December 28, 2021
Project No. 01210112.02, Task 7

Mr. Jeffrey Gove
Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, California 94105

Subject: **BAAQMD RULE 8-34 ANNUAL REPORT, BERKELEY LANDFILL, BERKELEY, CALIFORNIA (FACILITY NO. 3590)**

Dear Mr. Gove:

On behalf of the City of Berkeley (City), SCS Engineers (SCS) is submitting this Bay Area Air Quality Management District (BAAQMD), Regulation 8, Rule 34 Annual Report for the Berkeley Landfill in Berkeley, California (Plant No. 3590).

This BAAQMD Rule 8-34 Annual Report covers the reporting period of December 1, 2020 through November 30, 2021. The report pertains to the landfill gas (LFG) collection and control system (GCCS) operated at the landfill and includes the information required by BAAQMD Rule 8-34-411.

If you have any questions or need any additional information, please contact Anne Liu at (669) 213-3407 or Gabrielle Stephens at (562) 355-6510.

Sincerely,

Anne Liu
Staff Professional
SCS ENGINEERS

Gabrielle Fourie Stephens
Project Manager
SCS ENGINEERS

cc: Samantha Kinstrey; City of Berkeley
Pat Sullivan, SCS Engineers
Steven Harquail; SCSFS (electronic copy)

Enclosure

BAAQMD Rule 8-34 2021 Annual Report
Berkeley Landfill
Berkeley, California (Facility No. 3590)

Prepared for:

City of Berkeley
Public Works Department
1947 Center St., 4th Floor
Berkeley, California 94704

For Submittal to:

Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, California 94105

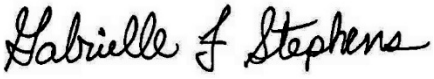
SCS ENGINEERS

01210112.02 Task 7 | December 2021

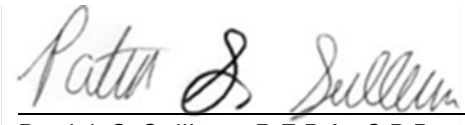
3843 Brickway Boulevard, Suite 208
Santa Rosa, CA 95403
707-546-9461

This Bay Area Air Quality Management District (BAAQMD) Rule 8-34 Annual Report for the Berkeley Landfill in Berkeley, California, dated December 2021, was prepared and reviewed by the following:

Anne Liu
Staff Professional
SCS ENGINEERS



Gabrielle Fourie Stephens
Senior Project Manager
SCS ENGINEERS



Patrick S. Sullivan, R.E.P.A., C.P.P.
Senior Vice President
SCS ENGINEERS

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1.0 INTRODUCTION

This Bay Area Air Quality Management District (BAAQMD) Rule 8-34 Annual Report for the period of December 1, 2020 through November 30, 2021 for the closed Berkeley Landfill (Landfill; Plant # 3590) is being submitted by the City of Berkeley (City) to the BAAQMD. The Annual Report pertains to the landfill gas (LFG) collection and control system (GCCS) operated at the City.

This report includes the following information, as required by BAAQMD Rule 8-34-411 for small design capacity landfills:

- All collection system and/or component downtime and reasons for the shutdown (8-34-501.1).
- All emission control system downtime and reason for the shutdown (8-34-501.2).
- Continuous temperature monitoring and dates of any excesses (8-34-501.3 and 507).
- Testing performed to satisfy of the requirements of this rule (8-34-501.4).
- Monthly landfill gas flow rates and excesses (8-34-501.5).
- Collection and emission control system leak testing and any excesses, action taken to correct excesses, and re-monitored concentrations (8-34-501.6 and 503).
- Annual waste acceptance rate and the current amount of waste in-place (8-34-501.7).
- Records of non-degradable waste if area is excluded from LFG collection (8-34-501.8).
- Continuous flow monitoring (8-34-501.10 and 508).

Information summarizing the monitoring activities associated with the above-listed items is provided in the following sections.

2.0 SITE BACKGROUND INFORMATION

The Landfill is located in Berkeley, California and is owned and operated by the City. The site is closed.

The 90-acre Landfill, located north of Spinnaker Way, is listed as Site Number 01-AC-0001 in the state solid waste information system (SWIS) database. The site forms the northern portion of a man-made peninsula, bounded by the San Francisco Bay on the west, north and east, and the Berkeley Marina on the south. The Landfill, which was constructed on reclaimed tidelands of San Francisco Bay, began receiving waste in 1961 and continued operations until 1983. The site was designated as a Class II-2 sanitary landfill and was permitted for disposal of non-hazardous municipal solid waste. The Landfill was closed in phases during the period 1981 through 1989 per the California Code of Regulations (CCR) Title 14 and 23 requirements in effect at the time. The Landfill is currently developed as a City park known as Cesar Chavez Park and is undergoing post-closure

monitoring and maintenance through various programs administered by CalRecycle, San Francisco Bay Regional Water Quality Control Board (RWQCB) and the BAAQMD.

At the time of closure, there were an estimated 1.5 million tons of waste in place. The City does not have accurate records of the amount of refuse placed in the Landfill since wastes were disposed at the site during a time period when such records were not required.

2.1 EXISTING LANDFILL GAS COLLECTION AND CONTROL SYSTEM

The City maintains BAAQMD Permit to Operate (PTO; Plant #3590) for the Landfill and its GCCS. The GCCS collects LFG from all areas of the landfill and sends it to a flare station where the LFG is combusted within an enclosed flare. The GCCS for the site was installed and became operational in 1988. It consists of a header piping network, vertical extraction wells 1 through 42 installed in the refuse fill, 16 horizontal gas collectors installed in fill south of Spinnaker Way, and one enclosed flare. The header piping network, vertical and horizontal wells and their associated components are all installed below ground.

A drawing of the LFG collection system showing all the extraction wells listed and their unique well identification numbers is provided in ***Appendix A***. Additional details about the GCCS are provided in the GCCS Design Plan, which was prepared for the site by SCS Engineers (SCS, 2001) and submitted to the BAAQMD. Other information is in the report by SCS Engineers: *Construction Completion Report: Landfill Gas Collection and Control System Improvements, Berkeley Landfill Berkeley, California,* dated September 12, 2016, which was also submitted to the BAAQMD.

Due to the continuing decline in gas volume and quality at the closed Landfill, the City replaced former flare A-3 with a much smaller capacity enclosed flare (2.4 million British Thermal Units per hour (MMBtu/hr)), A-4, which commenced operation on June 9, 2016. The old A-3 flare was permanently decommissioned and removed from the site.

3.0 MONITORING AND RECORDS

3.1 CONTINUOUSLY MONITORED PARAMETERS

In accordance with Condition No. 1826, Part 3 of the current PTO, the GCCS must be operated continuously under BAAQMD Rule 8-34-301.1. To comply with this requirