term, encourage investment in manure digesters and at the five-year Scoping Plan update determine if the program should be made mandatory by 2020.

SB 375 took effect in 2009 and required regional municipal planning organizations to develop regional land use plans that demonstrate how the regions will achieve compliance with the GHG reduction goals of AB 32. Cities located within these regions are then required, in turn, to update their General Plans in accordance with the regional plans. Non-compliance with SB 375 will result in transportation funds being withheld from the regional and/or local agency.

Landfill Methane Control Measure. One of the Early Action Measures adopted by CARB was the Landfill Methane Control Measure or Landfill Methane Rule (LMR). The LMR required that after July 17, 2010 landfills take measures to reduce methane emissions, including the implementation of integrated surface monitoring, component leak monitoring, landfill surface penetration monitoring, and earlier installation of a GCCS.

Senate Bill 1368 (SB 1368). In September 2006, the Governor signed Senate Bill 1368, which calls for the adoption of a GHG performance standard for in-state and imported electricity generators to mitigate climate change. On January 25, 2007, the California Public Utilities Commission (CPUC) adopted an interim GHG emissions performance standard. This standard is a facility-based emissions standard requiring all new long-term commitments for base load generation to serve California consumers with power plants that have emissions no greater than a combined cycle gas turbine plant. The established level is 1,100 pounds of CO_2 per megawatt-hour.

Senate Bill 375. SB 375 was signed into law on October 1, 2008. SB 375 provides emissions-reduction goals around which regions can plan, integrating disjointed planning activities, and provides incentives for local governments and developers to implement “smart growth” planning and development strategies, including reducing the average vehicle miles traveled (VMT) to reduce commuting distances and reduce criteria and GHG air pollutant emissions. SB 375 has three major components:

- Using the regional transportation planning process to achieve reductions in GHG emissions consistent with AB 32’s goals;

- Offering CEQA incentives to encourage projects that are consistent with a regional plan that achieves GHG emission reductions; and

- Coordinating the regional housing needs allocation process with the regional transportation process while maintaining local authority over land use decisions.

SB 375 requires each Metropolitan Planning Organization (MPO) to include a Sustainable Communities Strategy in the regional transportation plan that demonstrates how the region will meet the GHG emission targets and creates CEQA streamlining incentives for projects that are consistent with the regional

Sustainable Communities Strategy. The focus of SB 375 is on location of new residential projects and coordinated transportation planning.

Senate Bill 1383. Senate Bill 1383 (SB 1383) was passed by California in September 2016. SB 1383 targets the reduction of short-lived climate pollutants, including methane from landfills. The bill establishes a target reduction of 50% for organic waste from 2014 levels by 2020 and a 75% reduction by 2025. The law grants CalRecycle the authority to implement regulation to achieve increased organic waste disposal reduction targets.

Renewable Electricity Standards. There have been several recent legislative and executive actions covering renewable electricity in California. On September 12, 2002, Governor Gray Davis signed SB 1078, requiring California to generate 20% of its electricity from renewable energy by 2017. SB 107 changed the due date to 2010 instead of 2017. On November 17, 2008, Governor Arnold Schwarzenegger signed Executive Order S-14-08, which established a target for California to increase the state's Renewable Portfolio Standard to 33 percent renewable power by 2020.

3.4.4 Regional Policies – Greenhouse Gas

YSAQMD GHG Plans and Programs. YSAQMD’s climate protection program includes the integration of climate protection activities into existing programs. YSAQMD is continually seeking ways to integrate climate protection into current functions, including grant programs, CEQA review, regulations, inventory development, and outreach. In addition, YSAQMD’s climate protection program emphasizes collaboration with ongoing climate protection efforts at the local and State level, as well as public education and outreach and technical assistance to cities and counties. The YSAQMD recommends that impacts to climate change be evaluated for every CEQA project.

Solano County Climate Action Plan. In June 2011, the County Board of Supervisors adopted a Climate Action Plan Solano County, 2011). The CAP establishes goals for reducing GHG emissions while improving community health. This plan recommends 31 measures and 94 implementing actions that the community can take to reduce both emissions and communitywide contributions to global climate change. The County established a communitywide GHG emissions reduction goal of 20 percent below 2005 levels by 2020 within the Climate Action Plan, which exceeds guidance provided in the Scoping Plan and Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines.

The County’s GHG reduction measures are closely tied to public health measures, with many of the reduction measures also providing public health co-benefits. The reduction measures are grouped into five sectors:

1. Agriculture
2. Transportation and Land Use
3. Energy Use and Efficiency
4. Water Use and Efficiency
5. Waste Reduction and Recycling

The waste reduction and recycling strategy builds on past County successes by increasing waste diversion. The strategy focuses on reducing consumption of materials that otherwise end up in landfills and finding ways to recycle, especially organic waste, into new resources.

4.0 IMPACTS ASSESSMENT

4.1 SIGNIFICANCE CRITERIA

Appendix G of the *CEQA Guidelines* recognizes the following significance thresholds related to air quality and GHG. Based on these significance thresholds, potential impacts to air quality would be significant if the Project would:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Result in a cumulatively considerable net increase in any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard

c) Expose sensitive receptors to substantial pollutant concentrations;

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Based on CEQA Guidelines §§ 15064.4 and 15064.7(c), as well as Appendix G, a project would cause adverse impacts associated with GHG emissions if it would:

a) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment;

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

This analysis follows the updated methodology presented in the recent *YSAQMD Handbook for Assessing and Mitigating Air Quality Impacts* adopted June 2007 (YSAQMD, 2007). The YSAQMD guidelines further contain numerical thresholds of significance that are designed to implement, in the air district, the above general criteria for air quality impacts and those set forth in Appendix G of the State *CEQA Guidelines*. The YSAQMD thresholds have been developed and adopted as encouraged by CEQA, and only after extensive study. Although the project is located within the jurisdiction of the YSAQMD, the origin of some of the mobile sources are from the BAAQMD; for these reasons, the mobile source emissions were assigned to the air basin of its origin and is described and assessed further under Section 4.2.2. The YSAQMD and the BAAQMD thresholds (as presented in its *Air Quality Guidelines*) thus serve as a means of translating the general standards set forth in Appendix G into quantitative thresholds against which the Project's air pollutant emissions can be measured (YSAQMD, 2007; BAAQMD, 2017).

Table 4-1 presents both the YSAQMD and BAAQMD Thresholds of Significance for criteria pollutants of concern that are applicable to the Project. Because YSAQMD has not established a threshold of significance for GHG emissions, the GHG threshold applicable to stationary sources, as found in the BAAQMD's *Air Quality Guidelines* (BAAQMD, 2017), was applied.

Table 4-1: Thresholds of Significance applicable to the Proposed Project

Pollutant	Significance Thresholds			
Criteria Air Pollutant and Precursors (Regional)	Average Daily Emissions (lbs/day)		Maximum Annual Emissions (tpy)	
	YSAQMD (constructions and operations)	BAAQMD (operations)	YSAQMD (constructions and operations)	BAAQMD (operations)
ROG	--	54	10	10
NOx	--	54	10	10
PM_{10}	80	82	--	15
$PM_{2.5}$	--	54	--	10
Local CO	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)			
Criteria Pollutants – Stationary Sources	Emissions from new and modified stationary sources are generally controlled through the YSAQMD's permitting process. Most new and modified stationary sources will be subject to Best Available Control Technology (BACT) requirements. However, for any stationary source not subject to BACT, BACT may be voluntarily applied. In addition, increases in emissions may be required under YSAQMD new source review regulations, to be mitigated by providing offsets. As such, emissions from new or modified sources complying with applicable District regulations pertaining to BACT and offsets requirements typically will not be considered a significant air quality impact (except in special circumstances, such projects causing nuisance odors).			
GHGs –Stationary Sources	YSAQMD had not established a significance threshold for GHGs for stationary sources. BAAQMD currently has a GHG threshold; however, they have indicated to SCS that they do not recommend its continued use, as it was established to meet 2020 climate goals. BAAQMD indicated an updated GHG CEQA guidance is currently being developed based on the 2017 Climate Change Scoping Plan Update			
Risk and Hazards for new sources and receptors (Individual Project)	Probability of contracting concern for Maximally Exposed Individual (MEI) ; Equal to 10.0 in a million or more. Ground-level concentrations of non-carcinogenic toxic air contaminants would result in a Hazard Index equal to 1 for the MEI or greater.			
Odors	YSAQMD Rule 2.5 - A project may reasonably be expected to have a significant adverse odor impact where it "generates odorous emissions in such quantities as to cause detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which may endanger the comfort, repose, health, or safety of any such person or the public, or which may cause, or have a natural tendency to cause, injury or damage to business or property."			

Source: YSAQMD, 2007 and BAAQMD, 2017.

YSAQMD's approach to assessing cumulative impacts relating to ground-level ozone dictates that a Project's contribution to cumulative impacts to regional air quality would be considered potentially significant if the Project's impact would be individually significant (i.e., exceeds the YSAQMD's quantitative thresholds). For a

Project that would not result individually cause a significant impact, the Project's contribution to any cumulative impact may be considered less than significant, provided that the Project is consistent with all applicable regional air quality plans (YSAQMD, 2007).

4.2 PROJECT EMISSIONS

4.2.1 Construction Emissions

Construction activities are generally analyzed separately from operational impacts because they tend to be short-term and limited to localized impacts. However, ongoing or long-range construction activities that occur over a wide geographic area have the potential to create regional air quality impacts in much the same way as operational sources. Specifically, construction ozone precursor emissions (NOx and VOCs) as well as particulate matter emissions (PM_{10} and $PM_{2.5}$) have the potential to affect regional air quality if emitted in large enough quantities. Therefore, construction activities must be analyzed for both localized and regional impacts.

Activities which are typically associated with "construction," such as earthmoving and grading, occur as part of the regular landfilling activities during daily operation of the landfill. The Project will not change the equipment, methods, or intensity of these activities. For that reason, these activities may be considered part of existing operations, and are excluded from the impacts analysis for the Project. The construction activities that are evaluated include the initial preparation of the Triangle area to receive MSW.

Prior to placing MSW within the Triangle area, a base liner containment system must be constructed. The landfill expansion in the Triangle area will be constructed in three phases, one phase of initial site preparation work, and two phases of base liner construction, each of which will be approximately 10-acres in size. Each phase of the base liner construction project will involve the placement of 230,000 cubic yards of soil (compacted earthfill, a compacted clay barrier, and a protective soil operations layer), 20-acres of 60-mil high-density polyethylene (HDPE) plastic geomembrane liner (the base liner system includes two layers of the protective geomembrane), and 8,000 cubic yards of gravel for the leachate collection layer. The initial site work is planned to occur in 2020. The two base liner construction phases are currently planned to be constructed in the summers of years 2021 and 2022 (from April through October). However, for the purposes of this assessment, all construction activity is assumed to occur during 2020, which is a conservative assumption in that it assumes a higher intensity of construction activity than may actually occur.

Project construction will encompass a wide variety of activities that emit air pollutants. These activities may be grouped as creating either fugitive emissions or engine exhaust emissions. Fractions of the fugitive emissions from dust are PM_{10} and $PM_{2.5}$ emissions. Engine exhaust emissions include all pollutants, and may be directly emitted at the Project location, or indirectly emitted by vehicles en route to and from the Project, such as construction worker, material haul, and vendor vehicle trips.

Sources of fugitive emissions during construction of the Project will result from the following:

- Dust entrained during grubbing and land clearing activities,
- Dust entrained during grading and excavation activities, and
- Dust entrained during trenching for utilities, drainage, and subgrade structures.

Engine exhaust emissions during construction of the Project will result from the following:

- Off-road construction equipment used for site grubbing and land clearing activities;
- Off-road construction equipment used for grading and excavation activities;
- Off-road construction equipment used during trenching for utilities, drainage, and subgrade structures;
- Water trucks used to control construction dust emissions;
- Vendor vehicles delivering materials, such as gravel and geomembrane to the construction site; and,
- Automobiles used by workers to commute to the construction site.

Construction emissions were quantified using the California Emissions Estimator Model (CalEEMod) Version 2016.3.2, which was developed by the California Air Pollution Control Officers Association (CAPCOA) and is approved for use in all areas of California (CAPCOA, 2016). CalEEMod quantifies emissions of NOx, CO, VOC, PM_{10}, $PM_{2.5}$, and GHGs from construction activities using emission factors derived from CARB's Emission Factor (EMFAC) and OFFROAD models, for on-highway and off-road vehicles, respectively. The model calculates vehicle emissions based on the fleet average emission rate of vehicles operating in the SVAB portion of Solano County for the year in which the construction activity occurs. Emission factors for fugitive dust are also included in the model.

The relevant CalEEMod input parameters for Project are summarized in Table 4-2. A full listing of all data and inputs to CalEEMod is found in the CalEEMod output reports, which are contained in the Appendix.

Table 4-2: CalEEMod Inputs for the Proposed Project

CalEEMod Input Parameter	Value
Project Location	Solano County – Sacramento Valley Air Basin Portion
Land Use Subtype	User-Defined Industrial
Lot Acreage	24 Acres
Construction Start Date	April 15, 2020
Construction Duration	6 Months
Material Imported (Gravel)	8,000 cubic yards
No. of Construction Workers	15 Workers
Material and Unpaved Road Moisture Content	15%
Fugitive Dust Control Measures	Twice-Daily Watering; Limit Vehicle Speeds to 15 mph in Construction Area; cover all inactive storage piles; sweep streets if visible solid material is carried out from construction site

A summary of the emissions quantified by CalEEMod follows in Table 4-3. The emission totals shown reflect construction emissions before the application of the fugitive dust control measures shown above, which are also listed in Section 4.3.3. These measures may be considered as best management practices for reducing fugitive dust from construction projects. The CalEEMod output reports are included in the Appendix to this AQIA.

Table 4-3: Project Construction Emissions (Before Mitigation)

Activity	Pollutant									
	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_x	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
Grading – Fugitive Dust	-	-	-	2.7	1.5	-	-	-	-	-
Grading – Exhaust Emissions	9.8	77.8	100.9	4.7	4.3	0.13	13,480	4.4	0.0	13,589
Grading – Off-Site Emissions	0.2	1.2	1.6	41.2	4.2	0.0	740	0.0	0.0	741
Geomembrane Installation: On-Site Exhaust Emissions	2.1	16.8	19.22	1.1	1.1	0.07	2,553	0.6	0.0	2,569
Geomembrane Installation: Off-Site Exhaust Emissions	0.9	4.7	16.4	5.9	1.2	0.07	7,505	0.1	0.0	7,507
Maximum Daily Emissions	13.0	100.5	138.1	55.6	12.3	0.27	24,278	5.1	0.0	24,406
Significance Threshold	-	-	-	80	-	-	-	-	-	-
	Tons per Year						Metric Tons per Year			
Annual Emissions (2020)	0.7	5.5	7.8	2.9	0.6	0.0	950	0.3	0.0	957
Significance Thresholds	10	-	10	-	-	-	-	-	-	-

Source: Trinity Consultants, 2018.

4.2.2 Operational Emissions – Mobile Sources

Operational impacts are those that result from the day-to-day activities occurring throughout the various areas of RHRLF. Upon implementation of the Project, on-site landfilling activity will remain largely unchanged, with the only difference being the operation landfill equipment will be also permitted within the Triangle area.

Changes in operational emissions will result entirely from motor vehicles delivering MSW to the landfill. Specifically, the increase in the peak daily and 7-day average daily MSW acceptance rate limits could potentially result in higher daily and annual trips, respectively; and therefore engine exhaust emissions from MSW delivery vehicles. Emissions include NOx, VOC, CO, SOx, PM_{10}, $PM_{2.5}$, and GHGs, and would occur throughout the Project vicinity, with a small portion of emissions from each trip occurring at the RHRLF.

Recology has determined the fraction of MSW delivered to the landfill by vehicle type. Currently, approximately 69% percent of waste arrives at the facility via transfer trucks, which have an average capacity of 20 tons each. Approximately 16% percent of waste arrives via solid waste collection vehicles (packer trucks), which have an average capacity of 7.0 tons each. And approximately 15% of waste arrives via self-haul vehicles, which have an average capacity of 0.5 tons. Additionally, Recology has determined that the 7-day daily average quantity of MSW received by the facility in 2016 was 1,682 tpd (KD Anderson, 2018).

Recology is proposing an increase in the MSW that could be accepted at the landfill to a 7-day average of 3,200 tpd and a peak of 3,400 tpd. The origin of additional MSW that could be accepted is unknown. However, it is likely that the majority of the additional waste would come from farther than 20 miles away and would be delivered in transfer trucks. Recology has estimated that the additional waste that could be received under the proposed tonnage limits would be delivered by transfer trucks (91 round trips), packer trucks (23 round trips), and self-haul vehicles (81 round trips).

These values were used to reflect existing conditions and to determine the number of existing and proposed vehicle trips associated with increasing the peak daily MSW acceptance rate. The proposed increase in truck trips by vehicle type is shown in Table 4-4.

Table 4-4: Potential Increase in Peak Day Trips by Vehicle Type

Quantity (units)	Vehicle Type			
	Self-Haul Vehicles	Packer Trucks	Transfer Trucks	Total
2016 Total Round Trips (trips/day)	42	42	340	424
2020 Additional Round Trips (trips/day)	81	23	91	195
2020 Total Round Trips (trips/day)	123	65	431	619

Source: Ascent Environmental, 2018.

The emissions resulting from the increased truck trips are a factor of the exhaust emission rates of the respective vehicle types and the average length of the truck trips. Emission rates for each vehicle type were obtained from CARB's Emission Factor model, EMFAC2014, which is the latest version approved by CARB for statewide emission inventory purposes. The EMFAC2014 category of "medium duty vehicles" (MDV) was selected to represent self-haul vehicles. Because MDVs include both gasoline- and diesel-fueled, the aggregate emission rate of all fuels was determined according to the VMT-weighted average. The EMFAC2014 category of "T7 tractors" was selected for packer trucks and for transfer trucks. EMFAC2014 assumes that these vehicle categories include only diesel-fueled vehicles. The emission rates per pollutant, expressed in grams-per-mile, are shown in Table 4-5. All emission rates reflect the vehicles operating within the YSAQMD in calendar year 2016 for baseline emissions and year 2020 for project emissions, assuming the aggregate of all vehicle model years, travel speeds, and seasons.

EMFAC2014 does not contain sufficient data to determine the average trip length by vehicle category. These data exist in the 2017 version of the model (EMFAC2017) which has been fully developed, but not yet officially approved by USEPA (as of the date of this AQIA).

Table 4-5: Average Trip Length and Exhaust Emission Rates by Vehicle Type

Vehicle Category	Round Trip Distance (miles)	Emission Factors (grams per mile)						
		VOC	CO	NOx	PM_{10} [a]	$PM_{2.5}$ [a]	SOx	CO_2
Year 2016								
Medium Duty Vehicles (Self-Haul Vehicles)	16.2	0.056	1.952	0.279	0.002	0.00	0.000	575
T7 Tractors (Packer Trucks)	22.4	0.276	0.970	7.062	0.079	0.075	0.016	1,672
T7 Tractors (Transfer Trucks)	120	0.276	0.970	7.062	0.079	0.075	0.016	1,672
Year 2020								
Medium Duty Vehicles (Self-Haul Vehicles)	15.1	0.039	1.444	0.188	0.002	0.002	0.005	528
T7 Tractors (Packer Trucks)	21.7	0.159	0.646	5.077	0.023	0.022	0.015	1,611
T7 Tractors (Transfer Trucks)	120	0.159	0.646	5.077	0.023	0.022	0.015	1,611

Source: CARB, 2018 and Recology.

Note: (a) Includes tire wear and brake wear.

Using the emission factors in Table 4-5 and the vehicle trips in Table 4-4, the emissions from Year 2016, from additional project vehicle trips, and from total Year 2020 vehicle trips were calculated, as well as the net project change in emissions, and are shown in Tables 4-6, 4-7, 4-8, and 4-9. Because the EMFAC web database does not contain emission factors for CH_4 and N_2O, emissions of these GHGs were calculated according to the ratio of the emission factors of each pollutant to the emission factor for CO_2, found in 40 CFR Part 98, Tables C-1 and C-2, for “distillate fuel oil No. 2” (for Table C-1) and “Petroleum Products (All fuel types in Table C-1)” (for Table C-2). Annual emissions were calculated in the same manner, except based on the 7-day average daily waste acceptance rate of 3,200 tpd, and 365 days per year.

Table 4-6: Year 2016 Baseline Operational Emissions – Mobile Sources

Vehicle Category	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day[a]									
Medium Duty Vehicles (Self-Haul Vehicles)	0.1	2.9	0.4	0.0	0.0	0.0	862	0.0	0.0	865
T7 Tractors (Packer Trucks)	0.6	2.0	14.6	0.2	0.2	0.0	3,465	0.1	0.0	3,477
T7 Tractors (Transfer Trucks)	24.8	87.2	635.2	7.1	6.8	1.4	150,422	6.1	1.2	150,938
Maximum Daily Emissions	**25.4**	**92.2**	**650.3**	**7.2**	**6.9**	**1.5**	**154,750**	**6.3**	**1.3**	**155,281**
	Tons[b]						Metric Tons[c]			
Annual Emissions (2016)	**4.6**	**16.8**	**118.7**	**1.3**	**1.3**	**0.3**	**25,616**	**1.0**	**0.2**	**25,700**

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily trips * lb/453.6 g
(b) tons/year emissions = lb/day emissions * 365 days * ton/2000 lbs
(c) metric tons/year = lb/day emissions * 365 days / 2205 lbs/ metric ton. GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.

Table 4-7: Operational Emissions from Additional Vehicle Trips – Mobile Sources

Vehicle Category	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day[a]									
Medium Duty Vehicles (Self-Haul Vehicles)	0.1	3.9	0.5	0.0	0.0	0.0	1,424	0.1	0.0	1,429
T7 Tractors (Packer Trucks)	0.2	0.7	5.6	0.0	0.0	0.0	1,773	0.1	0.0	1,779
T7 Tractors (Transfer Trucks)	3.83	15.6	122	0.6	0.5	0.4	38,783	1.6	0.3	38,917
Maximum Daily Emissions	**4.1**	**20.2**	**128**	**0.6**	**0.6**	**0.4**	**41,980**	**1.7**	**0.3**	**42,125**
Emissions in SFBAAB[d]	**3.9**	**17.5**	**122**	**0.56**	**0.53**	**0.37**	**39,495**	**1.6**	**0.3**	**39,631**
Emissions in SVAB[d]	**0.2**	**2.66**	**5.84**	**0.03**	**0.03**	**0.02**	**2,484**	**0.1**	**0.02**	**2,493**
	Tons[b]						Metric Tons[c]			
Annual Emissions	**0.8**	**3.7**	**23.4**	**0.1**	**0.1**	**0.1**	**6,949**	**0.3**	**0.06**	**6,973**
Emissions in SFBAAB[d]	**0.71**	**3.19**	**22.4**	**0.1**	**0.1**	**0.07**	**6,537**	**0.3**	**0.05**	**6,560**
Emissions in SVAB[d]	**0.04**	**0.49**	**1.07**	**0.01**	**0.00**	**0.00**	**411**	**0.02**	**0.00**	**412**

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily trips * lb/453.6 g
(b) tons/year emissions = lb/day emissions * 365 days * ton/2000 lbs
(c) metric tons/year = lb/day emissions * 365 days / 2205 lbs/ metric ton. GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.

(d) Emissions in San Francisco Bay Area Air Basin (SFBAAB) attributed from 100% of transfer truck trips and 50% of self-haul trips. Emissions in Sacramento Valley Air Basin (SVAB) attributed from 100% packer truck trips and 50% of self-haul trips. (Ascent Environmental and Recology, 2018).

Table 4-8: Year 2020 Project Operational Emissions – Mobile Sources

Vehicle Category	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day[a]									
Medium Duty Vehicles (Self-Haul Vehicles)	0.2	5.9	0.8	0.0	0.0	0.0	2,163	0.1	0.0	2,171
T7 Tractors (Packer Trucks)	0.5	2.0	15.8	0.1	0.1	0.0	5,019	0.2	0.0	5,037
T7 Tractors (Transfer Trucks)	18.1	73.7	578.9	2.7	2.6	1.8	183,673	7.5	1.5	184,303
Maximum Daily Emissions	**18.8**	**81.6**	**595.5**	**2.8**	**2.6**	**1.8**	**190,855**	**7.7**	**1.5**	**191,510**
	Tons[b]						Metric Tons[c]			
Annual Emissions (2020)	**3.2**	**14.0**	**102.3**	**0.5**	**0.5**	**0.3**	**29,734**	**1.2**	**0.2**	**29,836**

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily trips * lb/4543.6 g
(b) tons/year emissions = lb/day emissions * 365 days * ton/2000 lbs * 3,200 tpd (7-day average daily MSW) / 3,400 tpd (peak daily MSW)
(c) metric tons/year = lb/day emissions * 365 days / 2205 lbs/ metric ton * 3,200 tpd (7-day average daily MSW) / 3,400 tpd (peak daily MSW). GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.

Table 4-9: Year 2020 Net Change in Project Operational Emissions – Mobile Sources

Vehicle Category	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day[a]									
Medium Duty Vehicles (Self-Haul Vehicles)	0.1	3.0	0.4	0.0	0.0	0.0	1,301	0.1	0.0	1,305
T7 Tractors (Packer Trucks)	-0.1	0.0	1.2	-0.1	-0.1	0.0	1,554	0.1	0.0	1,559
T7 Tractors (Transfer Trucks)	-6.6	-13.6	-56.3	-4.4	-4.2	0.3	33,251	1.3	0.3	33,365
Net Change in Maximum Daily Project Emissions[d]	**-6.7**	**-10.6**	**-54.8**	**-4.5**	**-4.3**	**0.4**	**36,105**	**1.5**	**0.3**	**36,229**
SFBAAB Significance Threshold	**54**	**-**	**54**	**82**	**54**	**-**	**-**	**-**	**-**	**-**
SVAB Significance Threshold	**-**	**-**	**-**	**80**	**-**	**-**	**-**	**-**	**-**	**-**
	Tons[b]						Metric Tons[c]			
Net Change in Annual Project Emissions (2020)[d]	**-1.1**	**-1.8**	**-9.4**	**-0.8**	**-0.7**	**0.1**	**5,625**	**0.2**	**0.0**	**5,644**
SFBAAB Significance Thresholds	**10**	**-**	**10**	**15**	**10**	**-**	**-**	**-**	**-**	**-**
SVAB Significance Thresholds	**10**	**-**	**10**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily trips * lb/4543.6 g
(b) tons/year emissions = lb/day emissions * 365 days * ton/2000 lbs * 3,200 tpd (7-day average daily MSW) / 3,400 tpd (peak daily MSW)
(c) metric tons/year = lb/day emissions * 365 days / 2205 lbs/ metric ton * 3,200 tpd (7-day average daily MSW) / 3,400 tpd (peak daily MSW). GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.
(d) Emissions in San Francisco Bay Area Air Basin attributed from 100% of transfer truck trips and 50% of self-haul trips. Emissions in Sacramento Valley Air Basin attributed from 100% packer truck trips and 50% of self-haul trips. (Ascent Environmental and Recology, 2018). However, combined net change in emissions attributed to both basins were conservatively compared to significance thresholds for each basin.

4.2.3 Operational Emissions – Stationary Sources

The Project includes additional landfill disposal capacity and a new C&D waste sorting operation, which are emission sources that require YSAQMD permits to operate.

The current landfill disposal operations are permitted in the existing facility Title V permit, and the additional landfill disposal that will be accepted at the RHRLF will be addressed by the YSAQMD as part of the facility permit modifications. Fugitive LFG emissions have been calculated for this analysis. The existing LFG flare does not have the capacity to combust all of the LFG that will be collected post-expansion. As such, this analysis assumes additional flare capacity will be permitted at a later date. For CEQA purposes, flare emissions assuming combustion of all collected LFG in the peak year of LFG generation have been calculated. LFG fugitive and flare emissions are presented in Table 4-10. It should be noted that a landfill gas to energy (LFGTE) electrical generation facility, owned and operated by a separate entity, G2 Energy, is located on the facility property. It currently burns approximately 50 percent of the LFG collected from RHRLF, which results in a reduction in the amount of LFG burned in the RHRLF flare. For purposes of this AQIA, it is assumed all collected LFG is combusted in the flare; however, it is expected that the flare and the G2 Energy facility will each continue to combust a portion of the RHR LFG.

The C&D waste sorting operation will consist of processing equipment as well as a diesel-powered generator to power the operation. Fugitive PM emissions from the waste sorting process has been estimated, along with emissions from diesel engine combustion. Emissions from the sorting process are presented in Table 4-11; Emissions from diesel-powered generator are presented in Table 4-12. Operational emissions from operational stationary sources are summarized in Table 4-13.

Landfill operational changes and the new C&D waste sorting operation will be evaluated under Rule 4-2—New Source Review, which requires that equipment comply with BACT, and that emission increases comply with offsetting requirements, as applicable. According to the YSAQMD CEQA Handbook (YSAQMD, 2007), stationary sources complying with BACT and emission offset requirements are usually considered as having less than significant air quality impacts (except in special circumstances, such as odor-emitting projects causing a public nuisance). For this reason, CEQA evaluation of operational emissions will be based on the mobile source emissions presented in Table 4-8. Mobile source emissions are not regulated by YSAQMD.

There will be daily and annual additional LFG emissions resulting from the Project increase in the landfill's average daily limit, increasing from 2,400 tpd to 3,200 tpd. Note that the increase in the peak daily limit (to 3,400 tpd) has no effect on maximum annual emissions, and therefore no effect on LandGEM LFG generation modeling or maximum potential LFG emissions. LFG emissions include fugitive emissions from the landfill surface (assumed to be 25% of LFG generated within the waste mass) and flare emissions from combustion of the portion of generated LFG that is captured by the gas collection system (assumed to be 75% of the LFG generated (U.S. EPA, AP-42 Section 2.4.4.2, 2008). The resultant increase in fugitive emissions of CH_4 and non-methane organic compounds (NMOC) were calculated using EPA's LandGEM (U.S. EPA, 2005). NMOC were conservatively assumed to consist entirely VOC. The primary constituents of landfill gas are CH4 (45-60%) and CO2 (40-60%) (Agency for Toxic Substances & Disease Registry, 2001). Flare emissions were also calculated using LandGEM results to determine the maximum amount of LFG that could be flared, and using emission factors for the existing flare for VOC, NOx, CO, SOx, PM_{10}, and $PM_{2.5}$.

The model parameters for the Baseline and Project LandGEMs, shown in Table 4-10, were selected to be consistent with use of LandGEM for emissions inventory and permitting purposes, in accordance with the EPA's LandGEM User's Guide (U.S. EPA, 2005), and the engineering evaluation conducted by YSAQMD on November 11, 2017 for the landfill (YSAQMD, 2017b). LandGEM was run twice; once using actual and permitted (Baseline) inputs, and again using post-expansion (Project) inputs. Peak-year (2035) emissions were used as Project emissions and compared to Baseline emissions to determine the emissions increase attributed to the Project. Note that two baseline scenarios are presented: Current actual (CA) and current permitted (CP). CA emissions are based on average emissions over the past two years (2017/18), per procedures specified in the YSAQMD's new source review regulation (Rule 3-4) (YSAQMD, 1997). CP emissions are based on peak year (2032) emissions, when the landfill is projected to reach full permitted capacity of 18,200,000 tons of waste in place. The CA baseline results in a larger emissions increase, compared to the CP baseline, and is conservatively assumed to be the baseline in this AQIA. However, YSAQMD rules allow CP emissions to be used as baseline in some circumstances, and SCS expects CP emissions to be allowed as baseline for LFG fugitive emissions for air permitting purposes because actual cumulative waste-in-place has been greater than 80% of projected cumulative waste-in-place during the past five years, per District New Source Review rule.

The Project LandGEM (future potential [FP] scenario) assumes the year 2020 to be the earliest anticipated date of landfill operation under the Project scenario (with increased daily and annual waste acceptance limits). The expanded landfill closure year was estimated as 2034, with the highest emissions occurring in 2035, based on LandGEM results. The LandGEM output reports for both Baseline and Project models are included in Appendix B. In accordance with the YSAQMD CEQA Handbook (YSAQMD, 2007), stationary sources complying with BACT and emission offset requirements are usually considered as having less than significant air quality impact.

For calculating flare emissions, CA baseline assumes 75% LFG collection rate based on an annual average of 2017/18 LFG generation, with all collected gas going to the existing flare. For CP baseline, it is assumed the existing flare is operating at its full permitted capacity (45.6 MMBtu/hr; 1,500 scfm). FP scenario assumes 75% collection of LFG generated in peak year (2035), with all collected LFG combusted in a flare with the same emission factors as the existing flare. This assumption is conservative, as the YSAQMD may impose more stringent emission limits for some pollutants during permitting of future flare capacity. FP scenario assumes combustion in a hypothetical flare with same emission factors as the existing flare. This assumption is conservative, as the YSAQMD may impose more stringent emission limits for some pollutants during permitting of additional flare capacity.

For SOx emissions from the flare, two scenarios were calculated. The first scenario involves retaining the current facility-wide SOx limit of 150 lbs/day, which is met through operation of an iron-sponge system to remove hydrogen sulfide from LFG prior to flare combustion. This system was voluntarily installed by RHRLF, with the current limit set to avoid triggering offset requirements for SOx. The second scenario involves proposing a higher SOx limit. If a higher limit is proposed by RHRLF as part of future YSAQMD permitting of additional flare capacity, it is expected that any potential increase in SOx emissions would trigger YSAQMD requirements to fully offset any increase in SOx. As such, the Project would result in no net increase in SOx emissions, after offsets.

Table 4-10: LandGEM Model Parameters and Inputs

Model Parameter	Value
CH_4 Generation Rate,[a] k ($year^{-1}$)	0.02
Potential CH_4 Generation Capacity,[b] L_o (m^3/Mg)	100
Corrected NMOC Concentration [c] (ppmv as hexane)	776.3
CH_4 Content [d] (% by volume)	50
Landfill Open Year	1964
Baseline - Waste Design Capacity (tons)	18,700,000
Baseline – Waste Acceptance Rate [e] (tons/year)	876,000
Baseline - Landfill Closure Year	2032
Baseline – Year of Peak Emissions	2033
Expansion - Waste Design Capacity (tons)	24,420,000
Expansion - Projected Waste Acceptance [f] (tons/year) [Beginning in 2020]	1,168,000
Expansion - Landfill Closure Year	2034
Expansion – Year of Peak Emissions	2035
Increase in Waste Acceptance Rate Based on Increase in 7-Day-Average [3,200 tpd – 2,400 tpd] (tons/year)	292,000
Control efficiency [g]	0.75

Notes: (a) Vacaville, CA receives an average of 24.53 inches of rainfall per year, based on the average 30-year rainfall measurements (U.S. Climate Data, 2018). Per 40 CFR 60.754.(a).(1).(i), for landfills located in geographical areas with a thirty year annual average precipitation of less than 25 inches, the k value to be used is 0.02 per year.

(b) Per EPA LandGEM Guidance for Emissions Inventory and Permitting

(c) Per Emission Evaluation and Statement of Basis for Authority to Construct (ATC) C-16-24 (YSAQMD, 2017)

(d) LandGEM default value

(e) Daily waste limit of 2,400 tpd * 365 days.

(f) Proposed 7-day-average waste limit of 3,200 tpd * 365 days

(g) AP-42 Section 2.4.4.2 (10/2008)

Table 4-11: Summary of Operational LFG Emissions from the Proposed Increase in Disposal Limit

Value	Pollutant (tpy) (metric tons/year for GHGs)									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SO_x	CO_2	CH_4	N_2O	CO_2e
Baseline (CA) Fugitive	12.19	-	-	-	-	-	7,187	2,028	0	50,698
Baseline (CA) Flare	3.41	15.47	3.87	0.001	0.001	27.38	8,057	0.50	0.10	42
Baseline (CA) Total	**15.60**	**15.47**	**3.87**	**0.001**	**0.001**	**27.38**	**15,244**	**2,028**	**0.10**	**50,740**
Baseline (CP) Fugitive	40.49	-	-	-	-	-	13,288	3,962	-	99,043
Baseline (CP) Flare	8.81	39.95	9.99	0.004	0.004	27.38	20,800	1.28	0.25	107
Baseline (CP) Total	**49.30**	**39.95**	**9.99**	**0.004**	**0.004**	**27.38**	**34,088**	**3,963**	**0.25**	**99,150**
Project (FP) Fugitive	53.09	-	-	-	-	-	17,428	5,196	0	129,898
Project (FP) Flare	17.31	92.86	23.22	0.008	0.008	27.38	48,354	2.97	0.59	249
Project (FP) Total	**70.40**	**92.86**	**23.22**	**0.008**	**0.008**	**27.38**	**65,782**	**5,199**	**0.59**	**130,147**
Project Increase (FP-CP)	**21.10**	**52.92**	**13.23**	**0.003**	**0.003**	**0.00**	**31,694**	**1,236**	**0.33**	**30,997**
Project Increase (FP-CA)	**54.80**	**77.39**	**19.35**	**0.007**	**0.007**	**0.00**	**50,530**	**3,170**	**0.49**	**79,407**

Notes: Two baseline scenarios are presented; however CA baseline is conservatively assumed for this AQIA.
(a) Two scenarios are included for FP for SOx: (1) with current SOx limit retained or (2) increase in permitted SOx limit. Where two values are included for project increase, the first is mitigated and the second is unmitigated.

Emissions from the new C&D waste sorting operation have been calculated and are presented below. The C&D waste sorting operation will include a screen and material sort line powered by one or more portable diesel engines with a combined rating of approximately 500 horsepower (HP). The C&D waste sorting operation will process up to 150 tpd of material for 260 days per year. The configuration of these units may vary depending on the characteristics of the waste being processed, and the type of recycled product being produced. Typical equipment is portable in design so that it may be moved to locations where stockpiled C&D waste is deposited and where processed C&D waste stockpiles are staged.

Emission factors for the C&D processing equipment were obtained from USEPA's *AP-42: Compilation of Air Emission Factors*, Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing. Where provided, "controlled" emission factors were selected (reflecting wet suppression, that is likely to be required as BACT) for screening, conveyor transfer points, truck unloading-fragmented stone, and truck loading-conveyor, crushed stone. The AP-42 emission factors are expressed in Table 11.19.2-2 in units of pounds per ton of material processed. Although the design of the C&D waste sorting operation is to be determined, for the purposes of this AQIA, it will be assumed that the processing system will contain the equivalent of one truck unloading conveyor, one screen, five conveyor transfer points, and one truck loading conveyor. C&D waste processing rates will ultimately depend on the quantity of waste received; however, for the purposes of this analysis, it is assumed that 150 tpd of C&D waste will be processed. PM_{10} and $PM_{2.5}$ emissions from the C&D waste sorting operation are calculated in Table 4-12.

Table 4-12: PM_{10} and $PM_{2.5}$ Emissions from the C&D Waste Sorting Operation

C&D Waste Processing Operation (from AP-42 Table 11.19.2-2)	No. of Sources	Emission Factor (lbs/ton)		Daily Emissions[a] (lbs/day)		Annual Emissions[a] (tons/year)	
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Truck Unloading – Fragmented Stone	1	1.6 E-5	1.6 E-5	0.002	0.002	0.0003	0.0003
Screening (controlled)	1	2.2 E-3	2.2 E-3	0.33	0.33	0.043	0.043
Conveyor Transfer Point (controlled)	5	4.6 E-5	1.3 E-5	0.01	0.002	0.001	0.0003
Truck Loading – Conveyor, crushed stone	1	1.0 E-4	1.0 E-4	0.02	0.02	0.002	0.002
Total		**0.0025**	**0.0024**	**0.35**	**0.35**	**0.046**	**0.045**

Notes: (a) Based on 150 tpd of C&D waste processing for 260 days/yr.

Additionally, the C&D sorting operation will require a portable, diesel-fueled internal combustion engine/generator. The engine will be required to meet CARB's *airborne Toxic Control Measure for Diesel Particulate matter from Portable Engines Rated at 50 Horsepower and Greater* (17 CCR § 93116 et seq.), as well as YSAQMD BACT requirements. This will require the engine to meet the Final Tier 4 certification standards found in Table 1 of 40 CFR 1039.101. These emission standards, as well as the maximum daily and annual emissions from the internal combustion engine/generator are shown in Table 4-13. While the exact rating of the engine is unknown, for the purposes of this AQIA, a 500 HP engine will be assumed to operate for 8 hours/day and 260 days/year. SO_2 emissions are based on a fuel sulfur content of 15 parts per million by weight (ppmw), and GHG emission factors are from 40 CFR 98, Subpart C, Tables C-1 and C-2.

Table 4-13: Emissions from the C&D Operation Portable Diesel Internal Combustion Engine

Value	Pollutant									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
Emission Factor (g/hp-hr, kg/mmBtu for GHG))	0.14	2.6	0.3	0.015	0.015	0.002	72.96	0.003	0.006	74.82
Maximum Daily Emissions (lbs/day)	1.2	22.9	2.6	0.1	0.1	0.0	7,282	0.30	0.60	7,468
Maximum Annual Emissions (tons/year, metric tons/year for GHGs)	0.16	2.98	0.34	0.017	0.017	0.002	859	0.04	0.07	881

Combined Project emissions from stationary operational sources, including LFG emissions and emissions associated with the new C&D sorting operation are presented in Table 4-14. Combined emissions after mitigation are presented and compared to applicable CEQA Significance Thresholds in Table 4-15

Table 4-14: Project Increase[a] - Operational Stationary Emissions

Activity	Pollutant									
	VOC[a]	CO	NOx[a]	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
LFG Emissions Increase	300	424	106	0.04	0.04	150	305,302	19,153	0	479,707
C&D Operation Emissions Increase	0.88	16.3	1.88	0.34	0.34	0.01	5,187	0.21	0.43	5,320
Total Increase	301	440	108	0.38	0.38	150	310,489	19,153	0.43	485,026
	Tons per Year						Metric Tons per Year			
LFG Emissions Increase	54.8	77.4	19.4	0.01	0.01	27.4	50,538	3,170	0	79,407
C&D Operation Emissions Increase	0.16	2.98	0.34	0.063	0.062	0.00	859	0.04	0.07	881
Total Increase	55.0	80.4	19.7	0.07	0.07	27.4	51,396	3,170	0.07	80,288

Notes: *(a) Project increase in emissions is based on conservative assumption of Current Actual scenario as baseline.*
(b) See Section 4.3.4 for operational sources subject to YSAQMD permitting.

Table 4-15: Project Increase - Operational Stationary Emissions (With Mitigation)

Activity	Pollutant									
	VOC[a]	CO	NOx[a]	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
	Pounds per Day									
Mitigated Maximum Daily Emissions	54	440	54	0.5	0.5	0.0	310,489	19,153	0.43	485,026
Significance Threshold	-	-	-	80	-	-	-	-	-	-
	Tons per Year						Metric Tons per Year			
Mitigated Annual Increase	9.9	80.4	9.9	0.07	0.07	0.00	51,369	3,170	0.6	80,288
Significance Thresholds	10	-	10	-	-	-	-	-	-	-

Notes: *(a) Assumption is that emission offsets would be provided for VOC and NOx to stay below significance thresholds.*

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Appendix A

Construction Emissions (CalEEMod Output Reports) (TRI, 2018)

Appendix B

Operational Emissions – Mobile Sources

Appendix C

LandGEM Output Reports (Baseline and Post-Project)

Appendix D

Operational Emissions – Stationary Sources and C&D Sorting Operation

Recology Hay Road Landfill CUP Ammendment No. 2

Solano-Sacramento County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	24.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	6.8	**Precipitation Freq (Days)**	56
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Area of "triangle" expansion is approximately 24 acres.

Construction Phase - Custom contruction schedule.

Off-road Equipment -

Off-road Equipment - Custom equipment list

Trips and VMT - Project-specific values.

On-road Fugitive Dust - Project-specific value equating to 0.4 mi/trip of non-paved road travel

Grading - Project-specific values.

Construction Off-road Equipment Mitigation - Project-specific Inputs

Vehicle Emission Factors -

Vehicle Emission Factors -

Vehicle Emission Factors -

Fleet Mix -

Consumer Products - construction only

Area Coating - construction only

Landscape Equipment - construction only

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	150	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	55	45
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	55	61
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstructionPhase	NumDays	370.00	22.00
tblConstructionPhase	NumDays	35.00	132.00
tblGrading	AcresOfGrading	924.00	24.00
tblGrading	MaterialImported	0.00	8,000.00
tblGrading	MaterialMoistureContentBulldozing	7.90	15.00
tblLandUse	LotAcreage	0.00	24.00
tblOffRoadEquipment	HorsePower	187.00	165.00
tblOffRoadEquipment	HorsePower	247.00	405.00
tblOffRoadEquipment	HorsePower	212.00	315.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	6.00
tblOnRoadDust	VendorPercentPave	94.00	99.90
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	30.00
tblTripsAndVMT	HaulingTripNumber	1,000.00	120.00
tblTripsAndVMT	VendorTripLength	9.00	400.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	WorkerTripNumber	33.00	23.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.6899	7.8308	5.4454	0.0107	2.5365	0.3248	2.8613	0.3405	0.2992	0.6397	0.0000	950.2348	950.2348	0.2698	0.0000	956.9798
Maximum	**0.6899**	**7.8308**	**5.4454**	**0.0107**	**2.5365**	**0.3248**	**2.8613**	**0.3405**	**0.2992**	**0.6397**	**0.0000**	**950.2348**	**950.2348**	**0.2698**	**0.0000**	**956.9798**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.6899	7.8308	5.4454	0.0107	2.4570	0.3248	2.7818	0.2815	0.2992	0.5807	0.0000	950.2338	950.2338	0.2698	0.0000	956.9788
Maximum	**0.6899**	**7.8308**	**5.4454**	**0.0107**	**2.4570**	**0.3248**	**2.7818**	**0.2815**	**0.2992**	**0.5807**	**0.0000**	**950.2338**	**950.2338**	**0.2698**	**0.0000**	**956.9788**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**3.13**	**0.00**	**2.78**	**17.31**	**0.00**	**9.21**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
8	**3-30-2020**	**6-29-2020**	3.7243	3.7243
9	**6-30-2020**	**9-29-2020**	4.0390	4.0390
		Highest	4.0390	4.0390

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	4/15/2020	10/15/2020	5	132	
2	Geomembrane Installation	Building Construction	6/1/2020	6/30/2020	5	22	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 24

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Crawler Tractors	1	8.00	315	0.43
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	165	0.41
Grading	Rubber Tired Dozers	1	8.00	405	0.40
Grading	Scrapers	6	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Geomembrane Installation	Cranes	1	7.00	231	0.29
Geomembrane Installation	Forklifts	3	8.00	89	0.20
Geomembrane Installation	Generator Sets	1	8.00	84	0.74
Geomembrane Installation	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Geomembrane Installation	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	13	23.00	10.00	120.00	15.00	9.00	30.00	LD_Mix	HDT_Mix	HHDT
Geomembrane Installation	9	0.00	6.00	0.00	15.00	400.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1767	0.0000	0.1767	0.0966	0.0000	0.0966	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.6462	7.3205	5.1320	9.1800e-003		0.3099	0.3099		0.2851	0.2851	0.0000	807.1216	807.1216	0.2610	0.0000	813.6475
Total	**0.6462**	**7.3205**	**5.1320**	**9.1800e-003**	**0.1767**	**0.3099**	**0.4865**	**0.0966**	**0.2851**	**0.3817**	**0.0000**	**807.1216**	**807.1216**	**0.2610**	**0.0000**	**813.6475**

3.2 Grading - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.7000e-004	0.0218	3.9000e-003	7.0000e-005	0.1360	8.0000e-005	0.1361	0.0138	8.0000e-005	0.0139	0.0000	6.5223	6.5223	2.0000e-004	0.0000	6.5274
Vendor	3.3300e-003	0.0831	0.0231	2.2000e-004	0.4492	4.8000e-004	0.4497	0.0458	4.6000e-004	0.0463	0.0000	21.1409	21.1409	1.0000e-003	0.0000	21.1659
Worker	7.0700e-003	5.1800e-003	0.0499	1.7000e-004	1.7180	1.1000e-004	1.7181	0.1741	1.0000e-004	0.1742	0.0000	15.1076	15.1076	3.7000e-004	0.0000	15.1168
Total	**0.0111**	**0.1101**	**0.0769**	**4.6000e-004**	**2.3032**	**6.7000e-004**	**2.3039**	**0.2337**	**6.4000e-004**	**0.2344**	**0.0000**	**42.7707**	**42.7707**	**1.5700e-003**	**0.0000**	**42.8100**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0972	0.0000	0.0972	0.0377	0.0000	0.0377	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.6462	7.3204	5.1320	9.1800e-003		0.3099	0.3099		0.2851	0.2851	0.0000	807.1206	807.1206	0.2610	0.0000	813.6466
Total	**0.6462**	**7.3204**	**5.1320**	**9.1800e-003**	**0.0972**	**0.3099**	**0.4070**	**0.0377**	**0.2851**	**0.3228**	**0.0000**	**807.1206**	**807.1206**	**0.2610**	**0.0000**	**813.6466**

3.2 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.7000e-004	0.0218	3.9000e-003	7.0000e-005	0.1360	8.0000e-005	0.1361	0.0138	8.0000e-005	0.0139	0.0000	6.5223	6.5223	2.0000e-004	0.0000	6.5274
Vendor	3.3300e-003	0.0831	0.0231	2.2000e-004	0.4492	4.8000e-004	0.4497	0.0458	4.6000e-004	0.0463	0.0000	21.1409	21.1409	1.0000e-003	0.0000	21.1659
Worker	7.0700e-003	5.1800e-003	0.0499	1.7000e-004	1.7180	1.1000e-004	1.7181	0.1741	1.0000e-004	0.1742	0.0000	15.1076	15.1076	3.7000e-004	0.0000	15.1168
Total	**0.0111**	**0.1101**	**0.0769**	**4.6000e-004**	**2.3032**	**6.7000e-004**	**2.3039**	**0.2337**	**6.4000e-004**	**0.2344**	**0.0000**	**42.7707**	**42.7707**	**1.5700e-003**	**0.0000**	**42.8100**

3.3 Geomembrane Installation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0233	0.2111	0.1853	3.0000e-004		0.0123	0.0123		0.0116	0.0116	0.0000	25.4771	25.4771	6.2200e-003	0.0000	25.6325
Total	**0.0233**	**0.2111**	**0.1853**	**3.0000e-004**		**0.0123**	**0.0123**		**0.0116**	**0.0116**	**0.0000**	**25.4771**	**25.4771**	**6.2200e-003**	**0.0000**	**25.6325**

3.3 Geomembrane Installation - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.3500e-003	0.1892	0.0512	7.9000e-004	0.0566	1.9900e-003	0.0586	0.0101	1.9100e-003	0.0120	0.0000	74.8654	74.8654	9.8000e-004	0.0000	74.8898
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.3500e-003**	**0.1892**	**0.0512**	**7.9000e-004**	**0.0566**	**1.9900e-003**	**0.0586**	**0.0101**	**1.9100e-003**	**0.0120**	**0.0000**	**74.8654**	**74.8654**	**9.8000e-004**	**0.0000**	**74.8898**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0233	0.2111	0.1853	3.0000e-004		0.0123	0.0123		0.0116	0.0116	0.0000	25.4771	25.4771	6.2200e-003	0.0000	25.6325
Total	**0.0233**	**0.2111**	**0.1853**	**3.0000e-004**		**0.0123**	**0.0123**		**0.0116**	**0.0116**	**0.0000**	**25.4771**	**25.4771**	**6.2200e-003**	**0.0000**	**25.6325**

3.3 Geomembrane Installation - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	9.3500e-003	0.1892	0.0512	7.9000e-004	0.0566	1.9900e-003	0.0586	0.0101	1.9100e-003	0.0120	0.0000	74.8654	74.8654	9.8000e-004	0.0000	74.8898
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**9.3500e-003**	**0.1892**	**0.0512**	**7.9000e-004**	**0.0566**	**1.9900e-003**	**0.0586**	**0.0101**	**1.9100e-003**	**0.0120**	**0.0000**	**74.8654**	**74.8654**	**9.8000e-004**	**0.0000**	**74.8898**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	15.00	8.00	9.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Industrial	0.579245	0.037675	0.174898	0.116107	0.020475	0.005588	0.009509	0.042408	0.003213	0.002343	0.006812	0.000608	0.001119

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**					**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Recology Hay Road Landfill CUP Ammendment No. 2

Solano-Sacramento County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	24.00	0.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	6.8	**Precipitation Freq (Days)**	56
Climate Zone	4			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Area of "triangle" expansion is approximately 24 acres.

Construction Phase - Custom contruction schedule.

Off-road Equipment -

Off-road Equipment - Custom equipment list

Trips and VMT - Project-specific values.

On-road Fugitive Dust - Project-specific value equating to 0.4 mi/trip of non-paved road travel

Grading - Project-specific values.

Construction Off-road Equipment Mitigation - Project-specific Inputs

Vehicle Emission Factors -

Vehicle Emission Factors -

Vehicle Emission Factors -

Fleet Mix -

Consumer Products - construction only

Area Coating - construction only

Landscape Equipment - construction only

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintNonresidentialExteriorValue	150	0
tblConstDustMitigation	WaterExposedAreaPM10PercentReduction	55	45
tblConstDustMitigation	WaterExposedAreaPM25PercentReduction	55	61
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstructionPhase	NumDays	370.00	22.00
tblConstructionPhase	NumDays	35.00	132.00
tblGrading	AcresOfGrading	924.00	24.00
tblGrading	MaterialImported	0.00	8,000.00
tblGrading	MaterialMoistureContentBulldozing	7.90	15.00
tblLandUse	LotAcreage	0.00	24.00
tblOffRoadEquipment	HorsePower	187.00	165.00
tblOffRoadEquipment	HorsePower	247.00	405.00
tblOffRoadEquipment	HorsePower	212.00	315.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	6.00
tblOnRoadDust	VendorPercentPave	94.00	99.90
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	30.00
tblTripsAndVMT	HaulingTripNumber	1,000.00	120.00
tblTripsAndVMT	VendorTripLength	9.00	400.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	WorkerTripNumber	33.00	23.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	12.9328	148.1088	100.5502	0.2450	49.5973	6.0035	55.6008	6.6229	5.5528	12.1757	0.0000	24,278.2691	24,278.2691	5.1070	0.0000	24,405.9445
Maximum	**12.9328**	**148.1088**	**100.5502**	**0.2450**	**49.5973**	**6.0035**	**55.6008**	**6.6229**	**5.5528**	**12.1757**	**0.0000**	**24,278.2691**	**24,278.2691**	**5.1070**	**0.0000**	**24,405.9445**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	12.9328	148.1088	100.5502	0.2450	48.3928	6.0035	54.3963	5.7301	5.5528	11.2829	0.0000	24,278.2691	24,278.2691	5.1070	0.0000	24,405.9445
Maximum	**12.9328**	**148.1088**	**100.5502**	**0.2450**	**48.3928**	**6.0035**	**54.3963**	**5.7301**	**5.5528**	**11.2829**	**0.0000**	**24,278.2691**	**24,278.2691**	**5.1070**	**0.0000**	**24,405.9445**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**2.43**	**0.00**	**2.17**	**13.48**	**0.00**	**7.33**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	4/15/2020	10/15/2020	5	132	
2	Geomembrane Installation	Building Construction	6/1/2020	6/30/2020	5	22	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 24

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Crawler Tractors	1	8.00	315	0.43
Grading	Excavators	2	8.00	158	0.38
Grading	Graders	1	8.00	165	0.41
Grading	Rubber Tired Dozers	1	8.00	405	0.40
Grading	Scrapers	6	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Geomembrane Installation	Cranes	1	7.00	231	0.29
Geomembrane Installation	Forklifts	3	8.00	89	0.20
Geomembrane Installation	Generator Sets	1	8.00	84	0.74
Geomembrane Installation	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Geomembrane Installation	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	13	23.00	10.00	120.00	15.00	9.00	30.00	LD_Mix	HDT_Mix	HHDT
Geomembrane Installation	9	0.00	6.00	0.00	15.00	400.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Water Unpaved Roads

Reduce Vehicle Speed on Unpaved Roads

3.2 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.6767	0.0000	2.6767	1.4636	0.0000	1.4636			0.0000			0.0000
Off-Road	9.7908	110.9158	77.7579	0.1392		4.6951	4.6951		4.3195	4.3195		13,480.2911	13,480.2911	4.3598		13,589.2861
Total	**9.7908**	**110.9158**	**77.7579**	**0.1392**	**2.6767**	**4.6951**	**7.3718**	**1.4636**	**4.3195**	**5.7831**		**13,480.2911**	**13,480.2911**	**4.3598**		**13,589.2861**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0101	0.3205	0.0572	1.0400e-003	2.4310	1.2600e-003	2.4323	0.2466	1.2100e-003	0.2478		109.6598	109.6598	3.2600e-003		109.7414
Vendor	0.0495	1.2364	0.3287	3.4100e-003	8.0270	7.2000e-003	8.0342	0.8162	6.8900e-003	0.8231		357.1649	357.1649	0.0160		357.5646
Worker	0.1130	0.0698	0.8513	2.7400e-003	30.7124	1.7100e-003	30.7141	3.1061	1.5800e-003	3.1077		273.3753	273.3753	6.6900e-003		273.5426
Total	**0.1727**	**1.6267**	**1.2372**	**7.1900e-003**	**41.1704**	**0.0102**	**41.1806**	**4.1689**	**9.6800e-003**	**4.1786**		**740.2001**	**740.2001**	**0.0259**		**740.8485**

3.2 Grading - 2020

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category						lb/day							lb/day			
Fugitive Dust					1.4722	0.0000	1.4722	0.5708	0.0000	0.5708			0.0000			0.0000
Off-Road	9.7908	110.9158	77.7579	0.1392		4.6951	4.6951		4.3195	4.3195	0.0000	13,480.2911	13,480.2911	4.3598		13,589.2861
Total	**9.7908**	**110.9158**	**77.7579**	**0.1392**	**1.4722**	**4.6951**	**6.1673**	**0.5708**	**4.3195**	**4.8903**	**0.0000**	**13,480.2911**	**13,480.2911**	**4.3598**		**13,589.2861**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category						lb/day							lb/day			
Hauling	0.0101	0.3205	0.0572	1.0400e-003	2.4310	1.2600e-003	2.4323	0.2466	1.2100e-003	0.2478		109.6598	109.6598	3.2600e-003		109.7414
Vendor	0.0495	1.2364	0.3287	3.4100e-003	8.0270	7.2000e-003	8.0342	0.8162	6.8900e-003	0.8231		357.1649	357.1649	0.0160		357.5646
Worker	0.1130	0.0698	0.8513	2.7400e-003	30.7124	1.7100e-003	30.7141	3.1061	1.5800e-003	3.1077		273.3753	273.3753	6.6900e-003		273.5426
Total	**0.1727**	**1.6267**	**1.2372**	**7.1900e-003**	**41.1704**	**0.0102**	**41.1806**	**4.1689**	**9.6800e-003**	**4.1786**		**740.2001**	**740.2001**	**0.0259**		**740.8485**

3.3 Geomembrane Installation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503		2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**		**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.8494	16.3802	4.7066	0.0718	5.7502	0.1812	5.9314	0.9904	0.1733	1.1637		7,504.7149	7,504.7149	0.0984		7,507.1755
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.8494**	**16.3802**	**4.7066**	**0.0718**	**5.7502**	**0.1812**	**5.9314**	**0.9904**	**0.1733**	**1.1637**		**7,504.7149**	**7,504.7149**	**0.0984**		**7,507.1755**

3.3 Geomembrane Installation - 2020

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503	0.0000	2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**	**0.0000**	**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.8494	16.3802	4.7066	0.0718	5.7502	0.1812	5.9314	0.9904	0.1733	1.1637		7,504.7149	7,504.7149	0.0984		7,507.1755
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.8494**	**16.3802**	**4.7066**	**0.0718**	**5.7502**	**0.1812**	**5.9314**	**0.9904**	**0.1733**	**1.1637**		**7,504.7149**	**7,504.7149**	**0.0984**		**7,507.1755**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	15.00	8.00	9.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Industrial	0.579245	0.037675	0.174898	0.116107	0.020475	0.005588	0.009509	0.042408	0.003213	0.002343	0.006812	0.000608	0.001119

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Operational Emissions - Mobile Sources

Number of Daily Round Trips

Quantity (units)	Disposal Vehicle Type: Self-Haul Vehicles	Packer Trucks	Transfer Trucks	Total
2016 Total Round Trips (trips/day)	42	42	340	424
2020 Total Round Trips (trips/day)	123	65	431	619
2020 Additional Round Trips (trips/day)	81	23	91	195

Source: Ascent, 2018.

Trip Length and Emission Factors

Vehicle Category	Round Trip Distance (miles)	Emission Factors (grams per mile)						
		VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2
Year 2016								
Medium Duty Vehicles (Self Haul Vehicles)	16.2	0.056	1.952	0.279	0.002	0.006	0.000	575
T7 Tractors (Packer Trucks)	22.4	0.276	0.970	7.062	0.079	0.075	0.016	1,672
T7 Tractors (Transfer Trucks)	120.0	0.276	0.970	7.062	0.079	0.075	0.016	1,672
Year 2020								
Medium Duty Vehicles (Self Haul Vehicles)	15.1	0.039	1.444	0.188	0.002	0.002	0.005	528
T7 Tractors (Packer Trucks)	21.7	0.159	0.646	5.077	0.023	0.022	0.015	1,611
T7 Tractors (Transfer Trucks)	120.0	0.159	0.646	5.077	0.023	0.022	0.015	1,611

Source: CARB, 2018 and Recology.

Baseline Emissions - Mobile Sources (2016)

Vehicle Category	Pollutant (Pounds per Day[a])									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
Year 2016										
Medium Duty Vehicles (Self-Haul Vehicles)	0.1	2.9	0.4	0.0	0.0	0.0	862	0.0	0.0	865
T7 Tractors (Packer Trucks)	0.6	2.0	14.6	0.2	0.2	0.0	3,465	0.1	0.0	3,477
T7 Tractors (Transfer Trucks)	24.8	87.2	635.2	7.1	6.8	1.4	150,422	6.1	1.2	150,938
Maximum Daily Emissions	25.4	92.2	650.3	7.2	6.9	1.5	154,750	6.3	1.3	155,281
	Tons per Year[b]						Metric Tons per Year[c]			
Maximum Annual Emissions (2016)	4.6	16.8	118.7	1.3	1.3	0.3	25,616	1.0	0.2	25,700

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily round trips * lb/4543.6 g
(b) tons/year emissions = lb/day emissions * 365 days/year * ton/2000 lbs * 3200 tpd (7-day average daily MSW) / 3400 tpd (peak daily MSW)
(c) metric tons/year = lb/day emissions * 365 days/year / 2205 lbs/metric ton. GWPs of 25 for CH4 and 298 for N2O applied for CO2e emissions.

Operational Emissions - Mobile Sources (2020)

Vehicle Category	Pollutant (Pounds per Day[a])									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
Year 2020										
Medium Duty Vehicles (Self-Haul Vehicles)	0.2	5.9	0.8	0.0	0.0	0.0	2,163	0.1	0.0	2,171
T7 Trucks (Packer Trucks)	0.5	2.0	15.8	0.1	0.1	0.0	5,019	0.2	0.0	5,037
T7 Tractors (Transfer Trucks)	18.1	73.7	578.9	2.7	2.6	1.8	183,673	7.5	1.5	184,303
Maximum Daily Emissions	18.8	81.6	595.5	2.8	2.6	1.8	190,855	7.7	1.5	191,510
	Tons per Year[b]						Metric Tons per Year[c]			
Maximum Annual Emissions (2020)	3.2	14.0	102.3	0.5	0.5	0.3	29,734	1.2	0.2	29,836

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily round trips * lb/4543.6 g
(b) tons/year emissions = lb/day emissions * 365 days/year * ton/2000 lbs * 3200 tpd (7-day average daily MSW) / 3400 tpd (peak daily MSW)

(c) metric tons/year = lb/day emissions * 365 days/year / 2205 lbs/metric ton * 3200 tpd (7-day average daily MSW) / 3400 tpd (peak daily MSW). GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.

Net Change in Project Operational Emissions - Mobile Sources

Vehicle Category	Pollutant (Pounds per Day[a])									
	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
Year 2020 - Proposed Project Net Change in Emissions										
Medium Duty Vehicles (Self-Haul Vehicles)	0.1	3.0	0.4	0.0	0.0	0.0	1300.9	0.1	0.0	1305.4
T7 Trucks (Packer Trucks)	-0.1	0.0	1.2	-0.1	-0.1	0.0	1553.9	0.1	0.0	1559.2
T7 Tractors (Transfer Trucks)	-6.6	-13.6	-56.3	-4.4	-4.2	0.3	33250.7	1.3	0.3	33364.8
Net Change in Maximum Daily Project Emissions[d]	-6.7	-10.6	-54.8	-4.5	-4.3	0.4	36,105	1.5	0.3	36,229
Emissions in San Francisco Bay Area Air Basin	-6.6	-12.1	-56.1	-4.4	-4.2	0.3	33901.1	1.4	0.3	34017.5
Significance Threshold	54.0	-	54.0	82.0	54.0	-	-	-	-	-
Significant Impact?	No	-	No	No	No	-	-	-	-	-
Emissions in Sacramento Valley Air Basin	0.0	1.5	1.4	-0.1	-0.1	0.0	2204.3	0.1	0.0	2211.9
Significance Threshold	-	-	-	80	-	-	-	-	-	-
Significant Impact?	-	-	-	No	-	-	-	-	-	-
	Tons per Year[b]						Metric Tons per Year[c]			
Net Change in Annual Project Emissions (2020)[d]	-1.1	-1.8	-9.4	-0.8	-0.7	0.1	5625.1	0.2	0.0	5644.4
Emissions in San Francisco Bay Area Air Basin	-1.1	-2.1	-9.6	-0.8	-0.7	0.1	5281.7	0.2	0.0	5299.8
Significance Thresholds	10.0	-	10.0	15.0	10.0	-	-	-	-	-
Significant Impact?	No	-	No	No	No	-	-	-	-	No
Emissions in Sacramento Valley Air Basin	0.0	0.3	0.2	0.0	0.0	0.0	343.4	0.0	0.0	344.6
Significance Thresholds	10	-	10	-	-	-	-	-	-	10,000
Significant Impact?	No	-	No	-	-	-	-	-	-	No

Notes: (a) lbs/day emissions = round trip distance (miles) * emission factor (g/mi) * No. of daily round trips * lb/4543.6 g

(b) tons/year emissions = lb/day emissions * 365 days/year * ton/2000 lbs * 3200 tpd (7-day average daily MSW) / 3400 tpd (peak daily MSW)

(c) metric tons/year = lb/day emissions * 365 days/year / 2205 lbs/metric ton * 3200 tpd (7-day average daily MSW) / 3400 tpd (peak daily MSW). GWPs of 25 for CH_4 and 298 for N_2O applied for CO_2e emissions.

(d) Emissions in San Francisco Bay Area Air Basin attributed from 100% of transfer truck trips and 50% of self-haul trips.
Emissions in Sacramento Valley Air Basin attributed from 100% packer truck trips and 50% of self haul trips. (Ascent Environmental and Recology, 2018)

Summary Report

Landfill Name or Identifier: Recology Hay Road - Bsaseline LandGEM

Date: Sunday, April 21, 2019

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

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

Where,

Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate (*year^{-1}*)
L_o = potential methane generation capacity (*m^3/Mg*)
M_i = mass of waste accepted in the i^{th} year (*Mg*)
t_{ij} = age of the j^{th} section of waste mass M_i accepted in the i^{th} year (*decimal years*, e.g., 3.2 years)

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

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

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1964**	
Landfill Closure Year (with 80-year limit)	**2032**	
Actual Closure Year (without limit)	***2032***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**17,000,000**	*megagrams*

MODEL PARAMETERS

Methane Generation Rate, k	**0.020**	*year $^{-1}$*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**776**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

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

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1964	18,182	20,000	0	0
1965	18,727	20,600	18,182	20,000
1966	19,273	21,200	36,909	40,600
1967	19,818	21,800	56,182	61,800
1968	20,455	22,500	76,000	83,600
1969	21,091	23,200	96,455	106,100
1970	21,727	23,900	117,545	129,300
1971	22,364	24,600	139,273	153,200
1972	23,000	25,300	161,636	177,800
1973	23,727	26,100	184,636	203,100
1974	24,455	26,900	208,364	229,200
1975	25,182	27,700	232,818	256,100
1976	25,909	28,500	258,000	283,800
1977	26,727	29,400	283,909	312,300
1978	27,545	30,300	310,636	341,700
1979	28,364	31,200	338,182	372,000
1980	29,182	32,100	366,545	403,200
1981	30,091	33,100	395,727	435,300
1982	31,000	34,100	425,818	468,400
1983	31,909	35,100	456,818	502,500
1984	32,909	36,200	488,727	537,600
1985	33,909	37,300	521,636	573,800
1986	34,909	38,400	555,545	611,100
1987	36,000	39,600	590,455	649,500
1988	37,091	40,800	626,455	689,100
1989	38,182	42,000	663,545	729,900
1990	39,364	43,300	701,727	771,900
1991	40,545	44,600	741,091	815,200
1992	41,727	45,900	781,636	859,800
1993	89,962	98,958	823,364	905,700
1994	105,075	115,583	913,325	1,004,658
1995	101,648	111,813	1,018,401	1,120,241
1996	109,274	120,201	1,120,049	1,232,054
1997	100,121	110,133	1,229,323	1,352,255
1998	100,657	110,723	1,329,444	1,462,388
1999	119,808	131,789	1,430,101	1,573,111
2000	112,999	124,299	1,549,909	1,704,900
2001	119,624	131,586	1,662,908	1,829,199
2002	121,682	133,850	1,782,532	1,960,785
2003	145,085	159,594	1,904,214	2,094,635

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
2004	159,580	175,538	2,049,299	2,254,229
2005	152,595	167,854	2,208,879	2,429,767
2006	166,537	183,191	2,361,474	2,597,621
2007	136,857	150,543	2,528,011	2,780,812
2008	134,680	148,148	2,664,868	2,931,355
2009	119,605	131,565	2,799,548	3,079,503
2010	156,266	171,893	2,919,153	3,211,068
2011	201,333	221,466	3,075,419	3,382,961
2012	239,364	263,300	3,276,752	3,604,427
2013	240,169	264,186	3,516,115	3,867,727
2014	225,649	248,214	3,756,285	4,131,913
2015	233,043	256,348	3,981,934	4,380,127
2016	558,801	614,681	4,214,977	4,636,475
2017	575,097	632,607	4,773,778	5,251,156
2018	672,261	739,487	5,348,875	5,883,763
2019	796,364	876,000	6,021,136	6,623,250
2020	796,364	876,000	6,817,500	7,499,250
2021	796,364	876,000	7,613,864	8,375,250
2022	796,364	876,000	8,410,227	9,251,250
2023	796,364	876,000	9,206,591	10,127,250
2024	796,364	876,000	10,002,955	11,003,250
2025	796,364	876,000	10,799,318	11,879,250
2026	796,364	876,000	11,595,682	12,755,250
2027	796,364	876,000	12,392,045	13,631,250
2028	796,364	876,000	13,188,409	14,507,250
2029	796,364	876,000	13,984,773	15,383,250
2030	796,364	876,000	14,781,136	16,259,250
2031	796,364	876,000	15,577,500	17,135,250
2032	626,136	688,750	16,373,864	18,011,250
2033	0	0	17,000,000	18,700,000
2034	0	0	17,000,000	18,700,000
2035	0	0	17,000,000	18,700,000
2036	0	0	17,000,000	18,700,000
2037	0	0	17,000,000	18,700,000
2038	0	0	17,000,000	18,700,000
2039	0	0	17,000,000	18,700,000
2040	0	0	17,000,000	18,700,000
2041	0	0	17,000,000	18,700,000
2042	0	0	17,000,000	18,700,000
2043	0	0	17,000,000	18,700,000

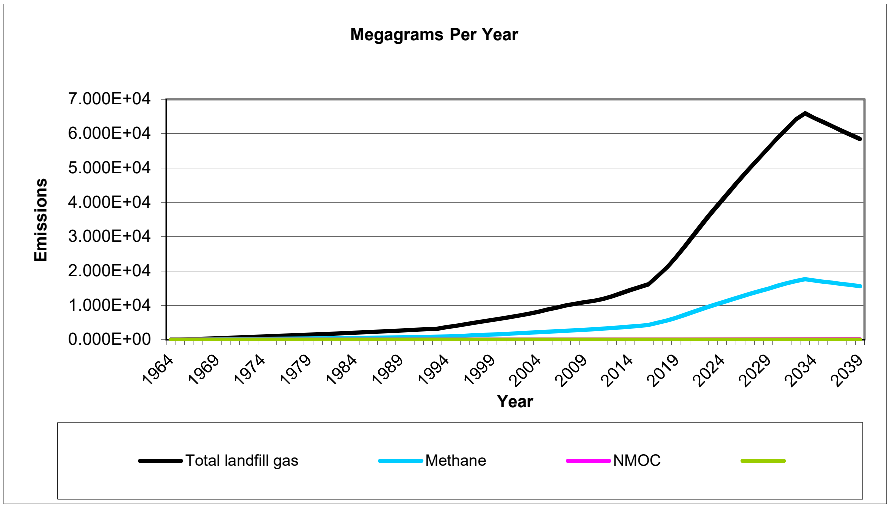
Pollutant Parameters

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

Pollutant Parameters (Continued)

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

Graphs


Megagrams Per Year
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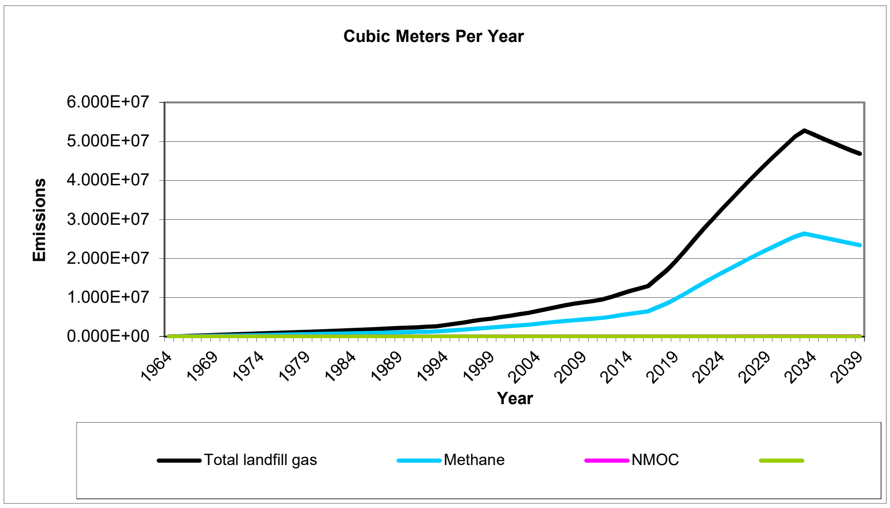
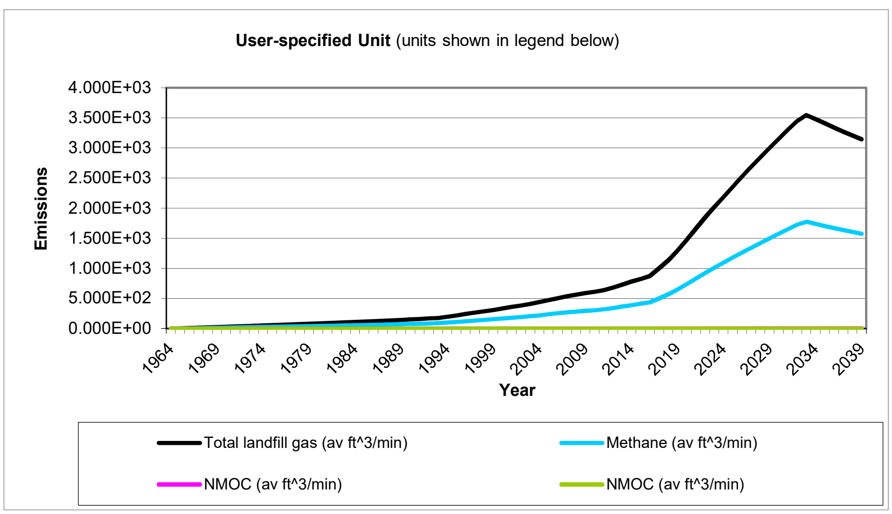
6.000E+04
5.000E+04
4.000E+04
3.000E+04
2.000E+04
1.000E+04
0.000E+00
Emissions
1964 1969 1974 1979 1984 1989 1994 1999 2004 2009 2014 2019 2024 2029 2034 2039
Year
Total landfill gas
Methane
NMOC


Cubic Meters Per Year
6.000E+07
5.000E+07
4.000E+07
3.000E+07
2.000E+07
1.000E+07
0.000E+00
Emissions
1964 1969 1974 1979 1984 1989 1994 1999 2004 2009 2014 2019 2024 2029 2034 2039
Year
Total landfill gas
Methane
NMOC


User-specified Unit (units shown in legend below)
4.000E+03
3.500E+03
3.000E+03
2.500E+03
2.000E+03
1.500E+03
1.000E+03
5.000E+02
0.000E+00
Emissions
1964 1969 1974 1979 1984 1989 1994 1999 2004 2009 2014 2019 2024 2029 2034 2039
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
NMOC (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1964	0	0	0	0	0	0
1965	9.001E+01	7.208E+04	4.843E+00	2.404E+01	3.604E+04	2.421E+00
1966	1.809E+02	1.449E+05	9.735E+00	4.833E+01	7.244E+04	4.868E+00
1967	2.728E+02	2.184E+05	1.468E+01	7.286E+01	1.092E+05	7.338E+00
1968	3.655E+02	2.927E+05	1.966E+01	9.762E+01	1.463E+05	9.832E+00
1969	4.595E+02	3.680E+05	2.472E+01	1.227E+02	1.840E+05	1.236E+01
1970	5.548E+02	4.443E+05	2.985E+01	1.482E+02	2.221E+05	1.493E+01
1971	6.514E+02	5.216E+05	3.505E+01	1.740E+02	2.608E+05	1.752E+01
1972	7.492E+02	5.999E+05	4.031E+01	2.001E+02	3.000E+05	2.015E+01
1973	8.482E+02	6.792E+05	4.564E+01	2.266E+02	3.396E+05	2.282E+01
1974	9.489E+02	7.598E+05	5.105E+01	2.535E+02	3.799E+05	2.553E+01
1975	1.051E+03	8.417E+05	5.656E+01	2.808E+02	4.209E+05	2.828E+01
1976	1.155E+03	9.249E+05	6.214E+01	3.085E+02	4.624E+05	3.107E+01
1977	1.260E+03	1.009E+06	6.781E+01	3.367E+02	5.046E+05	3.391E+01
1978	1.368E+03	1.095E+06	7.359E+01	3.654E+02	5.476E+05	3.680E+01
1979	1.477E+03	1.183E+06	7.947E+01	3.945E+02	5.914E+05	3.974E+01
1980	1.588E+03	1.272E+06	8.545E+01	4.242E+02	6.359E+05	4.273E+01
1981	1.701E+03	1.362E+06	9.153E+01	4.544E+02	6.811E+05	4.577E+01
1982	1.817E+03	1.455E+06	9.773E+01	4.852E+02	7.273E+05	4.887E+01
1983	1.934E+03	1.549E+06	1.041E+02	5.166E+02	7.743E+05	5.203E+01
1984	2.054E+03	1.645E+06	1.105E+02	5.486E+02	8.223E+05	5.525E+01
1985	2.176E+03	1.742E+06	1.171E+02	5.812E+02	8.712E+05	5.854E+01
1986	2.301E+03	1.842E+06	1.238E+02	6.146E+02	9.212E+05	6.189E+01
1987	2.428E+03	1.944E+06	1.306E+02	6.485E+02	9.721E+05	6.532E+01
1988	2.558E+03	2.048E+06	1.376E+02	6.833E+02	1.024E+06	6.882E+01
1989	2.691E+03	2.155E+06	1.448E+02	7.188E+02	1.077E+06	7.239E+01
1990	2.827E+03	2.264E+06	1.521E+02	7.551E+02	1.132E+06	7.605E+01
1991	2.966E+03	2.375E+06	1.596E+02	7.922E+02	1.187E+06	7.978E+01
1992	3.108E+03	2.489E+06	1.672E+02	8.301E+02	1.244E+06	8.360E+01
1993	3.253E+03	2.605E+06	1.750E+02	8.689E+02	1.302E+06	8.750E+01
1994	3.634E+03	2.910E+06	1.955E+02	9.706E+02	1.455E+06	9.775E+01
1995	4.082E+03	3.269E+06	2.196E+02	1.090E+03	1.634E+06	1.098E+02
1996	4.504E+03	3.607E+06	2.423E+02	1.203E+03	1.803E+06	1.212E+02
1997	4.956E+03	3.969E+06	2.667E+02	1.324E+03	1.984E+06	1.333E+02
1998	5.354E+03	4.287E+06	2.880E+02	1.430E+03	2.143E+06	1.440E+02
1999	5.746E+03	4.601E+06	3.091E+02	1.535E+03	2.301E+06	1.546E+02
2000	6.225E+03	4.985E+06	3.349E+02	1.663E+03	2.492E+06	1.675E+02
2001	6.661E+03	5.334E+06	3.584E+02	1.779E+03	2.667E+06	1.792E+02
2002	7.122E+03	5.703E+06	3.832E+02	1.902E+03	2.851E+06	1.916E+02
2003	7.583E+03	6.072E+06	4.080E+02	2.026E+03	3.036E+06	2.040E+02
2004	8.151E+03	6.527E+06	4.386E+02	2.177E+03	3.264E+06	2.193E+02
2005	8.780E+03	7.031E+06	4.724E+02	2.345E+03	3.515E+06	2.362E+02
2006	9.361E+03	7.496E+06	5.037E+02	2.501E+03	3.748E+06	2.518E+02
2007	1.000E+04	8.008E+06	5.381E+02	2.671E+03	4.004E+06	2.690E+02
2008	1.048E+04	8.392E+06	5.639E+02	2.799E+03	4.196E+06	2.819E+02
2009	1.094E+04	8.760E+06	5.886E+02	2.922E+03	4.380E+06	2.943E+02
2010	1.131E+04	9.060E+06	6.088E+02	3.022E+03	4.530E+06	3.044E+02
2011	1.186E+04	9.500E+06	6.383E+02	3.169E+03	4.750E+06	3.192E+02
2012	1.263E+04	1.011E+07	6.793E+02	3.373E+03	5.055E+06	3.397E+02
2013	1.356E+04	1.086E+07	7.296E+02	3.622E+03	5.430E+06	3.648E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2014	1.448E+04	1.160E+07	7.791E+02	3.868E+03	5.798E+06	3.896E+02
2015	1.531E+04	1.226E+07	8.238E+02	4.090E+03	6.131E+06	4.119E+02
2016	1.616E+04	1.294E+07	8.696E+02	4.317E+03	6.471E+06	4.348E+02
2017	1.861E+04	1.490E+07	1.001E+03	4.971E+03	7.451E+06	5.006E+02
2018	2.109E+04	1.689E+07	1.135E+03	5.633E+03	8.443E+06	5.673E+02
2019	2.400E+04	1.922E+07	1.291E+03	6.410E+03	9.608E+06	6.456E+02
2020	2.747E+04	2.199E+07	1.478E+03	7.336E+03	1.100E+07	7.389E+02
2021	3.086E+04	2.471E+07	1.661E+03	8.244E+03	1.236E+07	8.303E+02
2022	3.420E+04	2.738E+07	1.840E+03	9.134E+03	1.369E+07	9.199E+02
2023	3.746E+04	3.000E+07	2.015E+03	1.001E+04	1.500E+07	1.008E+03
2024	4.066E+04	3.256E+07	2.188E+03	1.086E+04	1.628E+07	1.094E+03
2025	4.380E+04	3.507E+07	2.356E+03	1.170E+04	1.754E+07	1.178E+03
2026	4.687E+04	3.753E+07	2.522E+03	1.252E+04	1.877E+07	1.261E+03
2027	4.989E+04	3.995E+07	2.684E+03	1.333E+04	1.997E+07	1.342E+03
2028	5.284E+04	4.231E+07	2.843E+03	1.411E+04	2.116E+07	1.422E+03
2029	5.574E+04	4.463E+07	2.999E+03	1.489E+04	2.232E+07	1.499E+03
2030	5.858E+04	4.691E+07	3.152E+03	1.565E+04	2.345E+07	1.576E+03
2031	6.136E+04	4.913E+07	3.301E+03	1.639E+04	2.457E+07	1.651E+03
2032	6.409E+04	5.132E+07	3.448E+03	1.712E+04	2.566E+07	1.724E+03
2033	6.592E+04	5.278E+07	3.547E+03	1.761E+04	2.639E+07	1.773E+03
2034	6.461E+04	5.174E+07	3.476E+03	1.726E+04	2.587E+07	1.738E+03
2035	6.333E+04	5.071E+07	3.408E+03	1.692E+04	2.536E+07	1.704E+03
2036	6.208E+04	4.971E+07	3.340E+03	1.658E+04	2.486E+07	1.670E+03
2037	6.085E+04	4.873E+07	3.274E+03	1.625E+04	2.436E+07	1.637E+03
2038	5.965E+04	4.776E+07	3.209E+03	1.593E+04	2.388E+07	1.605E+03
2039	5.846E+04	4.682E+07	3.146E+03	1.562E+04	2.341E+07	1.573E+03
2040	5.731E+04	4.589E+07	3.083E+03	1.531E+04	2.294E+07	1.542E+03
2041	5.617E+04	4.498E+07	3.022E+03	1.500E+04	2.249E+07	1.511E+03
2042	5.506E+04	4.409E+07	2.962E+03	1.471E+04	2.204E+07	1.481E+03
2043	5.397E+04	4.322E+07	2.904E+03	1.442E+04	2.161E+07	1.452E+03
2044	5.290E+04	4.236E+07	2.846E+03	1.413E+04	2.118E+07	1.423E+03
2045	5.185E+04	4.152E+07	2.790E+03	1.385E+04	2.076E+07	1.395E+03
2046	5.083E+04	4.070E+07	2.735E+03	1.358E+04	2.035E+07	1.367E+03
2047	4.982E+04	3.989E+07	2.680E+03	1.331E+04	1.995E+07	1.340E+03
2048	4.883E+04	3.910E+07	2.627E+03	1.304E+04	1.955E+07	1.314E+03
2049	4.787E+04	3.833E+07	2.575E+03	1.279E+04	1.916E+07	1.288E+03
2050	4.692E+04	3.757E+07	2.524E+03	1.253E+04	1.879E+07	1.262E+03
2051	4.599E+04	3.683E+07	2.474E+03	1.228E+04	1.841E+07	1.237E+03
2052	4.508E+04	3.610E+07	2.425E+03	1.204E+04	1.805E+07	1.213E+03
2053	4.419E+04	3.538E+07	2.377E+03	1.180E+04	1.769E+07	1.189E+03
2054	4.331E+04	3.468E+07	2.330E+03	1.157E+04	1.734E+07	1.165E+03
2055	4.245E+04	3.400E+07	2.284E+03	1.134E+04	1.700E+07	1.142E+03
2056	4.161E+04	3.332E+07	2.239E+03	1.112E+04	1.666E+07	1.119E+03
2057	4.079E+04	3.266E+07	2.195E+03	1.090E+04	1.633E+07	1.097E+03
2058	3.998E+04	3.202E+07	2.151E+03	1.068E+04	1.601E+07	1.076E+03
2059	3.919E+04	3.138E+07	2.109E+03	1.047E+04	1.569E+07	1.054E+03
2060	3.841E+04	3.076E+07	2.067E+03	1.026E+04	1.538E+07	1.033E+03
2061	3.765E+04	3.015E+07	2.026E+03	1.006E+04	1.508E+07	1.013E+03
2062	3.691E+04	2.955E+07	1.986E+03	9.858E+03	1.478E+07	9.929E+02
2063	3.618E+04	2.897E+07	1.946E+03	9.663E+03	1.448E+07	9.732E+02
2064	3.546E+04	2.840E+07	1.908E+03	9.472E+03	1.420E+07	9.539E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2065	3.476E+04	2.783E+07	1.870E+03	9.284E+03	1.392E+07	9.350E+02
2066	3.407E+04	2.728E+07	1.833E+03	9.100E+03	1.364E+07	9.165E+02
2067	3.340E+04	2.674E+07	1.797E+03	8.920E+03	1.337E+07	8.984E+02
2068	3.273E+04	2.621E+07	1.761E+03	8.744E+03	1.311E+07	8.806E+02
2069	3.209E+04	2.569E+07	1.726E+03	8.571E+03	1.285E+07	8.632E+02
2070	3.145E+04	2.518E+07	1.692E+03	8.401E+03	1.259E+07	8.461E+02
2071	3.083E+04	2.469E+07	1.659E+03	8.234E+03	1.234E+07	8.293E+02
2072	3.022E+04	2.420E+07	1.626E+03	8.071E+03	1.210E+07	8.129E+02
2073	2.962E+04	2.372E+07	1.594E+03	7.912E+03	1.186E+07	7.968E+02
2074	2.903E+04	2.325E+07	1.562E+03	7.755E+03	1.162E+07	7.810E+02
2075	2.846E+04	2.279E+07	1.531E+03	7.601E+03	1.139E+07	7.656E+02
2076	2.789E+04	2.234E+07	1.501E+03	7.451E+03	1.117E+07	7.504E+02
2077	2.734E+04	2.189E+07	1.471E+03	7.303E+03	1.095E+07	7.355E+02
2078	2.680E+04	2.146E+07	1.442E+03	7.159E+03	1.073E+07	7.210E+02
2079	2.627E+04	2.104E+07	1.413E+03	7.017E+03	1.052E+07	7.067E+02
2080	2.575E+04	2.062E+07	1.385E+03	6.878E+03	1.031E+07	6.927E+02
2081	2.524E+04	2.021E+07	1.358E+03	6.742E+03	1.011E+07	6.790E+02
2082	2.474E+04	1.981E+07	1.331E+03	6.608E+03	9.905E+06	6.655E+02
2083	2.425E+04	1.942E+07	1.305E+03	6.477E+03	9.709E+06	6.524E+02
2084	2.377E+04	1.903E+07	1.279E+03	6.349E+03	9.517E+06	6.394E+02
2085	2.330E+04	1.866E+07	1.254E+03	6.223E+03	9.328E+06	6.268E+02
2086	2.284E+04	1.829E+07	1.229E+03	6.100E+03	9.144E+06	6.144E+02
2087	2.239E+04	1.793E+07	1.204E+03	5.979E+03	8.963E+06	6.022E+02
2088	2.194E+04	1.757E+07	1.181E+03	5.861E+03	8.785E+06	5.903E+02
2089	2.151E+04	1.722E+07	1.157E+03	5.745E+03	8.611E+06	5.786E+02
2090	2.108E+04	1.688E+07	1.134E+03	5.631E+03	8.441E+06	5.671E+02
2091	2.066E+04	1.655E+07	1.112E+03	5.520E+03	8.274E+06	5.559E+02
2092	2.026E+04	1.622E+07	1.090E+03	5.410E+03	8.110E+06	5.449E+02
2093	1.985E+04	1.590E+07	1.068E+03	5.303E+03	7.949E+06	5.341E+02
2094	1.946E+04	1.558E+07	1.047E+03	5.198E+03	7.792E+06	5.235E+02
2095	1.908E+04	1.528E+07	1.026E+03	5.095E+03	7.638E+06	5.132E+02
2096	1.870E+04	1.497E+07	1.006E+03	4.994E+03	7.486E+06	5.030E+02
2097	1.833E+04	1.468E+07	9.861E+02	4.896E+03	7.338E+06	4.930E+02
2098	1.796E+04	1.439E+07	9.666E+02	4.799E+03	7.193E+06	4.833E+02
2099	1.761E+04	1.410E+07	9.474E+02	4.704E+03	7.050E+06	4.737E+02
2100	1.726E+04	1.382E+07	9.287E+02	4.610E+03	6.911E+06	4.643E+02
2101	1.692E+04	1.355E+07	9.103E+02	4.519E+03	6.774E+06	4.551E+02
2102	1.658E+04	1.328E+07	8.922E+02	4.430E+03	6.640E+06	4.461E+02
2103	1.626E+04	1.302E+07	8.746E+02	4.342E+03	6.508E+06	4.373E+02
2104	1.593E+04	1.276E+07	8.573E+02	4.256E+03	6.379E+06	4.286E+02

Results (Continued)

Year	NMOC					
	(Mg/year)	*(m^3/year)*	*(av ft^3/min)*	*(Mg/year)*	*(m^3/year)*	*(av ft^3/min)*
1964	0	0	0	0	0	0
1965	2.006E-01	5.595E+01	3.759E-03	0.000E+00	0.000E+00	0.000E+00
1966	4.032E-01	1.125E+02	7.557E-03	0.000E+00	0.000E+00	0.000E+00
1967	6.078E-01	1.696E+02	1.139E-02	0.000E+00	0.000E+00	0.000E+00
1968	8.144E-01	2.272E+02	1.527E-02	0.000E+00	0.000E+00	0.000E+00
1969	1.024E+00	2.856E+02	1.919E-02	0.000E+00	0.000E+00	0.000E+00
1970	1.236E+00	3.449E+02	2.317E-02	0.000E+00	0.000E+00	0.000E+00
1971	1.451E+00	4.049E+02	2.721E-02	0.000E+00	0.000E+00	0.000E+00
1972	1.669E+00	4.657E+02	3.129E-02	0.000E+00	0.000E+00	0.000E+00
1973	1.890E+00	5.273E+02	3.543E-02	0.000E+00	0.000E+00	0.000E+00
1974	2.114E+00	5.899E+02	3.963E-02	0.000E+00	0.000E+00	0.000E+00
1975	2.342E+00	6.534E+02	4.390E-02	0.000E+00	0.000E+00	0.000E+00
1976	2.574E+00	7.180E+02	4.824E-02	0.000E+00	0.000E+00	0.000E+00
1977	2.808E+00	7.835E+02	5.264E-02	0.000E+00	0.000E+00	0.000E+00
1978	3.048E+00	8.503E+02	5.713E-02	0.000E+00	0.000E+00	0.000E+00
1979	3.291E+00	9.182E+02	6.169E-02	0.000E+00	0.000E+00	0.000E+00
1980	3.539E+00	9.873E+02	6.634E-02	0.000E+00	0.000E+00	0.000E+00
1981	3.791E+00	1.058E+03	7.106E-02	0.000E+00	0.000E+00	0.000E+00
1982	4.048E+00	1.129E+03	7.587E-02	0.000E+00	0.000E+00	0.000E+00
1983	4.309E+00	1.202E+03	8.078E-02	0.000E+00	0.000E+00	0.000E+00
1984	4.576E+00	1.277E+03	8.578E-02	0.000E+00	0.000E+00	0.000E+00
1985	4.848E+00	1.353E+03	9.088E-02	0.000E+00	0.000E+00	0.000E+00
1986	5.127E+00	1.430E+03	9.610E-02	0.000E+00	0.000E+00	0.000E+00
1987	5.410E+00	1.509E+03	1.014E-01	0.000E+00	0.000E+00	0.000E+00
1988	5.700E+00	1.590E+03	1.068E-01	0.000E+00	0.000E+00	0.000E+00
1989	5.996E+00	1.673E+03	1.124E-01	0.000E+00	0.000E+00	0.000E+00
1990	6.299E+00	1.757E+03	1.181E-01	0.000E+00	0.000E+00	0.000E+00
1991	6.608E+00	1.844E+03	1.239E-01	0.000E+00	0.000E+00	0.000E+00
1992	6.925E+00	1.932E+03	1.298E-01	0.000E+00	0.000E+00	0.000E+00
1993	7.248E+00	2.022E+03	1.359E-01	0.000E+00	0.000E+00	0.000E+00
1994	8.097E+00	2.259E+03	1.518E-01	0.000E+00	0.000E+00	0.000E+00
1995	9.095E+00	2.537E+03	1.705E-01	0.000E+00	0.000E+00	0.000E+00
1996	1.004E+01	2.800E+03	1.881E-01	0.000E+00	0.000E+00	0.000E+00
1997	1.104E+01	3.081E+03	2.070E-01	0.000E+00	0.000E+00	0.000E+00
1998	1.193E+01	3.328E+03	2.236E-01	0.000E+00	0.000E+00	0.000E+00
1999	1.280E+01	3.572E+03	2.400E-01	0.000E+00	0.000E+00	0.000E+00
2000	1.387E+01	3.870E+03	2.600E-01	0.000E+00	0.000E+00	0.000E+00
2001	1.484E+01	4.141E+03	2.782E-01	0.000E+00	0.000E+00	0.000E+00
2002	1.587E+01	4.427E+03	2.975E-01	0.000E+00	0.000E+00	0.000E+00
2003	1.690E+01	4.714E+03	3.167E-01	0.000E+00	0.000E+00	0.000E+00
2004	1.816E+01	5.067E+03	3.405E-01	0.000E+00	0.000E+00	0.000E+00
2005	1.956E+01	5.458E+03	3.667E-01	0.000E+00	0.000E+00	0.000E+00
2006	2.086E+01	5.819E+03	3.910E-01	0.000E+00	0.000E+00	0.000E+00
2007	2.228E+01	6.217E+03	4.177E-01	0.000E+00	0.000E+00	0.000E+00
2008	2.335E+01	6.515E+03	4.377E-01	0.000E+00	0.000E+00	0.000E+00
2009	2.437E+01	6.800E+03	4.569E-01	0.000E+00	0.000E+00	0.000E+00
2010	2.521E+01	7.034E+03	4.726E-01	0.000E+00	0.000E+00	0.000E+00
2011	2.644E+01	7.375E+03	4.955E-01	0.000E+00	0.000E+00	0.000E+00
2012	2.813E+01	7.849E+03	5.274E-01	0.000E+00	0.000E+00	0.000E+00
2013	3.022E+01	8.430E+03	5.664E-01	0.000E+00	0.000E+00	0.000E+00

Results (Continued)

Year	NMOC					
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2014	3.227E+01	9.002E+03	6.049E-01	0.000E+00	0.000E+00	0.000E+00
2015	3.412E+01	9.518E+03	6.395E-01	0.000E+00	0.000E+00	0.000E+00
2016	3.601E+01	1.005E+04	6.751E-01	0.000E+00	0.000E+00	0.000E+00
2017	4.146E+01	1.157E+04	7.772E-01	0.000E+00	0.000E+00	0.000E+00
2018	4.699E+01	1.311E+04	8.808E-01	0.000E+00	0.000E+00	0.000E+00
2019	5.347E+01	1.492E+04	1.002E+00	0.000E+00	0.000E+00	0.000E+00
2020	6.120E+01	1.707E+04	1.147E+00	0.000E+00	0.000E+00	0.000E+00
2021	6.877E+01	1.919E+04	1.289E+00	0.000E+00	0.000E+00	0.000E+00
2022	7.619E+01	2.126E+04	1.428E+00	0.000E+00	0.000E+00	0.000E+00
2023	8.347E+01	2.329E+04	1.565E+00	0.000E+00	0.000E+00	0.000E+00
2024	9.060E+01	2.528E+04	1.698E+00	0.000E+00	0.000E+00	0.000E+00
2025	9.759E+01	2.723E+04	1.829E+00	0.000E+00	0.000E+00	0.000E+00
2026	1.044E+02	2.914E+04	1.958E+00	0.000E+00	0.000E+00	0.000E+00
2027	1.112E+02	3.101E+04	2.084E+00	0.000E+00	0.000E+00	0.000E+00
2028	1.177E+02	3.285E+04	2.207E+00	0.000E+00	0.000E+00	0.000E+00
2029	1.242E+02	3.465E+04	2.328E+00	0.000E+00	0.000E+00	0.000E+00
2030	1.305E+02	3.641E+04	2.447E+00	0.000E+00	0.000E+00	0.000E+00
2031	1.367E+02	3.814E+04	2.563E+00	0.000E+00	0.000E+00	0.000E+00
2032	1.428E+02	3.984E+04	2.677E+00	0.000E+00	0.000E+00	0.000E+00
2033	1.469E+02	4.098E+04	2.753E+00	0.000E+00	0.000E+00	0.000E+00
2034	1.440E+02	4.017E+04	2.699E+00	0.000E+00	0.000E+00	0.000E+00
2035	1.411E+02	3.937E+04	2.645E+00	0.000E+00	0.000E+00	0.000E+00
2036	1.383E+02	3.859E+04	2.593E+00	0.000E+00	0.000E+00	0.000E+00
2037	1.356E+02	3.783E+04	2.542E+00	0.000E+00	0.000E+00	0.000E+00
2038	1.329E+02	3.708E+04	2.491E+00	0.000E+00	0.000E+00	0.000E+00
2039	1.303E+02	3.634E+04	2.442E+00	0.000E+00	0.000E+00	0.000E+00
2040	1.277E+02	3.562E+04	2.394E+00	0.000E+00	0.000E+00	0.000E+00
2041	1.252E+02	3.492E+04	2.346E+00	0.000E+00	0.000E+00	0.000E+00
2042	1.227E+02	3.423E+04	2.300E+00	0.000E+00	0.000E+00	0.000E+00
2043	1.203E+02	3.355E+04	2.254E+00	0.000E+00	0.000E+00	0.000E+00
2044	1.179E+02	3.288E+04	2.210E+00	0.000E+00	0.000E+00	0.000E+00
2045	1.155E+02	3.223E+04	2.166E+00	0.000E+00	0.000E+00	0.000E+00
2046	1.133E+02	3.160E+04	2.123E+00	0.000E+00	0.000E+00	0.000E+00
2047	1.110E+02	3.097E+04	2.081E+00	0.000E+00	0.000E+00	0.000E+00
2048	1.088E+02	3.036E+04	2.040E+00	0.000E+00	0.000E+00	0.000E+00
2049	1.067E+02	2.976E+04	1.999E+00	0.000E+00	0.000E+00	0.000E+00
2050	1.045E+02	2.917E+04	1.960E+00	0.000E+00	0.000E+00	0.000E+00
2051	1.025E+02	2.859E+04	1.921E+00	0.000E+00	0.000E+00	0.000E+00
2052	1.004E+02	2.802E+04	1.883E+00	0.000E+00	0.000E+00	0.000E+00
2053	9.846E+01	2.747E+04	1.846E+00	0.000E+00	0.000E+00	0.000E+00
2054	9.651E+01	2.692E+04	1.809E+00	0.000E+00	0.000E+00	0.000E+00
2055	9.460E+01	2.639E+04	1.773E+00	0.000E+00	0.000E+00	0.000E+00
2056	9.272E+01	2.587E+04	1.738E+00	0.000E+00	0.000E+00	0.000E+00
2057	9.089E+01	2.536E+04	1.704E+00	0.000E+00	0.000E+00	0.000E+00
2058	8.909E+01	2.485E+04	1.670E+00	0.000E+00	0.000E+00	0.000E+00
2059	8.732E+01	2.436E+04	1.637E+00	0.000E+00	0.000E+00	0.000E+00
2060	8.559E+01	2.388E+04	1.604E+00	0.000E+00	0.000E+00	0.000E+00
2061	8.390E+01	2.341E+04	1.573E+00	0.000E+00	0.000E+00	0.000E+00
2062	8.224E+01	2.294E+04	1.542E+00	0.000E+00	0.000E+00	0.000E+00
2063	8.061E+01	2.249E+04	1.511E+00	0.000E+00	0.000E+00	0.000E+00
2064	7.901E+01	2.204E+04	1.481E+00	0.000E+00	0.000E+00	0.000E+00

Results (Continued)

Year	NMOC					
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2065	7.745E+01	2.161E+04	1.452E+00	0.000E+00	0.000E+00	0.000E+00
2066	7.591E+01	2.118E+04	1.423E+00	0.000E+00	0.000E+00	0.000E+00
2067	7.441E+01	2.076E+04	1.395E+00	0.000E+00	0.000E+00	0.000E+00
2068	7.294E+01	2.035E+04	1.367E+00	0.000E+00	0.000E+00	0.000E+00
2069	7.149E+01	1.995E+04	1.340E+00	0.000E+00	0.000E+00	0.000E+00
2070	7.008E+01	1.955E+04	1.314E+00	0.000E+00	0.000E+00	0.000E+00
2071	6.869E+01	1.916E+04	1.288E+00	0.000E+00	0.000E+00	0.000E+00
2072	6.733E+01	1.878E+04	1.262E+00	0.000E+00	0.000E+00	0.000E+00
2073	6.600E+01	1.841E+04	1.237E+00	0.000E+00	0.000E+00	0.000E+00
2074	6.469E+01	1.805E+04	1.213E+00	0.000E+00	0.000E+00	0.000E+00
2075	6.341E+01	1.769E+04	1.189E+00	0.000E+00	0.000E+00	0.000E+00
2076	6.215E+01	1.734E+04	1.165E+00	0.000E+00	0.000E+00	0.000E+00
2077	6.092E+01	1.700E+04	1.142E+00	0.000E+00	0.000E+00	0.000E+00
2078	5.972E+01	1.666E+04	1.119E+00	0.000E+00	0.000E+00	0.000E+00
2079	5.853E+01	1.633E+04	1.097E+00	0.000E+00	0.000E+00	0.000E+00
2080	5.738E+01	1.601E+04	1.075E+00	0.000E+00	0.000E+00	0.000E+00
2081	5.624E+01	1.569E+04	1.054E+00	0.000E+00	0.000E+00	0.000E+00
2082	5.513E+01	1.538E+04	1.033E+00	0.000E+00	0.000E+00	0.000E+00
2083	5.403E+01	1.507E+04	1.013E+00	0.000E+00	0.000E+00	0.000E+00
2084	5.296E+01	1.478E+04	9.928E-01	0.000E+00	0.000E+00	0.000E+00
2085	5.192E+01	1.448E+04	9.731E-01	0.000E+00	0.000E+00	0.000E+00
2086	5.089E+01	1.420E+04	9.539E-01	0.000E+00	0.000E+00	0.000E+00
2087	4.988E+01	1.392E+04	9.350E-01	0.000E+00	0.000E+00	0.000E+00
2088	4.889E+01	1.364E+04	9.165E-01	0.000E+00	0.000E+00	0.000E+00
2089	4.792E+01	1.337E+04	8.983E-01	0.000E+00	0.000E+00	0.000E+00
2090	4.697E+01	1.311E+04	8.805E-01	0.000E+00	0.000E+00	0.000E+00
2091	4.604E+01	1.285E+04	8.631E-01	0.000E+00	0.000E+00	0.000E+00
2092	4.513E+01	1.259E+04	8.460E-01	0.000E+00	0.000E+00	0.000E+00
2093	4.424E+01	1.234E+04	8.293E-01	0.000E+00	0.000E+00	0.000E+00
2094	4.336E+01	1.210E+04	8.128E-01	0.000E+00	0.000E+00	0.000E+00
2095	4.250E+01	1.186E+04	7.967E-01	0.000E+00	0.000E+00	0.000E+00
2096	4.166E+01	1.162E+04	7.810E-01	0.000E+00	0.000E+00	0.000E+00
2097	4.084E+01	1.139E+04	7.655E-01	0.000E+00	0.000E+00	0.000E+00
2098	4.003E+01	1.117E+04	7.503E-01	0.000E+00	0.000E+00	0.000E+00
2099	3.924E+01	1.095E+04	7.355E-01	0.000E+00	0.000E+00	0.000E+00
2100	3.846E+01	1.073E+04	7.209E-01	0.000E+00	0.000E+00	0.000E+00
2101	3.770E+01	1.052E+04	7.066E-01	0.000E+00	0.000E+00	0.000E+00
2102	3.695E+01	1.031E+04	6.927E-01	0.000E+00	0.000E+00	0.000E+00
2103	3.622E+01	1.010E+04	6.789E-01	0.000E+00	0.000E+00	0.000E+00
2104	3.550E+01	9.905E+03	6.655E-01	0.000E+00	0.000E+00	0.000E+00

Summary Report

Landfill Name or Identifier: Recology Hay Road - Post-Project LandGEM

Date: Sunday, April 21, 2019

Description/Comments:

About LandGEM:

First-Order Decomposition Rate Equation:

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

Where,
Q_{CH4} = annual methane generation in the year of the calculation *(m^3/year)*
i = 1-year time increment
n = (year of the calculation) - (initial year of waste acceptance)
j = 0.1-year time increment
k = methane generation rate *($year^{-1}$)*
L_o = potential methane generation capacity *(m^3/Mg)*

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

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

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

Input Review

LANDFILL CHARACTERISTICS

Landfill Open Year	**1964**	
Landfill Closure Year (with 80-year limit)	**2034**	
Actual Closure Year (without limit)	***2034***	
Have Model Calculate Closure Year?	**Yes**	
Waste Design Capacity	**24,420,000**	*short tons*

MODEL PARAMETERS

Methane Generation Rate, k	**0.020**	*year^{-1}*
Potential Methane Generation Capacity, L_o	**100**	*m^3/Mg*
NMOC Concentration	**776**	*ppmv as hexane*
Methane Content	**50**	*% by volume*

GASES / POLLUTANTS SELECTED

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

WASTE ACCEPTANCE RATES

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*
1964	18,182	20,000	0	0
1965	18,727	20,600	18,182	20,000
1966	19,273	21,200	36,909	40,600
1967	19,818	21,800	56,182	61,800
1968	20,455	22,500	76,000	83,600
1969	21,091	23,200	96,455	106,100
1970	21,727	23,900	117,545	129,300
1971	22,364	24,600	139,273	153,200
1972	23,000	25,300	161,636	177,800
1973	23,727	26,100	184,636	203,100
1974	24,455	26,900	208,364	229,200
1975	25,182	27,700	232,818	256,100
1976	25,909	28,500	258,000	283,800
1977	26,727	29,400	283,909	312,300
1978	27,545	30,300	310,636	341,700
1979	28,364	31,200	338,182	372,000
1980	29,182	32,100	366,545	403,200
1981	30,091	33,100	395,727	435,300
1982	31,000	34,100	425,818	468,400
1983	31,909	35,100	456,818	502,500
1984	32,909	36,200	488,727	537,600
1985	33,909	37,300	521,636	573,800
1986	34,909	38,400	555,545	611,100
1987	36,000	39,600	590,455	649,500
1988	37,091	40,800	626,455	689,100
1989	38,182	42,000	663,545	729,900
1990	39,364	43,300	701,727	771,900
1991	40,545	44,600	741,091	815,200
1992	41,727	45,900	781,636	859,800
1993	89,962	98,958	823,364	905,700
1994	105,075	115,583	913,325	1,004,658
1995	101,648	111,813	1,018,401	1,120,241
1996	109,274	120,201	1,120,049	1,232,054
1997	100,121	110,133	1,229,323	1,352,255
1998	100,657	110,723	1,329,444	1,462,388
1999	119,808	131,789	1,430,101	1,573,111
2000	112,999	124,299	1,549,909	1,704,900
2001	119,624	131,586	1,662,908	1,829,199
2002	121,682	133,850	1,782,532	1,960,785
2003	145,085	159,594	1,904,214	2,094,635

WASTE ACCEPTANCE RATES (Continued)

Year	Waste Accepted		Waste-In-Place	
	(Mg/year)	(short tons/year)	(Mg)	(short tons)
2004	159,580	175,538	2,049,299	2,254,229
2005	152,595	167,854	2,208,879	2,429,767
2006	166,537	183,191	2,361,474	2,597,621
2007	136,857	150,543	2,528,011	2,780,812
2008	134,680	148,148	2,664,868	2,931,355
2009	119,605	131,565	2,799,548	3,079,503
2010	156,266	171,893	2,919,153	3,211,068
2011	201,333	221,466	3,075,419	3,382,961
2012	239,364	263,300	3,276,752	3,604,427
2013	240,169	264,186	3,516,115	3,867,727
2014	225,649	248,214	3,756,285	4,131,913
2015	233,043	256,348	3,981,934	4,380,127
2016	558,801	614,681	4,214,977	4,636,475
2017	575,097	632,607	4,773,778	5,251,156
2018	672,261	739,487	5,348,875	5,883,763
2019	796,364	876,000	6,021,136	6,623,250
2020	1,061,818	1,168,000	6,817,500	7,499,250
2021	1,061,818	1,168,000	7,879,318	8,667,250
2022	1,061,818	1,168,000	8,941,136	9,835,250
2023	1,061,818	1,168,000	10,002,955	11,003,250
2024	1,061,818	1,168,000	11,064,773	12,171,250
2025	1,061,818	1,168,000	12,126,591	13,339,250
2026	1,061,818	1,168,000	13,188,409	14,507,250
2027	1,061,818	1,168,000	14,250,227	15,675,250
2028	1,061,818	1,168,000	15,312,045	16,843,250
2029	1,061,818	1,168,000	16,373,864	18,011,250
2030	1,061,818	1,168,000	17,435,682	19,179,250
2031	1,061,818	1,168,000	18,497,500	20,347,250
2032	1,061,818	1,168,000	19,559,318	21,515,250
2033	1,061,818	1,168,000	20,621,136	22,683,250
2034	517,045	568,750	21,682,955	23,851,250
2035	0	0	22,200,000	24,420,000
2036	0	0	22,200,000	24,420,000
2037	0	0	22,200,000	24,420,000
2038	0	0	22,200,000	24,420,000
2039	0	0	22,200,000	24,420,000
2040	0	0	22,200,000	24,420,000
2041	0	0	22,200,000	24,420,000
2042	0	0	22,200,000	24,420,000
2043	0	0	22,200,000	24,420,000

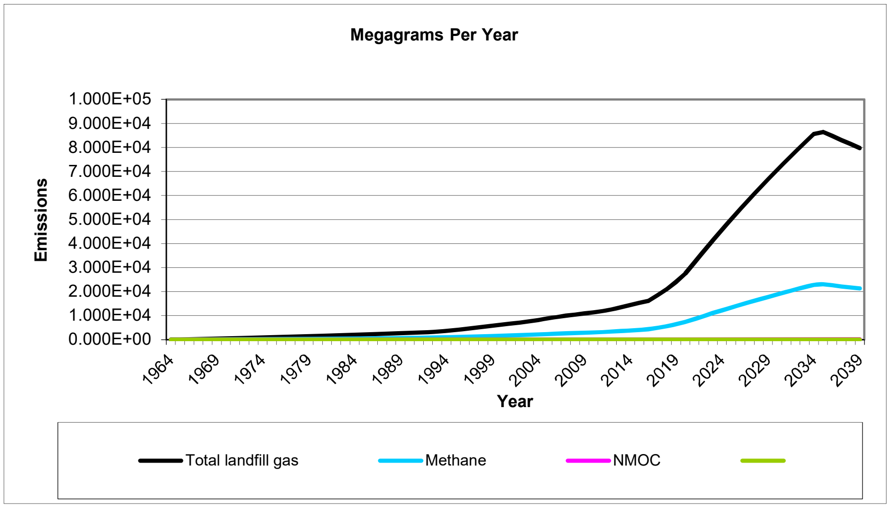
Pollutant Parameters

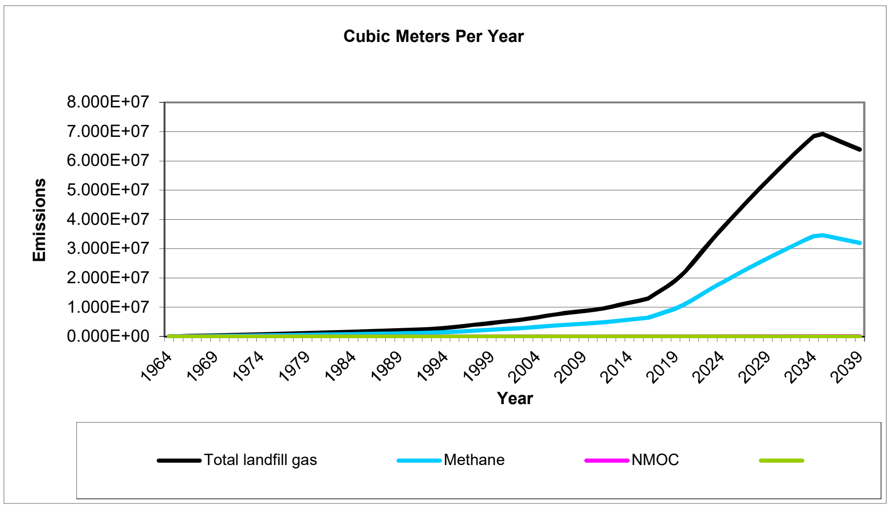
	Gas / Pollutant Default Parameters:			User-specified Pollutant Parameters:	
	Compound	Concentration (*ppmv*)	Molecular Weight	Concentration (*ppmv*)	Molecular Weight
Gases	Total landfill gas		0.00		
	Methane		16.04		
	Carbon dioxide		44.01		
	NMOC	4,000	86.18		
Pollutants	1,1,1-Trichloroethane (methyl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

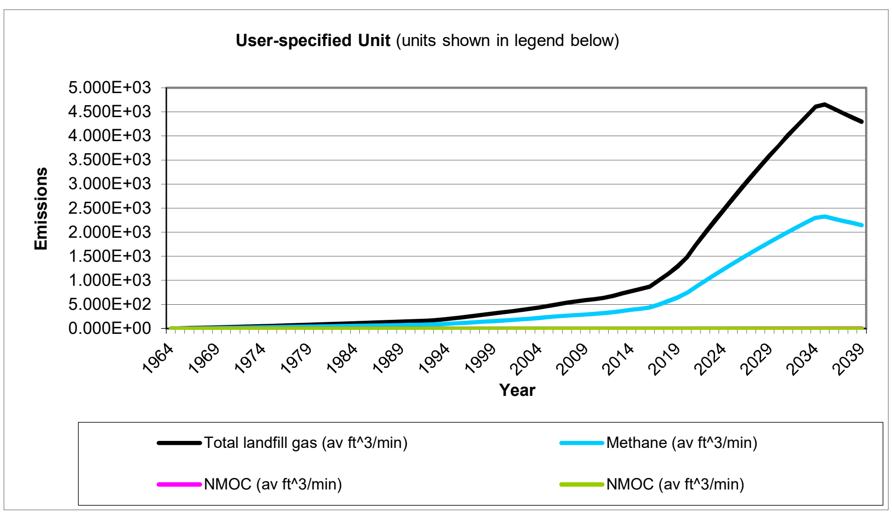
Pollutant Parameters (Continued)

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

Graphs


Megagrams Per Year
1.000E+05
9.000E+04
8.000E+04
7.000E+04
6.000E+04
5.000E+04
4.000E+04
3.000E+04
2.000E+04
1.000E+04
0.000E+00
Emissions
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
2014
2019
2024
2029
2034
2039
Year
Total landfill gas
Methane
NMOC


Cubic Meters Per Year
8.000E+07
7.000E+07
6.000E+07
5.000E+07
4.000E+07
3.000E+07
2.000E+07
1.000E+07
0.000E+00
Emissions
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
2014
2019
2024
2029
2034
2039
Year
Total landfill gas
Methane
NMOC


User-specified Unit (units shown in legend below)
5.000E+03
4.500E+03
4.000E+03
3.500E+03
3.000E+03
2.500E+03
2.000E+03
1.500E+03
1.000E+03
5.000E+02
0.000E+00
Emissions
1964
1969
1974
1979
1984
1989
1994
1999
2004
2009
2014
2019
2024
2029
2034
2039
Year
Total landfill gas (av ft^3/min)
Methane (av ft^3/min)
NMOC (av ft^3/min)
NMOC (av ft^3/min)

Results

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1964	0	0	0	0	0	0
1965	9.001E+01	7.208E+04	4.843E+00	2.404E+01	3.604E+04	2.421E+00
1966	1.809E+02	1.449E+05	9.735E+00	4.833E+01	7.244E+04	4.868E+00
1967	2.728E+02	2.184E+05	1.468E+01	7.286E+01	1.092E+05	7.338E+00
1968	3.655E+02	2.927E+05	1.966E+01	9.762E+01	1.463E+05	9.832E+00
1969	4.595E+02	3.680E+05	2.472E+01	1.227E+02	1.840E+05	1.236E+01
1970	5.548E+02	4.443E+05	2.985E+01	1.482E+02	2.221E+05	1.493E+01
1971	6.514E+02	5.216E+05	3.505E+01	1.740E+02	2.608E+05	1.752E+01
1972	7.492E+02	5.999E+05	4.031E+01	2.001E+02	3.000E+05	2.015E+01
1973	8.482E+02	6.792E+05	4.564E+01	2.266E+02	3.396E+05	2.282E+01
1974	9.489E+02	7.598E+05	5.105E+01	2.535E+02	3.799E+05	2.553E+01
1975	1.051E+03	8.417E+05	5.656E+01	2.808E+02	4.209E+05	2.828E+01
1976	1.155E+03	9.249E+05	6.214E+01	3.085E+02	4.624E+05	3.107E+01
1977	1.260E+03	1.009E+06	6.781E+01	3.367E+02	5.046E+05	3.391E+01
1978	1.368E+03	1.095E+06	7.359E+01	3.654E+02	5.476E+05	3.680E+01
1979	1.477E+03	1.183E+06	7.947E+01	3.945E+02	5.914E+05	3.974E+01
1980	1.588E+03	1.272E+06	8.545E+01	4.242E+02	6.359E+05	4.273E+01
1981	1.701E+03	1.362E+06	9.153E+01	4.544E+02	6.811E+05	4.577E+01
1982	1.817E+03	1.455E+06	9.773E+01	4.852E+02	7.273E+05	4.887E+01
1983	1.934E+03	1.549E+06	1.041E+02	5.166E+02	7.743E+05	5.203E+01
1984	2.054E+03	1.645E+06	1.105E+02	5.486E+02	8.223E+05	5.525E+01
1985	2.176E+03	1.742E+06	1.171E+02	5.812E+02	8.712E+05	5.854E+01
1986	2.301E+03	1.842E+06	1.238E+02	6.146E+02	9.212E+05	6.189E+01
1987	2.428E+03	1.944E+06	1.306E+02	6.485E+02	9.721E+05	6.532E+01
1988	2.558E+03	2.048E+06	1.376E+02	6.833E+02	1.024E+06	6.882E+01
1989	2.691E+03	2.155E+06	1.448E+02	7.188E+02	1.077E+06	7.239E+01
1990	2.827E+03	2.264E+06	1.521E+02	7.551E+02	1.132E+06	7.605E+01
1991	2.966E+03	2.375E+06	1.596E+02	7.922E+02	1.187E+06	7.978E+01
1992	3.108E+03	2.489E+06	1.672E+02	8.301E+02	1.244E+06	8.360E+01
1993	3.253E+03	2.605E+06	1.750E+02	8.689E+02	1.302E+06	8.750E+01
1994	3.634E+03	2.910E+06	1.955E+02	9.706E+02	1.455E+06	9.775E+01
1995	4.082E+03	3.269E+06	2.196E+02	1.090E+03	1.634E+06	1.098E+02
1996	4.504E+03	3.607E+06	2.423E+02	1.203E+03	1.803E+06	1.212E+02
1997	4.956E+03	3.969E+06	2.667E+02	1.324E+03	1.984E+06	1.333E+02
1998	5.354E+03	4.287E+06	2.880E+02	1.430E+03	2.143E+06	1.440E+02
1999	5.746E+03	4.601E+06	3.091E+02	1.535E+03	2.301E+06	1.546E+02
2000	6.225E+03	4.985E+06	3.349E+02	1.663E+03	2.492E+06	1.675E+02
2001	6.661E+03	5.334E+06	3.584E+02	1.779E+03	2.667E+06	1.792E+02
2002	7.122E+03	5.703E+06	3.832E+02	1.902E+03	2.851E+06	1.916E+02
2003	7.583E+03	6.072E+06	4.080E+02	2.026E+03	3.036E+06	2.040E+02
2004	8.151E+03	6.527E+06	4.386E+02	2.177E+03	3.264E+06	2.193E+02
2005	8.780E+03	7.031E+06	4.724E+02	2.345E+03	3.515E+06	2.362E+02
2006	9.361E+03	7.496E+06	5.037E+02	2.501E+03	3.748E+06	2.518E+02
2007	1.000E+04	8.008E+06	5.381E+02	2.671E+03	4.004E+06	2.690E+02
2008	1.048E+04	8.392E+06	5.639E+02	2.799E+03	4.196E+06	2.819E+02
2009	1.094E+04	8.760E+06	5.886E+02	2.922E+03	4.380E+06	2.943E+02
2010	1.131E+04	9.060E+06	6.088E+02	3.022E+03	4.530E+06	3.044E+02
2011	1.186E+04	9.500E+06	6.383E+02	3.169E+03	4.750E+06	3.192E+02
2012	1.263E+04	1.011E+07	6.793E+02	3.373E+03	5.055E+06	3.397E+02
2013	1.356E+04	1.086E+07	7.296E+02	3.622E+03	5.430E+06	3.648E+02

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2014	1.448E+04	1.160E+07	7.791E+02	3.868E+03	5.798E+06	3.896E+02
2015	1.531E+04	1.226E+07	8.238E+02	4.090E+03	6.131E+06	4.119E+02
2016	1.616E+04	1.294E+07	8.696E+02	4.317E+03	6.471E+06	4.348E+02
2017	1.861E+04	1.490E+07	1.001E+03	4.971E+03	7.451E+06	5.006E+02
2018	2.109E+04	1.689E+07	1.135E+03	5.633E+03	8.443E+06	5.673E+02
2019	2.400E+04	1.922E+07	1.291E+03	6.410E+03	9.608E+06	6.456E+02
2020	2.747E+04	2.199E+07	1.478E+03	7.336E+03	1.100E+07	7.389E+02
2021	3.218E+04	2.577E+07	1.731E+03	8.595E+03	1.288E+07	8.656E+02
2022	3.680E+04	2.947E+07	1.980E+03	9.829E+03	1.473E+07	9.899E+02
2023	4.133E+04	3.309E+07	2.223E+03	1.104E+04	1.655E+07	1.112E+03
2024	4.576E+04	3.665E+07	2.462E+03	1.222E+04	1.832E+07	1.231E+03
2025	5.011E+04	4.013E+07	2.696E+03	1.339E+04	2.006E+07	1.348E+03
2026	5.438E+04	4.354E+07	2.926E+03	1.453E+04	2.177E+07	1.463E+03
2027	5.856E+04	4.689E+07	3.151E+03	1.564E+04	2.345E+07	1.575E+03
2028	6.266E+04	5.017E+07	3.371E+03	1.674E+04	2.509E+07	1.686E+03
2029	6.667E+04	5.339E+07	3.587E+03	1.781E+04	2.669E+07	1.794E+03
2030	7.061E+04	5.654E+07	3.799E+03	1.886E+04	2.827E+07	1.899E+03
2031	7.447E+04	5.963E+07	4.007E+03	1.989E+04	2.981E+07	2.003E+03
2032	7.825E+04	6.266E+07	4.210E+03	2.090E+04	3.133E+07	2.105E+03
2033	8.196E+04	6.563E+07	4.409E+03	2.189E+04	3.281E+07	2.205E+03
2034	8.559E+04	6.854E+07	4.605E+03	2.286E+04	3.427E+07	2.302E+03
2035	8.645E+04	6.923E+07	4.651E+03	2.309E+04	3.461E+07	2.326E+03
2036	8.474E+04	6.786E+07	4.559E+03	2.264E+04	3.393E+07	2.280E+03
2037	8.306E+04	6.651E+07	4.469E+03	2.219E+04	3.326E+07	2.235E+03
2038	8.142E+04	6.520E+07	4.381E+03	2.175E+04	3.260E+07	2.190E+03
2039	7.981E+04	6.391E+07	4.294E+03	2.132E+04	3.195E+07	2.147E+03
2040	7.823E+04	6.264E+07	4.209E+03	2.090E+04	3.132E+07	2.104E+03
2041	7.668E+04	6.140E+07	4.126E+03	2.048E+04	3.070E+07	2.063E+03
2042	7.516E+04	6.018E+07	4.044E+03	2.008E+04	3.009E+07	2.022E+03
2043	7.367E+04	5.899E+07	3.964E+03	1.968E+04	2.950E+07	1.982E+03
2044	7.221E+04	5.782E+07	3.885E+03	1.929E+04	2.891E+07	1.943E+03
2045	7.078E+04	5.668E+07	3.808E+03	1.891E+04	2.834E+07	1.904E+03
2046	6.938E+04	5.556E+07	3.733E+03	1.853E+04	2.778E+07	1.866E+03
2047	6.801E+04	5.446E+07	3.659E+03	1.817E+04	2.723E+07	1.829E+03
2048	6.666E+04	5.338E+07	3.587E+03	1.781E+04	2.669E+07	1.793E+03
2049	6.534E+04	5.232E+07	3.516E+03	1.745E+04	2.616E+07	1.758E+03
2050	6.405E+04	5.129E+07	3.446E+03	1.711E+04	2.564E+07	1.723E+03
2051	6.278E+04	5.027E+07	3.378E+03	1.677E+04	2.514E+07	1.689E+03
2052	6.154E+04	4.928E+07	3.311E+03	1.644E+04	2.464E+07	1.655E+03
2053	6.032E+04	4.830E+07	3.245E+03	1.611E+04	2.415E+07	1.623E+03
2054	5.912E+04	4.734E+07	3.181E+03	1.579E+04	2.367E+07	1.590E+03
2055	5.795E+04	4.641E+07	3.118E+03	1.548E+04	2.320E+07	1.559E+03
2056	5.680E+04	4.549E+07	3.056E+03	1.517E+04	2.274E+07	1.528E+03
2057	5.568E+04	4.459E+07	2.996E+03	1.487E+04	2.229E+07	1.498E+03
2058	5.458E+04	4.370E+07	2.936E+03	1.458E+04	2.185E+07	1.468E+03
2059	5.350E+04	4.284E+07	2.878E+03	1.429E+04	2.142E+07	1.439E+03
2060	5.244E+04	4.199E+07	2.821E+03	1.401E+04	2.099E+07	1.411E+03
2061	5.140E+04	4.116E+07	2.765E+03	1.373E+04	2.058E+07	1.383E+03
2062	5.038E+04	4.034E+07	2.711E+03	1.346E+04	2.017E+07	1.355E+03
2063	4.938E+04	3.954E+07	2.657E+03	1.319E+04	1.977E+07	1.328E+03
2064	4.841E+04	3.876E+07	2.604E+03	1.293E+04	1.938E+07	1.302E+03

Results (Continued)

Year	Total landfill gas			Methane		
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2065	4.745E+04	3.799E+07	2.553E+03	1.267E+04	1.900E+07	1.276E+03
2066	4.651E+04	3.724E+07	2.502E+03	1.242E+04	1.862E+07	1.251E+03
2067	4.559E+04	3.650E+07	2.453E+03	1.218E+04	1.825E+07	1.226E+03
2068	4.468E+04	3.578E+07	2.404E+03	1.194E+04	1.789E+07	1.202E+03
2069	4.380E+04	3.507E+07	2.357E+03	1.170E+04	1.754E+07	1.178E+03
2070	4.293E+04	3.438E+07	2.310E+03	1.147E+04	1.719E+07	1.155E+03
2071	4.208E+04	3.370E+07	2.264E+03	1.124E+04	1.685E+07	1.132E+03
2072	4.125E+04	3.303E+07	2.219E+03	1.102E+04	1.652E+07	1.110E+03
2073	4.043E+04	3.238E+07	2.175E+03	1.080E+04	1.619E+07	1.088E+03
2074	3.963E+04	3.173E+07	2.132E+03	1.059E+04	1.587E+07	1.066E+03
2075	3.885E+04	3.111E+07	2.090E+03	1.038E+04	1.555E+07	1.045E+03
2076	3.808E+04	3.049E+07	2.049E+03	1.017E+04	1.525E+07	1.024E+03
2077	3.732E+04	2.989E+07	2.008E+03	9.969E+03	1.494E+07	1.004E+03
2078	3.658E+04	2.930E+07	1.968E+03	9.772E+03	1.465E+07	9.842E+02
2079	3.586E+04	2.872E+07	1.929E+03	9.579E+03	1.436E+07	9.647E+02
2080	3.515E+04	2.815E+07	1.891E+03	9.389E+03	1.407E+07	9.456E+02
2081	3.445E+04	2.759E+07	1.854E+03	9.203E+03	1.379E+07	9.269E+02
2082	3.377E+04	2.704E+07	1.817E+03	9.021E+03	1.352E+07	9.085E+02
2083	3.310E+04	2.651E+07	1.781E+03	8.842E+03	1.325E+07	8.905E+02
2084	3.245E+04	2.598E+07	1.746E+03	8.667E+03	1.299E+07	8.729E+02
2085	3.180E+04	2.547E+07	1.711E+03	8.495E+03	1.273E+07	8.556E+02
2086	3.118E+04	2.496E+07	1.677E+03	8.327E+03	1.248E+07	8.387E+02
2087	3.056E+04	2.447E+07	1.644E+03	8.162E+03	1.223E+07	8.220E+02
2088	2.995E+04	2.398E+07	1.612E+03	8.001E+03	1.199E+07	8.058E+02
2089	2.936E+04	2.351E+07	1.580E+03	7.842E+03	1.175E+07	7.898E+02
2090	2.878E+04	2.304E+07	1.548E+03	7.687E+03	1.152E+07	7.742E+02
2091	2.821E+04	2.259E+07	1.518E+03	7.535E+03	1.129E+07	7.588E+02
2092	2.765E+04	2.214E+07	1.488E+03	7.386E+03	1.107E+07	7.438E+02
2093	2.710E+04	2.170E+07	1.458E+03	7.239E+03	1.085E+07	7.291E+02
2094	2.657E+04	2.127E+07	1.429E+03	7.096E+03	1.064E+07	7.147E+02
2095	2.604E+04	2.085E+07	1.401E+03	6.955E+03	1.043E+07	7.005E+02
2096	2.552E+04	2.044E+07	1.373E+03	6.818E+03	1.022E+07	6.866E+02
2097	2.502E+04	2.003E+07	1.346E+03	6.683E+03	1.002E+07	6.730E+02
2098	2.452E+04	1.964E+07	1.319E+03	6.550E+03	9.819E+06	6.597E+02
2099	2.404E+04	1.925E+07	1.293E+03	6.421E+03	9.624E+06	6.466E+02
2100	2.356E+04	1.887E+07	1.268E+03	6.294E+03	9.434E+06	6.338E+02
2101	2.310E+04	1.849E+07	1.243E+03	6.169E+03	9.247E+06	6.213E+02
2102	2.264E+04	1.813E+07	1.218E+03	6.047E+03	9.064E+06	6.090E+02
2103	2.219E+04	1.777E+07	1.194E+03	5.927E+03	8.884E+06	5.969E+02
2104	2.175E+04	1.742E+07	1.170E+03	5.810E+03	8.708E+06	5.851E+02

Results (Continued)

Year	NMOC					
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
1964	0	0	0	0	0	0
1965	2.006E-01	5.595E+01	3.759E-03	0.000E+00	0.000E+00	0.000E+00
1966	4.032E-01	1.125E+02	7.557E-03	0.000E+00	0.000E+00	0.000E+00
1967	6.078E-01	1.696E+02	1.139E-02	0.000E+00	0.000E+00	0.000E+00
1968	8.144E-01	2.272E+02	1.527E-02	0.000E+00	0.000E+00	0.000E+00
1969	1.024E+00	2.856E+02	1.919E-02	0.000E+00	0.000E+00	0.000E+00
1970	1.236E+00	3.449E+02	2.317E-02	0.000E+00	0.000E+00	0.000E+00
1971	1.451E+00	4.049E+02	2.721E-02	0.000E+00	0.000E+00	0.000E+00
1972	1.669E+00	4.657E+02	3.129E-02	0.000E+00	0.000E+00	0.000E+00
1973	1.890E+00	5.273E+02	3.543E-02	0.000E+00	0.000E+00	0.000E+00
1974	2.114E+00	5.899E+02	3.963E-02	0.000E+00	0.000E+00	0.000E+00
1975	2.342E+00	6.534E+02	4.390E-02	0.000E+00	0.000E+00	0.000E+00
1976	2.574E+00	7.180E+02	4.824E-02	0.000E+00	0.000E+00	0.000E+00
1977	2.808E+00	7.835E+02	5.264E-02	0.000E+00	0.000E+00	0.000E+00
1978	3.048E+00	8.503E+02	5.713E-02	0.000E+00	0.000E+00	0.000E+00
1979	3.291E+00	9.182E+02	6.169E-02	0.000E+00	0.000E+00	0.000E+00
1980	3.539E+00	9.873E+02	6.634E-02	0.000E+00	0.000E+00	0.000E+00
1981	3.791E+00	1.058E+03	7.106E-02	0.000E+00	0.000E+00	0.000E+00
1982	4.048E+00	1.129E+03	7.587E-02	0.000E+00	0.000E+00	0.000E+00
1983	4.309E+00	1.202E+03	8.078E-02	0.000E+00	0.000E+00	0.000E+00
1984	4.576E+00	1.277E+03	8.578E-02	0.000E+00	0.000E+00	0.000E+00
1985	4.848E+00	1.353E+03	9.088E-02	0.000E+00	0.000E+00	0.000E+00
1986	5.127E+00	1.430E+03	9.610E-02	0.000E+00	0.000E+00	0.000E+00
1987	5.410E+00	1.509E+03	1.014E-01	0.000E+00	0.000E+00	0.000E+00
1988	5.700E+00	1.590E+03	1.068E-01	0.000E+00	0.000E+00	0.000E+00
1989	5.996E+00	1.673E+03	1.124E-01	0.000E+00	0.000E+00	0.000E+00
1990	6.299E+00	1.757E+03	1.181E-01	0.000E+00	0.000E+00	0.000E+00
1991	6.608E+00	1.844E+03	1.239E-01	0.000E+00	0.000E+00	0.000E+00
1992	6.925E+00	1.932E+03	1.298E-01	0.000E+00	0.000E+00	0.000E+00
1993	7.248E+00	2.022E+03	1.359E-01	0.000E+00	0.000E+00	0.000E+00
1994	8.097E+00	2.259E+03	1.518E-01	0.000E+00	0.000E+00	0.000E+00
1995	9.095E+00	2.537E+03	1.705E-01	0.000E+00	0.000E+00	0.000E+00
1996	1.004E+01	2.800E+03	1.881E-01	0.000E+00	0.000E+00	0.000E+00
1997	1.104E+01	3.081E+03	2.070E-01	0.000E+00	0.000E+00	0.000E+00
1998	1.193E+01	3.328E+03	2.236E-01	0.000E+00	0.000E+00	0.000E+00
1999	1.280E+01	3.572E+03	2.400E-01	0.000E+00	0.000E+00	0.000E+00
2000	1.387E+01	3.870E+03	2.600E-01	0.000E+00	0.000E+00	0.000E+00
2001	1.484E+01	4.141E+03	2.782E-01	0.000E+00	0.000E+00	0.000E+00
2002	1.587E+01	4.427E+03	2.975E-01	0.000E+00	0.000E+00	0.000E+00
2003	1.690E+01	4.714E+03	3.167E-01	0.000E+00	0.000E+00	0.000E+00
2004	1.816E+01	5.067E+03	3.405E-01	0.000E+00	0.000E+00	0.000E+00
2005	1.956E+01	5.458E+03	3.667E-01	0.000E+00	0.000E+00	0.000E+00
2006	2.086E+01	5.819E+03	3.910E-01	0.000E+00	0.000E+00	0.000E+00
2007	2.228E+01	6.217E+03	4.177E-01	0.000E+00	0.000E+00	0.000E+00
2008	2.335E+01	6.515E+03	4.377E-01	0.000E+00	0.000E+00	0.000E+00
2009	2.437E+01	6.800E+03	4.569E-01	0.000E+00	0.000E+00	0.000E+00
2010	2.521E+01	7.034E+03	4.726E-01	0.000E+00	0.000E+00	0.000E+00
2011	2.644E+01	7.375E+03	4.955E-01	0.000E+00	0.000E+00	0.000E+00
2012	2.813E+01	7.849E+03	5.274E-01	0.000E+00	0.000E+00	0.000E+00
2013	3.022E+01	8.430E+03	5.664E-01	0.000E+00	0.000E+00	0.000E+00

Results (Continued)

Year	NMOC					
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2014	3.227E+01	9.002E+03	6.049E-01	0.000E+00	0.000E+00	0.000E+00
2015	3.412E+01	9.518E+03	6.395E-01	0.000E+00	0.000E+00	0.000E+00
2016	3.601E+01	1.005E+04	6.751E-01	0.000E+00	0.000E+00	0.000E+00
2017	4.146E+01	1.157E+04	7.772E-01	0.000E+00	0.000E+00	0.000E+00
2018	4.699E+01	1.311E+04	8.808E-01	0.000E+00	0.000E+00	0.000E+00
2019	5.347E+01	1.492E+04	1.002E+00	0.000E+00	0.000E+00	0.000E+00
2020	6.120E+01	1.707E+04	1.147E+00	0.000E+00	0.000E+00	0.000E+00
2021	7.170E+01	2.000E+04	1.344E+00	0.000E+00	0.000E+00	0.000E+00
2022	8.199E+01	2.287E+04	1.537E+00	0.000E+00	0.000E+00	0.000E+00
2023	9.208E+01	2.569E+04	1.726E+00	0.000E+00	0.000E+00	0.000E+00
2024	1.020E+02	2.845E+04	1.911E+00	0.000E+00	0.000E+00	0.000E+00
2025	1.117E+02	3.115E+04	2.093E+00	0.000E+00	0.000E+00	0.000E+00
2026	1.212E+02	3.380E+04	2.271E+00	0.000E+00	0.000E+00	0.000E+00
2027	1.305E+02	3.640E+04	2.446E+00	0.000E+00	0.000E+00	0.000E+00
2028	1.396E+02	3.895E+04	2.617E+00	0.000E+00	0.000E+00	0.000E+00
2029	1.486E+02	4.144E+04	2.785E+00	0.000E+00	0.000E+00	0.000E+00
2030	1.573E+02	4.389E+04	2.949E+00	0.000E+00	0.000E+00	0.000E+00
2031	1.659E+02	4.629E+04	3.110E+00	0.000E+00	0.000E+00	0.000E+00
2032	1.744E+02	4.864E+04	3.268E+00	0.000E+00	0.000E+00	0.000E+00
2033	1.826E+02	5.095E+04	3.423E+00	0.000E+00	0.000E+00	0.000E+00
2034	1.907E+02	5.320E+04	3.575E+00	0.000E+00	0.000E+00	0.000E+00
2035	1.926E+02	5.374E+04	3.611E+00	0.000E+00	0.000E+00	0.000E+00
2036	1.888E+02	5.268E+04	3.539E+00	0.000E+00	0.000E+00	0.000E+00
2037	1.851E+02	5.164E+04	3.469E+00	0.000E+00	0.000E+00	0.000E+00
2038	1.814E+02	5.061E+04	3.401E+00	0.000E+00	0.000E+00	0.000E+00
2039	1.778E+02	4.961E+04	3.333E+00	0.000E+00	0.000E+00	0.000E+00
2040	1.743E+02	4.863E+04	3.267E+00	0.000E+00	0.000E+00	0.000E+00
2041	1.709E+02	4.767E+04	3.203E+00	0.000E+00	0.000E+00	0.000E+00
2042	1.675E+02	4.672E+04	3.139E+00	0.000E+00	0.000E+00	0.000E+00
2043	1.642E+02	4.580E+04	3.077E+00	0.000E+00	0.000E+00	0.000E+00
2044	1.609E+02	4.489E+04	3.016E+00	0.000E+00	0.000E+00	0.000E+00
2045	1.577E+02	4.400E+04	2.956E+00	0.000E+00	0.000E+00	0.000E+00
2046	1.546E+02	4.313E+04	2.898E+00	0.000E+00	0.000E+00	0.000E+00
2047	1.515E+02	4.228E+04	2.840E+00	0.000E+00	0.000E+00	0.000E+00
2048	1.485E+02	4.144E+04	2.784E+00	0.000E+00	0.000E+00	0.000E+00
2049	1.456E+02	4.062E+04	2.729E+00	0.000E+00	0.000E+00	0.000E+00
2050	1.427E+02	3.981E+04	2.675E+00	0.000E+00	0.000E+00	0.000E+00
2051	1.399E+02	3.903E+04	2.622E+00	0.000E+00	0.000E+00	0.000E+00
2052	1.371E+02	3.825E+04	2.570E+00	0.000E+00	0.000E+00	0.000E+00
2053	1.344E+02	3.749E+04	2.519E+00	0.000E+00	0.000E+00	0.000E+00
2054	1.317E+02	3.675E+04	2.469E+00	0.000E+00	0.000E+00	0.000E+00
2055	1.291E+02	3.602E+04	2.420E+00	0.000E+00	0.000E+00	0.000E+00
2056	1.266E+02	3.531E+04	2.373E+00	0.000E+00	0.000E+00	0.000E+00
2057	1.241E+02	3.461E+04	2.326E+00	0.000E+00	0.000E+00	0.000E+00
2058	1.216E+02	3.393E+04	2.280E+00	0.000E+00	0.000E+00	0.000E+00
2059	1.192E+02	3.325E+04	2.234E+00	0.000E+00	0.000E+00	0.000E+00
2060	1.168E+02	3.260E+04	2.190E+00	0.000E+00	0.000E+00	0.000E+00
2061	1.145E+02	3.195E+04	2.147E+00	0.000E+00	0.000E+00	0.000E+00
2062	1.123E+02	3.132E+04	2.104E+00	0.000E+00	0.000E+00	0.000E+00
2063	1.100E+02	3.070E+04	2.063E+00	0.000E+00	0.000E+00	0.000E+00
2064	1.079E+02	3.009E+04	2.022E+00	0.000E+00	0.000E+00	0.000E+00

Results (Continued)

Year	NMOC					
	(Mg/year)	(m^3/year)	(av ft^3/min)	(Mg/year)	(m^3/year)	(av ft^3/min)
2065	1.057E+02	2.949E+04	1.982E+00	0.000E+00	0.000E+00	0.000E+00
2066	1.036E+02	2.891E+04	1.942E+00	0.000E+00	0.000E+00	0.000E+00
2067	1.016E+02	2.834E+04	1.904E+00	0.000E+00	0.000E+00	0.000E+00
2068	9.957E+01	2.778E+04	1.866E+00	0.000E+00	0.000E+00	0.000E+00
2069	9.759E+01	2.723E+04	1.829E+00	0.000E+00	0.000E+00	0.000E+00
2070	9.566E+01	2.669E+04	1.793E+00	0.000E+00	0.000E+00	0.000E+00
2071	9.377E+01	2.616E+04	1.758E+00	0.000E+00	0.000E+00	0.000E+00
2072	9.191E+01	2.564E+04	1.723E+00	0.000E+00	0.000E+00	0.000E+00
2073	9.009E+01	2.513E+04	1.689E+00	0.000E+00	0.000E+00	0.000E+00
2074	8.831E+01	2.464E+04	1.655E+00	0.000E+00	0.000E+00	0.000E+00
2075	8.656E+01	2.415E+04	1.623E+00	0.000E+00	0.000E+00	0.000E+00
2076	8.484E+01	2.367E+04	1.590E+00	0.000E+00	0.000E+00	0.000E+00
2077	8.316E+01	2.320E+04	1.559E+00	0.000E+00	0.000E+00	0.000E+00
2078	8.152E+01	2.274E+04	1.528E+00	0.000E+00	0.000E+00	0.000E+00
2079	7.990E+01	2.229E+04	1.498E+00	0.000E+00	0.000E+00	0.000E+00
2080	7.832E+01	2.185E+04	1.468E+00	0.000E+00	0.000E+00	0.000E+00
2081	7.677E+01	2.142E+04	1.439E+00	0.000E+00	0.000E+00	0.000E+00
2082	7.525E+01	2.099E+04	1.411E+00	0.000E+00	0.000E+00	0.000E+00
2083	7.376E+01	2.058E+04	1.383E+00	0.000E+00	0.000E+00	0.000E+00
2084	7.230E+01	2.017E+04	1.355E+00	0.000E+00	0.000E+00	0.000E+00
2085	7.087E+01	1.977E+04	1.328E+00	0.000E+00	0.000E+00	0.000E+00
2086	6.946E+01	1.938E+04	1.302E+00	0.000E+00	0.000E+00	0.000E+00
2087	6.809E+01	1.900E+04	1.276E+00	0.000E+00	0.000E+00	0.000E+00
2088	6.674E+01	1.862E+04	1.251E+00	0.000E+00	0.000E+00	0.000E+00
2089	6.542E+01	1.825E+04	1.226E+00	0.000E+00	0.000E+00	0.000E+00
2090	6.412E+01	1.789E+04	1.202E+00	0.000E+00	0.000E+00	0.000E+00
2091	6.285E+01	1.754E+04	1.178E+00	0.000E+00	0.000E+00	0.000E+00
2092	6.161E+01	1.719E+04	1.155E+00	0.000E+00	0.000E+00	0.000E+00
2093	6.039E+01	1.685E+04	1.132E+00	0.000E+00	0.000E+00	0.000E+00
2094	5.919E+01	1.651E+04	1.110E+00	0.000E+00	0.000E+00	0.000E+00
2095	5.802E+01	1.619E+04	1.088E+00	0.000E+00	0.000E+00	0.000E+00
2096	5.687E+01	1.587E+04	1.066E+00	0.000E+00	0.000E+00	0.000E+00
2097	5.575E+01	1.555E+04	1.045E+00	0.000E+00	0.000E+00	0.000E+00
2098	5.464E+01	1.524E+04	1.024E+00	0.000E+00	0.000E+00	0.000E+00
2099	5.356E+01	1.494E+04	1.004E+00	0.000E+00	0.000E+00	0.000E+00
2100	5.250E+01	1.465E+04	9.841E-01	0.000E+00	0.000E+00	0.000E+00
2101	5.146E+01	1.436E+04	9.646E-01	0.000E+00	0.000E+00	0.000E+00
2102	5.044E+01	1.407E+04	9.455E-01	0.000E+00	0.000E+00	0.000E+00
2103	4.944E+01	1.379E+04	9.268E-01	0.000E+00	0.000E+00	0.000E+00
2104	4.846E+01	1.352E+04	9.084E-01	0.000E+00	0.000E+00	0.000E+00

TABLE 1A
LANDFILL OPERATIONS - STATIONARY SOURCES - CAP EMISSIONS SUMMARY
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Current Actual (Annual Average of Years 2017/18)

Criteria Air Pollutants	NOX	CO	SOX	VOC	PM10	PM2.5
	tons per year					
Sources						
Landfill Surface (Fugitive)	--	--	--	12.19		--
Flare	3.87	15.47	27.38	3.41	0.001	0.001
Total Current Actual Baseline Emissions	**3.87**	**15.47**	**27.38**	**15.60**	**0.001**	**0.001**

Current Permitted (Flare at Full Permitted Capacity) (Landfill at Full Permitted Capacity [Year 2032])

Criteria Air Pollutants	NOX	CO	SOX	VOC	PM10	PM2.5
	tons per year					
Sources						
Landfill Surface (Fugitive)	--	--	--	40.49		--
Flare	9.99	39.95	27.38	8.81	0.004	0.004
Total Current Permitted Baseline Emissions	**9.99**	**39.95**	**27.38**	**49.30**	**0.004**	**0.004**

Post-Project / Future Potential (FP) (Year 2035 for LFG Emissions; 2020 for C&D Sorting Emissions)

Criteria Air Pollutants	NOX	CO	SOX [a]	VOC	PM10	PM2.5
	tons per year					
Sources						
Landfill Surface (Fugitive)	--	--	--	53.09		--
Flare	23.22	92.86	27.38 / 54.75	17.31	0.008	0.008
C&D - Fugitive Dust	--	--	--	--	0.046	0.045
C&D - Portable Diesel Engine	0.34	2.98	0.002	0.16	0.017	0.017
Total Future Potential Emissions	**23.56**	**95.84**	**27.38 / 54.75**	**70.56**	**0.071**	**0.070**

Project Increase

Criteria Air Pollutants	NOX	CO	SOx [a]	VOC	PM10	PM2.5
	tons per year					
Baseline = Current Permitted [FP - CP]	13.57	55.90	0.0 / 27.38	21.26	0.30	0.40
Baseline = Current Actual [FP - CA] *	**19.69**	**80.37**	**0.0 / 27.38**	**54.96**	**0.070**	**0.069**
	lbs per day					
Baseline = Current Actual [FP - CA] *	**107.90**	**440.38**	**0.0 / 150**	**301.13**	**0.38**	**0.38**

* Either current actual or current permitted emissions may be used as baseline emissions; to be determined during YSAQMD permitting.
For the purpose of this AQIA, current actual emissions are conservatively assumed for baseline emissions. Current permitted emissions are provided for informational purposes.

(a) For Future Potential SOx, two scenarios are provided; one with the facility-wide daily limit of 150 lbs retained, and the other with the daily limit doubled to 300 lbs. If the limit is increased, District regulations will require the additoinal emissions to be offset. Thus, SOx emission increase, after mitigation, would be zero for both scenarios

TABLE 1B
LANDFILL OPERATIONS - STATIONARY SOURCES - GHG EMISSIONS SUMMARY
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Current Actual (Annual Average of Years 2017/18)

Greenhouse Gases	CO_2	CH_4	N_2O	CO_2e
	metric tons per year			
Sources				
Landfill Surface (Fugitive)	7,187	2,028	--	50,698
Flare	8,057	0.50	0.10	41
Total Current Actual Baseline Emissions	**15,244**	**2,028**	**0.10**	**50,740**

Current Permitted (Flare at Full Permitted Capacity) (Landfill at Full Permitted Capacity [Year 2032])

Greenhouse Gases	CO_2	CH_4	N_2O	CO_2e
	metric tons per year			
Sources				
Landfill Surface (Fugitive)	13,288	3,962	--	99,043
Flare	20,800	1.28	0.25	107
Total Current Permitted Baseline Emissions	**34,088**	**3,963**	**0.25**	**99,150**

Post-Project / Future Potential (FP) (Year 2035 for LFG Emissions; 2020 for C&D Sorting Emissions)

Greenhouse Gases	CO_2	CH_4	N_2O	CO_2e
	metric tons per year			
Sources				
Landfill Surface (Fugitive)	17,428	5,196	--	129,898
Flare	48,354	2.97	0.59	249
C&D - Portable Diesel Engine	859	0.04	0.07	881
Total Future Potential Emissions	**66,640**	**5,199**	**0.66**	**131,027**

Project Increase

Greenhouse Gases	CO_2	CH_4	N_2O	CO_2e
	metric tons per year			
Baseline = Current Actual [FP - CA] *	51,396	3,171	0.56	80,288
Baseline = Current Permitted [FP - CP]	32,553	1,236	0.40	31,878
	lbs per day			
Baseline = Current Actual [FP - CA] *	310,489	19,153	3.37	485,026
Baseline = Current Permitted [FP - CP]	196,653	7,467	2.44	192,577

* Either current actual or current permitted emissions may be used as baseline emissions; to be determined during YSAQMD permitting. For the purpose of this AQIA, current actual emissions are conservatively assumed for baseline emissions. Current permitted emissions are provided for informational purposes.

TABLE 2A
FUGITIVE LANDFILL GAS EMISSIONS - CURRENT ACTUAL (2017-18)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	3.40E-04	75.0%	2.55E-04	8.51E-05	1.70E-01	4.66E-04
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	6.12E-04	75.0%	4.59E-04	1.53E-04	3.06E-01	8.38E-04
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	3.61E-04	75.0%	2.71E-04	9.02E-05	1.80E-01	4.94E-04
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	8.48E-03	75.0%	6.36E-03	2.12E-03	4.24E+00	1.16E-02
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	1.30E-02	75.0%	9.74E-03	3.25E-03	6.49E+00	1.78E-02
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	3.21E-03	75.0%	2.41E-03	8.03E-04	1.61E+00	4.40E-03
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	2.19E-01	75.0%	1.64E-01	5.48E-02	1.10E+02	3.00E-01
107-13-1	Acrylonitrile**	53.06	0.007	2.71E-04	75.0%	2.03E-04	6.77E-05	1.35E-01	3.71E-04
75-27-4	Bromodichloromethane**	163.83	0.004	4.78E-04	75.0%	3.58E-04	1.19E-04	2.39E-01	6.54E-04
71-43-2	Benzene*	78.11	1.600	9.11E-02	75.0%	6.83E-02	2.28E-02	4.55E+01	1.25E-01
75-15-0	Carbon disulfide*	76.13	0.440	2.44E-02	75.0%	1.83E-02	6.10E-03	1.22E+01	3.34E-02
56-23-5	Carbon tetrachloride**	153.84	0.004	4.49E-04	75.0%	3.36E-04	1.12E-04	2.24E-01	6.14E-04
463-58-1	Carbonyl sulfide	60.07	0.183	8.01E-03	75.0%	6.01E-03	2.00E-03	4.01E+00	1.10E-02
108-90-7	Chlorobenzene**	112.56	0.005	4.10E-04	75.0%	3.08E-04	1.03E-04	2.05E-01	5.62E-04
75-45-6	Chlorodifluoromethane	86.47	0.355	2.24E-02	75.0%	1.68E-02	5.59E-03	1.12E+01	3.07E-02
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	3.76E-04	75.0%	2.82E-04	9.41E-05	1.88E-01	5.15E-04
67-66-3	Chloroform**	119.39	0.003	2.96E-04	75.0%	2.22E-04	7.40E-05	1.48E-01	4.05E-04
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	3.68E-04	75.0%	2.76E-04	9.20E-05	1.84E-01	5.04E-04
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	6.43E-04	75.0%	4.82E-04	1.61E-04	3.21E-01	8.81E-04
75-43-4	Dichlorodifluoromethane **	120.91	0.250	2.20E-02	75.0%	1.65E-02	5.51E-03	1.10E+01	3.02E-02
75-71-8	Dichlorofluoromethane	102.92	2.620	1.97E-01	75.0%	1.47E-01	4.91E-02	9.83E+01	2.69E-01
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	2.79E-04	75.0%	2.09E-04	6.97E-05	1.39E-01	3.82E-04
64-17-5	Ethanol *	46.08	11.000	3.69E-01	75.0%	2.77E-01	9.24E-02	1.85E+02	5.06E-01
100-41-4	Ethylbenzene*	106.16	5.100	3.95E-01	75.0%	2.96E-01	9.87E-02	1.97E+02	5.41E-01
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	4.93E-04	75.0%	3.70E-04	1.23E-04	2.47E-01	6.75E-04
75-69-4	Fluorotrichloromethane	137.40	0.327	3.28E-02	75.0%	2.46E-02	8.19E-03	1.64E+01	4.49E-02
110-54-3	Hexane*	86.18	0.580	3.64E-02	75.0%	2.73E-02	9.11E-03	1.82E+01	4.99E-02
7783-06-4	Hydrogen Sulfide (e)	34.08	1236	3.07E+01	75.0%	2.30E+01	7.68E+00	1.54E+04	4.21E+01
7439-97-6	Mercury (total)(f)	200.61	0.00029	4.27E-05	75.0%	3.20E-05	1.07E-05	2.13E-02	5.85E-05
78-93-3	Methyl ethyl ketone*	72.11	19.000	9.99E-01	75.0%	7.49E-01	2.50E-01	4.99E+02	1.37E+00
108-10-1	Methyl isobutyl ketone *	100.16	0.940	6.86E-02	75.0%	5.15E-02	1.72E-02	3.43E+01	9.40E-02
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	2.78E-02	75.0%	2.09E-02	6.95E-03	1.39E+01	3.81E-02
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	1.05E-02	75.0%	7.90E-03	2.63E-03	5.27E+00	1.44E-02
75-01-4	Vinyl chloride*	62.50	0.130	5.92E-03	75.0%	4.44E-03	1.48E-03	2.96E+00	8.11E-03
7647-01-0	Hydrochloric acid (g)	36.50	42.000	1.12E+00	75.0%	8.38E-01	2.79E-01	5.59E+02	1.53E+00
108-88-3	Toluene*	92.13	12.000	8.06E-01	75.0%	6.04E-01	2.01E-01	4.03E+02	1.10E+00
1330-20-7	Xylenes**	106.16	11.000	8.51E-01	75.0%	6.38E-01	2.13E-01	4.26E+02	1.17E+00
Totals: HAPs						**27.03**	**9.01**	**18018.73**	**49.37**

Criteria Air Pollutants	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
NMOCs as Hexane	86.18	776.3	48.77	0.75	36.57	12.19	2.44E+04	66.80
VOCs/ROGs (h)	86.18	776.3	48.77	0.75	36.57	12.19	2.44E+04	66.80

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentrations of RHR HAPs found in LFG based on site-specific data from the December 14, 2018 source test are denoted with asterisks; (*) for compounds with detected values, and (**) for non-detected compounds, which were assumed to be present at one-half their respective method detection limits. If site-specific data were unavailable, default concentrations from Waste Industry Air Coalition *Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values (WIAC, 2010) were used*.

(c) Landfill gas generation rate represents average for 2017-18, as derived from EPA LandGEM model (Baseline version) (See Appendix C).

(d) According to NSPS for Municipal Solid Waste Landfills, 75% of the LFG generation can reasonably be collected from a comprehensive gas system.

(e) Concentration of H2S is maximum monitored concentration (pre-treatment) during at least monthly monitoring from July 2018 through December 2018

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(h) VOCs/ROGs assumed to equal NMOCs.

TABLE 2A
FUGITIVE LANDFILL GAS EMISSIONS - CURRENT ACTUAL (2017-18)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
Average LFG generation rate (2017-18) (c)	1,068	SCFM
LFG Collection System efficiency (d)	75%	%

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS
(HAPS)
Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

(NMOCs/VOCs)
Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

TABLE 2B
FUGITIVE LANDFILL GAS EMISSIONS - CURRENT PERMITTED (2033)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	1.13E-03	75.0%	8.48E-04	2.83E-04	5.65E-01	1.55E-03
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	2.03E-03	75.0%	1.52E-03	5.08E-04	1.02E+00	2.78E-03
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	1.20E-03	75.0%	8.98E-04	2.99E-04	5.99E-01	1.64E-03
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	2.82E-02	75.0%	2.11E-02	7.04E-03	1.41E+01	3.86E-02
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	4.31E-02	75.0%	3.23E-02	1.08E-02	2.16E+01	5.91E-02
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	1.07E-02	75.0%	8.00E-03	2.67E-03	5.33E+00	1.46E-02
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	7.28E-01	75.0%	5.46E-01	1.82E-01	3.64E+02	9.97E-01
107-13-1	Acrylonitrile**	53.06	0.007	8.99E-04	75.0%	6.74E-04	2.25E-04	4.50E-01	1.23E-03
75-27-4	Bromodichloromethane**	163.83	0.004	1.59E-03	75.0%	1.19E-03	3.97E-04	7.93E-01	2.17E-03
71-43-2	Benzene*	78.11	1.600	3.03E-01	75.0%	2.27E-01	7.56E-02	1.51E+02	4.14E-01
75-15-0	Carbon disulfide*	76.13	0.440	8.11E-02	75.0%	6.08E-02	2.03E-02	4.05E+01	1.11E-01
56-23-5	Carbon tetrachloride**	153.84	0.004	1.49E-03	75.0%	1.12E-03	3.72E-04	7.45E-01	2.04E-03
463-58-1	Carbonyl sulfide	60.07	0.183	2.66E-02	75.0%	2.00E-02	6.65E-03	1.33E+01	3.65E-02
108-90-7	Chlorobenzene**	112.56	0.005	1.36E-03	75.0%	1.02E-03	3.41E-04	6.81E-01	1.87E-03
75-45-6	Chlorodifluoromethane	86.47	0.355	7.43E-02	75.0%	5.57E-02	1.86E-02	3.72E+01	1.02E-01
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	1.25E-03	75.0%	9.37E-04	3.12E-04	6.25E-01	1.71E-03
67-66-3	Chloroform**	119.39	0.003	9.83E-04	75.0%	7.37E-04	2.46E-04	4.91E-01	1.35E-03
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	1.22E-03	75.0%	9.17E-04	3.06E-04	6.11E-01	1.67E-03
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	2.14E-03	75.0%	1.60E-03	5.34E-04	1.07E+00	2.92E-03
75-43-4	Dichlorodifluoromethane **	120.91	0.250	7.32E-02	75.0%	5.49E-02	1.83E-02	3.66E+01	1.00E-01
75-71-8	Dichlorofluoromethane	102.92	2.620	6.53E-01	75.0%	4.90E-01	1.63E-01	3.26E+02	8.94E-01
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	9.25E-04	75.0%	6.94E-04	2.31E-04	4.63E-01	1.27E-03
64-17-5	Ethanol *	46.08	11.000	1.23E+00	75.0%	9.20E-01	3.07E-01	6.14E+02	1.68E+00
100-41-4	Ethylbenzene*	106.16	5.100	1.31E+00	75.0%	9.83E-01	3.28E-01	6.55E+02	1.80E+00
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	1.64E-03	75.0%	1.23E-03	4.09E-04	8.19E-01	2.24E-03
75-69-4	Fluorotrichloromethane	137.40	0.327	1.09E-01	75.0%	8.16E-02	2.72E-02	5.44E+01	1.49E-01
110-54-3	Hexane*	86.18	0.580	1.21E-01	75.0%	9.08E-02	3.03E-02	6.05E+01	1.66E-01
7783-06-4	Hydrogen Sulfide (e)	34.08	1236	1.02E+02	75.0%	7.65E+01	2.55E+01	5.10E+04	1.40E+02
7439-97-6	Mercury (total)(f)	200.61	0.000	1.42E-04	75.0%	1.06E-04	3.55E-05	7.09E-02	1.94E-04
78-93-3	Methyl ethyl ketone*	72.11	19.000	3.32E+00	75.0%	2.49E+00	8.29E-01	1.66E+03	4.54E+00
108-10-1	Methyl isobutyl ketone *	100.16	0.940	2.28E-01	75.0%	1.71E-01	5.70E-02	1.14E+02	3.12E-01
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	9.23E-02	75.0%	6.93E-02	2.31E-02	4.62E+01	1.26E-01
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	3.50E-02	75.0%	2.62E-02	8.75E-03	1.75E+01	4.79E-02
75-01-4	Vinyl chloride*	62.50	0.130	1.97E-02	75.0%	1.48E-02	4.92E-03	9.83E+00	2.69E-02
7647-01-0	Hydrochloric acid (g)	36.50	42.000	3.71E+00	75.0%	2.78E+00	9.28E-01	1.86E+03	5.08E+00
108-88-3	Toluene*	92.13	12.000	2.68E+00	75.0%	2.01E+00	6.69E-01	1.34E+03	3.67E+00
1330-20-7	Xylenes**	106.16	11.000	2.83E+00	75.0%	2.12E+00	7.07E-01	1.41E+03	3.87E+00
Totals: HAPs						**89.76**	**29.92**	**59843.11**	**163.95**

Criteria Air Pollutants	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
NMOCs as Hexane	86.18	776.3	161.96	0.75	121.47	40.49	8.10E+04	221.86
VOCs/ROGs (h)	86.18	776.3	161.96	0.75	121.47	40.49	8.10E+04	221.86

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentrations of RHR HAPs found in LFG based on site-specific data from the December 14, 2018 source test are denoted with asterisks; (*) for compounds with detected values, and (**) for non-detected compounds, which were assumed to be present at one-half their respective method detection limits. If site-specific data were unavailable, default concentrations from Waste Industry Air Coalition *Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values (WIAC, 2010) were used*.

(c) Landfill gas generation rate represents peak potential gas generation, which occurs in 2033, the year after current permitted waste capacity of 17 million megagrams is reached, as derived from EPA LandGEM model (Baseline version) (ATTACHED).

(d) According to NSPS for Municipal Solid Waste Landfills, 75% of the LFG generation can reasonably be collected from a comprehensive gas system.

(e) Concentration of H2S is maximum monitored concentration (pre-treatment) during at least monthly monitoring from July 2018 through December 2018

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(h) VOCs/ROGs assumed to equal NMOCs.

TABLE 2B
FUGITIVE LANDFILL GAS EMISSIONS - CURRENT PERMITTED (2033)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
Maximum LFG generation rate (2033) (c)	3,547	SCFM
LFG Collection System efficiency (d)	75%	%

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS

(HAPS)

Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

(NMOCs/VOCs)

Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

TABLE 2C
FUGITIVE LANDFILL GAS EMISSIONS - POST-PROJECT (FUTURE POTENTIAL) (2035)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	1.48E-03	75.0%	1.11E-03	3.71E-04	7.41E-01	2.03E-03
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	2.66E-03	75.0%	2.00E-03	6.66E-04	1.33E+00	3.65E-03
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	1.57E-03	75.0%	1.18E-03	3.93E-04	7.85E-01	2.15E-03
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	3.69E-02	75.0%	2.77E-02	9.23E-03	1.85E+01	5.06E-02
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	5.65E-02	75.0%	4.24E-02	1.41E-02	2.83E+01	7.75E-02
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	1.40E-02	75.0%	1.05E-02	3.50E-03	6.99E+00	1.92E-02
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	9.54E-01	75.0%	7.16E-01	2.39E-01	4.77E+02	1.31E+00
107-13-1	Acrylonitrile**	53.06	0.007	1.18E-03	75.0%	8.84E-04	2.95E-04	5.90E-01	1.62E-03
75-27-4	Bromodichloromethane**	163.83	0.004	2.08E-03	75.0%	1.56E-03	5.20E-04	1.04E+00	2.85E-03
71-43-2	Benzene*	78.11	1.600	3.97E-01	75.0%	2.98E-01	9.92E-02	1.98E+02	5.43E-01
75-15-0	Carbon disulfide*	76.13	0.440	1.06E-01	75.0%	7.97E-02	2.66E-02	5.32E+01	1.46E-01
56-23-5	Carbon tetrachloride**	153.84	0.004	1.95E-03	75.0%	1.47E-03	4.88E-04	9.77E-01	2.68E-03
463-58-1	Carbonyl sulfide	60.07	0.183	3.49E-02	75.0%	2.62E-02	8.72E-03	1.74E+01	4.78E-02
108-90-7	Chlorobenzene**	112.56	0.005	1.79E-03	75.0%	1.34E-03	4.47E-04	8.93E-01	2.45E-03
75-45-6	Chlorodifluoromethane	86.47	0.355	9.74E-02	75.0%	7.31E-02	2.44E-02	4.87E+01	1.33E-01
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	1.64E-03	75.0%	1.23E-03	4.10E-04	8.19E-01	2.24E-03
67-66-3	Chloroform**	119.39	0.003	1.29E-03	75.0%	9.66E-04	3.22E-04	6.44E-01	1.77E-03
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	1.60E-03	75.0%	1.20E-03	4.01E-04	8.01E-01	2.20E-03
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	2.80E-03	75.0%	2.10E-03	7.00E-04	1.40E+00	3.84E-03
75-43-4	Dichlorodifluoromethane **	120.91	0.250	9.60E-02	75.0%	7.20E-02	2.40E-02	4.80E+01	1.31E-01
75-71-8	Dichlorofluoromethane	102.92	2.620	8.56E-01	75.0%	6.42E-01	2.14E-01	4.28E+02	1.17E+00
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	1.21E-03	75.0%	9.10E-04	3.03E-04	6.07E-01	1.66E-03
64-17-5	Ethanol *	46.08	11.000	1.61E+00	75.0%	1.21E+00	4.02E-01	8.05E+02	2.20E+00
100-41-4	Ethylbenzene*	106.16	5.100	1.72E+00	75.0%	1.29E+00	4.30E-01	8.59E+02	2.35E+00
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	2.15E-03	75.0%	1.61E-03	5.37E-04	1.07E+00	2.94E-03
75-69-4	Fluorotrichloromethane	137.40	0.327	1.43E-01	75.0%	1.07E-01	3.57E-02	7.13E+01	1.95E-01
110-54-3	Hexane*	86.18	0.580	1.59E-01	75.0%	1.19E-01	3.97E-02	7.93E+01	2.17E-01
7783-06-4	Hydrogen Sulfide (e)	34.08	1236	1.34E+02	75.0%	1.00E+02	3.34E+01	6.69E+04	1.83E+02
7439-97-6	Mercury (total)(f)	200.61	0.000	1.86E-04	75.0%	1.39E-04	4.65E-05	9.30E-02	2.55E-04
78-93-3	Methyl ethyl ketone*	72.11	19.000	4.35E+00	75.0%	3.26E+00	1.09E+00	2.17E+03	5.96E+00
108-10-1	Methyl isobutyl ketone *	100.16	0.940	2.99E-01	75.0%	2.24E-01	7.47E-02	1.49E+02	4.09E-01
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	1.21E-01	75.0%	9.08E-02	3.03E-02	6.05E+01	1.66E-01
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	4.59E-02	75.0%	3.44E-02	1.15E-02	2.29E+01	6.29E-02
75-01-4	Vinyl chloride*	62.50	0.130	2.58E-02	75.0%	1.93E-02	6.45E-03	1.29E+01	3.53E-02
7647-01-0	Hydrochloric acid (g)	36.50	42.000	4.87E+00	75.0%	3.65E+00	1.22E+00	2.43E+03	6.67E+00
108-88-3	Toluene*	92.13	12.000	3.51E+00	75.0%	2.63E+00	8.77E-01	1.75E+03	4.81E+00
1330-20-7	Xylenes**	106.16	11.000	3.71E+00	75.0%	2.78E+00	9.27E-01	1.85E+03	5.08E+00
Totals: HAPs						**117.70**	**39.23**	**78469.21**	**214.98**

Criteria Air Pollutants	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Total Pollutant Flow Rate (tons/yr)	LFG Collection System Efficiency (%)(d)	Pollutant Flow Rate to Control Device (tons/yr)	Pollutant Emission Rate from Landfill (tons/yr)	Pollutant Emission Rate from Landfill (lbs/yr)	Pollutant Emission Rate from Landfill (lbs/day)
NMOCs as Hexane	86.18	776.30	212.37	0.75	159.28	53.09	1.06E+05	290.92
VOCs/ROGs (h)	86.18	776.30	212.37	0.75	159.28	53.09	1.06E+05	290.92

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentrations of RHR HAPs found in LFG based on site-specific data from the December 14, 2018 source test are denoted with asterisks; (*) for compounds with detected values, and (**) for non-detected compounds, which were assumed to be present at one-half their respective method detection limits. If site-specific data were unavailable, default concentrations from Waste Industry Air Coalition *Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values (WIAC, 2010) were used*.

(c) Landfill gas generation rate represents peak potential gas generation, which occurs in 2035, the year after future potential waste capacity of 24.42 million megagrams is reached, as derived from EPA LandGEM model (Post-Project version) (ATTACHED).

(d) According to NSPS for Municipal Solid Waste Landfills, 75% of the LFG generation can reasonably be collected from a comprehensive gas system.

(e) Concentration of H2S is maximum monitored concentration (pre-treatment) during at least monthly monitoring from July 2018 through December 2018

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(h) VOCs/ROGs assumed to equal NMOCs.

TABLE 2C
FUGITIVE LANDFILL GAS EMISSIONS - POST-PROJECT (FUTURE POTENTIAL) (2035)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
Peak LFG generation rate (2035) (c)	4,651	SCFM
LFG Collection System efficiency (d)	75%	%

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS

(HAPS)

Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

(NMOCs/VOCs)

Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

TABLE 3A
LANDFILL GAS FLARE EMISSIONS - CURRENT ACTUAL
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Pollutant Flow Rate to Flare (tons/yr)	Flare Destruction Efficiency (%) (d)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Maximum Emissions from Flare (tons/yr)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	1.85E-04	98.0%	8.46E-07	2.03E-05	7.41E-03	3.70E-06
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	3.33E-04	98.0%	1.52E-06	3.65E-05	1.33E-02	6.66E-06
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	1.96E-04	98.0%	0	2.15E-05	7.85E-03	3.93E-06
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	4.61E-03	98.0%	2.11E-05	5.06E-04	1.85E-01	9.23E-05
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	7.07E-03	98.0%	3.23E-05	7.74E-04	2.83E-01	1.41E-04
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	1.75E-03	98.0%	7.98E-06	1.92E-04	6.99E-02	3.50E-05
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	1.19E-01	99.7%	8.17E-05	1.96E-03	7.15E-01	3.58E-04
107-13-1	Acrylonitrile**	53.06	0.007	1.47E-04	99.7%	1.01E-07	2.42E-06	8.84E-04	4.42E-07
75-27-4	Bromodichloromethane**	163.83	0.004	2.60E-04	98.0%	1.19E-06	2.85E-05	1.04E-02	5.20E-06
71-43-2	Benzene*	78.11	1.600	4.96E-02	99.7%	3.40E-05	8.15E-04	2.97E-01	1.49E-04
75-15-0	Carbon disulfide*	76.13	0.440	1.33E-02	99.7%	9.10E-06	2.18E-04	7.97E-02	3.99E-05
56-23-5	Carbon tetrachloride**	153.84	0.004	2.44E-04	98.0%	1.11E-06	2.68E-05	9.76E-03	4.88E-06
463-58-1	Carbonyl sulfide	60.07	0.183	4.36E-03	99.7%	2.99E-06	7.17E-05	2.62E-02	1.31E-05
108-90-7	Chlorobenzene**	112.56	0.005	2.23E-04	98.0%	1.02E-06	2.45E-05	8.93E-03	4.47E-06
75-45-6	Chlorodifluoromethane	86.47	0.355	1.22E-02	98.0%	5.56E-05	1.33E-03	4.87E-01	2.44E-04
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	2.05E-04	98.0%	9.35E-07	2.24E-05	8.19E-03	4.10E-06
67-66-3	Chloroform**	119.39	0.003	1.61E-04	98.0%	7.35E-07	1.76E-05	6.44E-03	3.22E-06
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	2.00E-04	98.0%	9.15E-07	2.20E-05	8.01E-03	4.01E-06
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	3.50E-04	98.0%	1.60E-06	3.83E-05	1.40E-02	7.00E-06
75-43-4	Dichlorodifluoromethane **	120.91	0.250	1.20E-02	98.0%	5.48E-05	1.31E-03	4.80E-01	2.40E-04
75-71-8	Dichlorofluoromethane	102.92	2.620	1.07E-01	98.0%	4.88E-04	1.17E-02	4.28E+00	2.14E-03
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	1.52E-04	98.0%	6.92E-07	1.66E-05	6.07E-03	3.03E-06
64-17-5	Ethanol *	46.08	11.000	2.01E-01	99.7%	1.38E-04	3.31E-03	1.21E+00	6.03E-04
100-41-4	Ethylbenzene*	106.16	5.100	2.15E-01	99.7%	1.47E-04	3.53E-03	1.29E+00	6.44E-04
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	2.68E-04	98.0%	1.23E-06	2.94E-05	1.07E-02	5.37E-06
75-69-4	Fluorotrichloromethane	137.40	0.327	1.78E-02	98.0%	8.14E-05	1.95E-03	7.13E-01	3.56E-04
110-54-3	Hexane*	86.18	0.580	1.98E-02	99.7%	1.36E-05	3.26E-04	1.19E-01	5.95E-05
2148-87-8	Hydrogen Sulfide (e)	34.08	1236.000	1.67E+01	99.7%	1.14E-02	2.75E-01	1.00E+02	5.01E-02
7439-97-6	Mercury (total)(f)	200.61	0.000	2.32E-05	--	5.31E-06	1.27E-04	4.65E-02	2.32E-05
78-93-3	Methyl ethyl ketone*	72.11	19.000	5.44E-01	99.7%	3.72E-04	8.93E-03	3.26E+00	1.63E-03
108-10-1	Methyl isobutyl ketone *	100.16	0.940	3.74E-02	99.7%	2.56E-05	6.14E-04	2.24E-01	1.12E-04
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	1.51E-02	98.0%	6.91E-05	1.66E-03	6.05E-01	3.03E-04
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	5.73E-03	98.0%	2.62E-05	6.28E-04	2.29E-01	1.15E-04
75-01-4	Vinyl chloride*	62.50	0.130	3.22E-03	98.0%	1.47E-05	3.53E-04	1.29E-01	6.45E-05
7647-01-0	Hydrochloric acid (g)	36.50	42.000	6.08E-01	--	1.40E-01	3.36E+00	1.23E+03	6.14E-01
108-88-3	Toluene*	92.13	12.000	4.39E-01	99.7%	3.00E-04	7.21E-03	2.63E+00	1.32E-03
1330-20-7	Xylenes**	106.16	11.000	4.63E-01	99.7%	3.17E-04	7.62E-03	2.78E+00	1.39E-03
Totals: HAPs						**0.15**	**3.69**	**1348.08**	**0.67**

Criteria Air Pollutants	Molecular weight	Outlet Concentration of Compound (ppmv)	Emission Factor (lb/MMft^3)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Pollutant Flow Rate from Flare (tons/yr) (h)
Total Non-Methane Organics (NMOCs) as Hexane @3% O_2	86.18	31.40	--	0.78	18.70	6,826.09	3.41
Volatile Orgnic Compounds (VOCs (g)	86.18	31.40	--	0.78	18.70	6,826.09	3.41

Criteria Air Pollutants	Emission Factor (lb/MMft^3)	Emission Factor (lb/MMBtu)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (tons/yr)
Nitrogen Oxides (NO_X)	--	0.050	0.88	21.20	3.87
Carbon Monoxide (CO)	--	0.20	3.53	84.79	15.47
Sulfur Dioxide (SO_2)	--	--	--	150.00	27.38
Particulate Matter (PM, PM_{10}, $PM_{2.5}$)	0.0168	--	0.0003	0.01	0.001

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentration of HAPs found in LFG are site specific data (*) from the December 6-7, 2016 source test. Non-detect values were assumed to be present at one-half their detection limit. If site specific data were unavailable, they were taken from Waste Industry Air Coalition Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values.

(c) Pollutant emission rate based on actual average annual volume of LFG combusted in flare in 2017/18.

(d) Values taken from AP-42 Table 2.4-3 ("Control Efficiencies for LFG Constituents")

(e) Concentration of Dichlorofluoromethane based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(g) VOCs assumed to equal NMOCs.

(h) Based on YSAQMD Emission Evaluations for prior Recology Hay Road permitting.

TABLE 3A
LANDFILL GAS FLARE EMISSIONS - CURRENT ACTUAL
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
LFG Collection Rate to Flare (2017-18 average) (c)	581	SCFM
LFG Exhaust Rate from Flare (h)	2,564	SCFM @10% O2
LFG F-Factor (h)	8,710	SCF/MMBtu
Flare Heat Input at LFG Collection Rate	17.7	MMBtu/hr

Criteria pollutant emission factors used for flare:		
Pollutant	Emission Factor	Data Source
NMOCs/VOCs	20 ppmv outlet @3% O2 as hexane	Current Permit Limit
CO	0.2 lb/MMBtu	Current Permit Limit
SO_2	150 lbs/day	Current Permit Limit
NO_x	0.05 lb/MMBtu	Current Permit Limit
$PM/PM_{10/2.5}$	0.0168 lb/MMft^3	AP-42 Table 2.4-5

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS

(HAPS)

Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

Emission = Rate * Emission Factor;

(NMOCs/VOCs)

Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)*oxygen content correction factor [(20.9-8)/(20.9-3)]

TABLE 3B
LANDFILL GAS FLARE EMISSIONS - CURRENT PERMITTED
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Pollutant Flow Rate to Flare (tons/yr)	Flare Destruction Efficiency (%) (d)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Maximum Emissions from Flare (tons/yr)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	6.37E-04	98.0%	2.91E-06	6.98E-05	2.55E-02	1.27E-05
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	1.15E-03	98.0%	5.23E-06	1.26E-04	4.58E-02	2.29E-05
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	6.75E-04	98.0%	3.08E-06	7.40E-05	2.70E-02	1.35E-05
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	1.59E-02	98.0%	7.25E-05	1.74E-03	6.35E-01	3.18E-04
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	2.43E-02	98.0%	1.11E-04	2.66E-03	9.73E-01	4.86E-04
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	6.02E-03	98.0%	2.75E-05	6.59E-04	2.41E-01	1.20E-04
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	4.10E-01	99.7%	2.81E-04	6.74E-03	2.46E+00	1.23E-03
107-13-1	Acrylonitrile**	53.06	0.007	5.07E-04	99.7%	3.47E-07	8.33E-06	3.04E-03	1.52E-06
75-27-4	Bromodichloromethane**	163.83	0.004	8.95E-04	98.0%	4.08E-06	9.80E-05	3.58E-02	1.79E-05
71-43-2	Benzene*	78.11	1.600	1.71E-01	99.7%	1.17E-04	2.80E-03	1.02E+00	5.12E-04
75-15-0	Carbon disulfide*	76.13	0.440	4.57E-02	99.7%	3.13E-05	7.52E-04	2.74E-01	1.37E-04
56-23-5	Carbon tetrachloride**	153.84	0.004	8.40E-04	98.0%	3.84E-06	9.21E-05	3.36E-02	1.68E-05
463-58-1	Carbonyl sulfide	60.07	0.183	1.50E-02	99.7%	1.03E-05	2.47E-04	9.00E-02	4.50E-05
108-90-7	Chlorobenzene**	112.56	0.005	7.68E-04	98.0%	3.51E-06	8.42E-05	3.07E-02	1.54E-05
75-45-6	Chlorodifluoromethane	86.47	0.355	4.19E-02	98.0%	1.91E-04	4.59E-03	1.68E+00	8.38E-04
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	7.05E-04	98.0%	3.22E-06	7.72E-05	2.82E-02	1.41E-05
67-66-3	Chloroform**	119.39	0.003	5.54E-04	98.0%	2.53E-06	6.07E-05	2.22E-02	1.11E-05
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	6.89E-04	98.0%	3.15E-06	7.55E-05	2.76E-02	1.38E-05
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	1.20E-03	98.0%	5.50E-06	1.32E-04	4.82E-02	2.41E-05
75-43-4	Dichlorodifluoromethane **	120.91	0.250	4.13E-02	98.0%	1.88E-04	4.52E-03	1.65E+00	8.25E-04
75-71-8	Dichlorofluoromethane	102.92	2.620	3.68E-01	98.0%	1.68E-03	4.03E-02	1.47E+01	7.36E-03
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	5.22E-04	98.0%	2.38E-06	5.72E-05	2.09E-02	1.04E-05
64-17-5	Ethanol *	46.08	11.000	6.92E-01	99.7%	4.74E-04	1.14E-02	4.15E+00	2.08E-03
100-41-4	Ethylbenzene*	106.16	5.100	7.39E-01	99.7%	5.06E-04	1.21E-02	4.43E+00	2.22E-03
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	9.23E-04	98.0%	4.22E-06	1.01E-04	3.69E-02	1.85E-05
75-69-4	Fluorotrichloromethane	137.40	0.327	6.13E-02	98.0%	2.80E-04	6.72E-03	2.45E+00	1.23E-03
110-54-3	Hexane*	86.18	0.580	6.82E-02	99.7%	4.67E-05	1.12E-03	4.09E-01	2.05E-04
2148-87-8	Hydrogen Sulfide (e)	34.08	1236.000	5.75E+01	99.7%	3.94E-02	9.45E-01	3.45E+02	1.72E-01
7439-97-6	Mercury (total)(f)	200.61	0.000	8.00E-05	--	1.83E-05	4.38E-04	1.60E-01	8.00E-05
78-93-3	Methyl ethyl ketone*	72.11	19.000	1.87E+00	99.7%	1.28E-03	3.07E-02	1.12E+01	5.61E-03
108-10-1	Methyl isobutyl ketone *	100.16	0.940	1.29E-01	99.7%	8.80E-05	2.11E-03	7.71E-01	3.86E-04
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	5.21E-02	98.0%	2.38E-04	5.71E-03	2.08E+00	1.04E-03
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	1.97E-02	98.0%	9.01E-05	2.16E-03	7.89E-01	3.95E-04
75-01-4	Vinyl chloride*	62.50	0.130	1.11E-02	98.0%	5.06E-05	1.22E-03	4.44E-01	2.22E-04
7647-01-0	Hydrochloric acid (g)	36.50	42.000	2.09E+00	--	4.82E-01	1.16E+01	4.22E+03	2.11E+00
108-88-3	Toluene*	92.13	12.000	1.51E+00	99.7%	1.03E-03	2.48E-02	9.05E+00	4.53E-03
1330-20-7	Xylenes**	106.16	11.000	1.59E+00	99.7%	1.09E-03	2.62E-02	9.56E+00	4.78E-03
Totals: HAPs						**0.53**	**12.71**	**4638.60**	**2.32**

Criteria Air Pollutants	Molecular weight	Outlet Concentration of Compound (ppmv)	Emission Factor ($lb/MMft^3$)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Pollutant Flow Rate from Flare (tons/yr) (h)
Total Non-Methane Organics (NMOCs) as Hexane @3% O_2	86.18	31.40	--	2.01	48.28	17,621.61	8.81
Volatile Orgnic Compounds (VOCs (g)	86.18	31.40	--	2.01	48.28	17,621.61	8.81

Criteria Air Pollutants	Emission Factor ($lb/MMft^3$)	Emission Factor (lb/MMBtu)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (tons/yr)
Nitrogen Oxides (NO_X)	--	0.050	2.28	54.72	9.99
Carbon Monoxide (CO)	--	0.20	9.12	218.88	39.95
Sulfur Dioxide (SO_2)	--	--	--	150.00	27.38
Particulate Matter (PM, PM_{10}, $PM_{2.5}$)	0.0168	--	0.0010	0.02	0.004

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentration of HAPs found in LFG are site specific data (*) from the December 6-7, 2016 source test. Non-detect values were assumed to be present at one-half their detection limit. If site specific data were unavailable, they were taken from Waste Industry Air Coalition Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values.

(c) Pollutant emission rate based on rated capacity of flare.

(d) Values taken from AP-42 Table 2.4-3 ("Control Efficiencies for LFG Constituents")

(e) Concentration of Dichlorofluoromethane based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(g) VOCs assumed to equal NMOCs.

(h) Based on YSAQMD Emission Evaluations for prior Recology Hay Road permitting.

TABLE 3B
LANDFILL GAS FLARE EMISSIONS - CURRENT PERMITTED
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
LFG Rate to Flare (based on rated flare capacity)	2,000	SCFM
LFG Exhaust Rate from Flare (h)	6,620	SCFM @10% O2
LFG F-Factor (h)	8,710	SCF/MMBtu
Flare Heat Input (flare capacity, per current permit)	45.6	MMBtu/hr

Criteria pollutant emission factors used for flare:

Pollutant	Emission Factor	Data Source
NMOCs/VOCs	20 ppmv outlet @3% O2 as hexane	BACT/NSPS
CO	0.2 lb/MMBtu	Current Permit Limit
SO_2	150 lbs/day	Current Permit Limit
NO_x	0.05 lb/MMBtu	Current Permit Limit
PM/$PM_{10/2.5}$	0.0168 lb/MMft^3	AP-42 Table 2.4-5

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS

(HAPS)

Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

Emission = Rate * Emission Factor;

(NMOCs/VOCs)

Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)*oxygen content correction factor [(20.9-8)/(20.9-3)]

TABLE 3C
LANDFILL GAS FLARE EMISSIONS - FUTURE POTENTIAL (POST-PROJECT) (2035)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

CAS NUMBER	COMPOUNDS	Molecular Weight (g/Mol)	Ave. Concentration of Compounds Found In LFG (ppmv)(b)	Pollutant Flow Rate to Flare (tons/yr)	Flare Destruction Efficiency (%) (d)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Maximum Emissions from Flare (tons/yr)
Hazardous Air Pollutants (HAPs)(a)									
71-55-6	1,1,1-Trichloroethane (methyl chloroform)**	133.41	0.0035	1.11E-03	98.0%	5.08E-06	1.22E-04	4.45E-02	2.22E-05
79-34-5	1,1,2,2-Tetrachloroethane**	167.85	0.005	2.00E-03	98.0%	9.12E-06	2.19E-04	7.99E-02	4.00E-05
75-34-3	1,1-Dichloroethane (ethylidene dichloride)**	98.97	0.005	1.18E-03	98.0%	5.38E-06	1.29E-04	4.71E-02	2.36E-05
75-35-4	1,1-Dichloroethene (vinylidene chloride)*	96.94	0.120	2.77E-02	98.0%	1.26E-04	3.04E-03	1.11E+00	5.54E-04
107-06-2	1,2-Dichloroethane (ethylene dichloride)*	98.96	0.180	4.24E-02	98.0%	1.94E-04	4.65E-03	1.70E+00	8.48E-04
78-87-5	1,2-Dichloropropane (propylene dichloride)**	112.99	0.039	1.05E-02	98.0%	4.79E-05	1.15E-03	4.20E-01	2.10E-04
67-63-0	2-Propanol (isopropyl alcohol)*	60.11	5.000	7.16E-01	99.7%	4.90E-04	1.18E-02	4.29E+00	2.15E-03
107-13-1	Acrylonitrile**	53.06	0.007	8.84E-04	99.7%	6.06E-07	1.45E-05	5.31E-03	2.65E-06
75-27-4	Bromodichloromethane**	163.83	0.004	1.56E-03	98.0%	7.12E-06	1.71E-04	6.24E-02	3.12E-05
71-43-2	Benzene*	78.11	1.600	2.98E-01	99.7%	2.04E-04	4.89E-03	1.79E+00	8.93E-04
75-15-0	Carbon disulfide*	76.13	0.440	7.97E-02	99.7%	5.46E-05	1.31E-03	4.78E-01	2.39E-04
56-23-5	Carbon tetrachloride**	153.84	0.004	1.47E-03	98.0%	6.69E-06	1.61E-04	5.86E-02	2.93E-05
463-58-1	Carbonyl sulfide	60.07	0.183	2.62E-02	99.7%	1.79E-05	4.30E-04	1.57E-01	7.85E-05
108-90-7	Chlorobenzene**	112.56	0.005	1.34E-03	98.0%	6.12E-06	1.47E-04	5.36E-02	2.68E-05
75-45-6	Chlorodifluoromethane	86.47	0.355	7.31E-02	98.0%	3.34E-04	8.01E-03	2.92E+00	1.46E-03
75-00-3	Chloroethane (ethyl chloride)**	64.52	0.008	1.23E-03	98.0%	5.61E-06	1.35E-04	4.92E-02	2.46E-05
67-66-3	Chloroform**	119.39	0.003	9.66E-04	98.0%	4.41E-06	1.06E-04	3.87E-02	1.93E-05
74-87-3	*Chloromethane (methyl chloride)*	50.49	0.010	1.20E-03	98.0%	5.49E-06	1.32E-04	4.81E-02	2.40E-05
106-46-7	Dichlorobenzene (1,4-Dichlorobenzene)**	147.00	0.006	2.10E-03	98.0%	9.59E-06	2.30E-04	8.40E-02	4.20E-05
75-43-4	Dichlorodifluoromethane **	120.91	0.250	7.20E-02	98.0%	3.29E-04	7.89E-03	2.88E+00	1.44E-03
75-71-8	Dichlorofluoromethane	102.92	2.620	6.42E-01	98.0%	2.93E-03	7.04E-02	2.57E+01	1.28E-02
75-09-2	Dichloromethane (methylene chloride)**	84.94	0.005	9.10E-04	98.0%	4.16E-06	9.97E-05	3.64E-02	1.82E-05
64-17-5	Ethanol *	46.08	11.000	1.21E+00	99.7%	8.27E-04	1.98E-02	7.24E+00	3.62E-03
100-41-4	Ethylbenzene*	106.16	5.100	1.29E+00	99.7%	8.83E-04	2.12E-02	7.73E+00	3.87E-03
106-93-4	Ethylene dibromide (1,2-Dibromoethane)**	187.88	0.004	1.61E-03	98.0%	7.35E-06	1.76E-04	6.44E-02	3.22E-05
75-69-4	Fluorotrichloromethane	137.40	0.327	1.07E-01	98.0%	4.88E-04	1.17E-02	4.28E+00	2.14E-03
110-54-3	Hexane*	86.18	0.580	1.19E-01	99.7%	8.15E-05	1.96E-03	7.14E-01	3.57E-04
2148-87-8	Hydrogen Sulfide (e)	34.08	1236.000	1.00E+02	99.7%	6.87E-02	1.65E+00	6.02E+02	3.01E-01
7439-97-6	Mercury (total)(f)	200.61	0.000	1.39E-04	--	3.18E-05	7.64E-04	2.79E-01	1.39E-04
78-93-3	Methyl ethyl ketone*	72.11	19.000	3.26E+00	99.7%	2.23E-03	5.36E-02	1.96E+01	9.79E-03
108-10-1	Methyl isobutyl ketone *	100.16	0.940	2.24E-01	99.7%	1.54E-04	3.68E-03	1.34E+00	6.72E-04
127-18-4	Perchloroethylene (tetrachloroethylene)*	165.83	0.230	9.08E-02	98.0%	4.15E-04	9.95E-03	3.63E+00	1.82E-03
79-01-6	Trichloroethylene (trichloroethene)*	131.40	0.110	3.44E-02	98.0%	1.57E-04	3.77E-03	1.38E+00	6.88E-04
75-01-4	Vinyl chloride*	62.50	0.130	1.93E-02	98.0%	8.83E-05	2.12E-03	7.74E-01	3.87E-04
7647-01-0	Hydrochloric acid (g)	36.50	42.000	3.65E+00	--	8.41E-01	2.02E+01	7.37E+03	3.68E+00
108-88-3	Toluene*	92.13	12.000	2.63E+00	99.7%	1.80E-03	4.33E-02	1.58E+01	7.90E-03
1330-20-7	Xylenes**	106.16	11.000	2.78E+00	99.7%	1.90E-03	4.57E-02	1.67E+01	8.34E-03
Totals: HAPs						**0.92**	**22.17**	**8090.29**	**4.05**

Criteria Air Pollutants	Molecular weight	Outlet Concentration of Compound (ppmv)	Emission Factor ($lb/MMft^3$)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (lbs/yr)	Pollutant Flow Rate from Flare (tons/yr) (h)
Total Non-Methane Organics (NMOCs) as Hexane @3% O_2 (g)	86.18	31.40	--	3.95	94.83	3.46E+04	17.31
Volatile Orgnic Compounds (VOCs (g)	86.18	31.40	--	3.95	94.83	34,614.33	17.31

Criteria Air Pollutants	Emission Factor ($lb/MMft^3$)	Emission Factor (lb/MMBtu)	Maximum Emissions from Flare (lbs/hr)	Maximum Emissions from Flare (lbs/day)	Maximum Emissions from Flare (tons/yr)
Nitrogen Oxides (NO_X)	--	0.050	5.30	127.21	23.22
Carbon Monoxide (CO)	--	0.20	21.20	508.84	92.86
Sulfur Dioxide (SO_2) - Current Limit / Increased Limit Scenarios	--	--	--	150 / 300	27.38 / 54.75
Particulate Matter (PM, PM_{10}, $PM_{2.5}$)	0.0168	--	0.0018	0.04	0.008

Notes:

(a) List of hazardous air pollutants was from Title III Clean Air Act Amendments, 1990, and include compounds found in landfill gas, as determined from a list in AP-42 Tables 2.4-1 ("Default Concentrations for Landfill Gas Constituents, 11/98").

(b) Average concentration of HAPs found in LFG are site specific data (*) from the December 6-7, 2016 source test. Non-detect values were assumed to be present at one-half their detection limit. If site specific data were unavailable, they were taken from Waste Industry Air Coalition Comparison of Recent Landfill Gas Analyses with Historic AP-42 Values.

(c) Pollutant emission rate based on estimated maximum collection rate at peak year of 2035.

(d) Values taken from AP-42 Table 2.4-3 ("Control Efficiencies for LFG Constituents")

(e) Concentration of Dichlorofluoromethane based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(f) Concentration of Mercury based on EPA AP-42 Section 2.4 Table 2.4-1 (11/98).

(g) Concentration of HCl is based on AP-42 default, 2.4.4.2, (11/98).

(g) VOCs assumed to equal NMOCs.

(h) Based on YSAQMD Emission Evaluations for prior Recology Hay Road permitting.

TABLE 3C
LANDFILL GAS FLARE EMISSIONS - FUTURE POTENTIAL (POST-PROJECT) (2035)
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

Variables:

MODEL INPUT VARIABLES:		
Methane Content	50%	%
LFG Collection Rate to Flare (2035) (c)	3,488	SCFM
LFG Exhaust Rate from Flare (h)	15,389	SCFM @10% O2
LFG F-Factor (h)	8,710	SCF/MMBtu
Flare Heat Input at LFG Collection Rate	106.0	MMBtu/hr

Criteria pollutant emission factors used for flare:

Pollutant	Emission Factor	Data Source
NMOCs/VOCs	20 ppmv outlet @3% O2 as hexane	BACT/NSPS
CO	0.2 lb/MMBtu	Current Permit Limit
SO_2	150 lbs/day	Current Permit Limit
NO_x	0.05 lb/MMBtu	Current Permit Limit
$PM/PM_{10/2.5}$	0.0168 lb/$MMft^3$	AP-42 Table 2.4-5

CONVERSIONS

ton conversion	2000	lbs
lb conversion	453.6	g
hour conversion	60	min
day conversion	24	hrs
year conversion	365	days
mol conversion	24.04	L @ 68 °F and 1 atm (STP)
cf conversion	28.32	L
ppm conversion	1,000,000	

EXAMPLE CALCULATIONS
(HAPS)
Total Pollutant Flow Rate (To Flare)= ((Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(Total LFG to Flare [cfm])
*(60min*24hr*365 days)*(1ton/2000 lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)

Pollutant Flow rate to Flare = (Total pollutant flow rate [tons/yr])*(Collection efficiency)

Pollutant Emissions through landfill = (Total pollutant flow rate [tons/yr]) * (1 - collection efficiency)

Emission = Rate * Emission Factor;

(NMOCs/VOCs)
Maximum Flare flow rate = (Molecular Weight of Compound[g/mol])*(Concentration of Compound[ppm]/1,000,000)*(LFG Flow from flare [cfm])
*(60min*24hr*365days)*(1ton/2000lb)*(1lb/453.6g)*(1mol/24.04L @ STP)*(28.32L/1cf)*oxygen content correction factor [(20.9-10)/(20.9-3)]

TABLE 4
LANDFILL GAS EMISSIONS - GREENHOUSE GAS
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

	Metric Tons			
	CO_2	CH_4	N_2O	CO_2e
Baseline (CA) Fugitive	7,187	2,028	0.0	50,698
Baseline (CA) Flare	8,057	0.5	0.1	41
Baseline (CA) Total	15,244	2,028	0.1	50,740
Baseline (CP) Fugitive	13,288	3,962	0.0	99,043
Baseline (CP) Flare	20,800	1.3	0.3	107
Baseline (CP) Total	34,088	3,963	0.3	99,150
Project (FP) Fugitive	17,428	5,196	0.0	129,898
Project (FP) Flare	48,354	3.0	0.6	249
Project (FP) Total	65,782	5,199	0.6	130,147
Project Increase (FP-CP)	31,694	1,236	0.3	30,997
Project Increase (FP-CA)	50,538	3,170	0.5	79,407

Landfill Surface Increase	10,241	3,168	0.0	79,200
Landfill Increase (FP-CA) (lb/day)	61,867	19,138	0.0	478,455
Flare Increase	40,297	2.5	0.5	207
Flare Increase (FP-CA) (lb/day)	243,435	15	2.9	1,252

Annual Increase (tpy)	51,396	3,171	0.6	80,288	(including Generator emissions)
Daily Increase (lb/day)	310,489	19,153	3.4	485,026	(including Generator emissions)

	Metric Tons										
	CH4 Generation	CO2 Generation	CH4 Collected	CH4 Oxidized in Cover	CO2 from oxidation in cover	CO2 collected	CO2 passing through cover	Flare Heat Input (mmBtu/yr)	CO2 from flaring	CH4 from flaring	N2O from flaring
Baseline (CA)	9,013	26,270	6,760	225	620	19,703	6,568	154,737	8,057	0.50	9.75E-02
Baseline (CP)	17,608	48,311	13,206	440	1,211	36,233	12,078	399,456	20,800	1.28	2.52E-01
Project (FP)	23,093	63,362	17,320	577	1,588	47,521	15,840	928,629	48,354	2.97	5.85E-01

99%	Combustion Efficiency
75%	Collection Efficiency
10%	Oxidation in LF Surface
2.75	CO2 to CH4 mass ratio
25	CH4 GWP
298	N2O GWP
8760	hours/year
52.07	CO2 EF (kg/mmBtu)
3.20E-03	CH4 EF (kg/mmBtu)
6.30E-04	N2O EF (kg/mmBtu)
1000	kg/MT
2205	lb/MT
365	day/year

TABLE 5
C&D SORTING - CAP AND GHG EMISSIONS
RECOLOGY HAY ROAD LANDFILL
VACAVILLE, CALIFORNIA

C&D Sorting Operations

C&D Waste Processing Operation (from AP-42 11.19.2-2)	No. of Sources	Emission Factor		Daily Emissions		Annual Emissions	
		PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Truck Unloading -Fragmented Stone	1	1.6E-05	1.6E-05	0.002	0.002	0.0003	0.0003
Fines Screening (controlled)	1	0.0022	0.0022	0.33	0.33	0.043	0.043
Conveyor Transfer Point (controlled)	5	4.6E-05	1.3E-05	0.01	0.002	0.001	0.0003
Truck Loading - Conveyor, crushed stone	1	0.00010	0.00010	0.02	0.02	0.002	0.002
Total		0.0025	0.0024	0.35	0.35	0.046	0.045

Notes: (a) Based on 500 tpd of C&D waste processing for 5 days/week and 52 weeks/year.

Portable IC Engine Emissions

Value	VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SOx	CO_2	CH_4	N_2O	CO_2e
Emission Factor (a) (g/bhp-hr, kg/mmBtu for GHG)	0.14	2.6	0.3	0.015	0.015	0.002	72.96	3.00E-03	6.00E-03	74.82
Maximum Daily Emissions (b) (lbs/day, kg/day for GHG)	1.2	22.9	2.6	0.1	0.1	0.02	7,282	0.30	0.60	7,468
Maximum Annual Emissions (c) (tons/year, metric tons/year for GHGs)	0.2	3.0	0.3	0.02	0.02	0.002	859	0.04	0.07	880.56

Notes: (a) Final Tier 4 certification standards found in Table 1 of 40 CFR 1039.101, SO2 emissions are based on a fuel sulfur content of 15 ppmw, and
(b) Based on a 500 hp engine operating 8 hours/day at full load.
(c) Based on 5 days/week and 52 weeks/year of operation.

41	gallon/hr
25	CH4 GWP
298	N2O GWP estimated fuel consumption rate for 500 hp generator
0.138	mmBtu/gallon
260	operating days/year
8	operating hours/day
1000	kg/MT
2.205	lb/kg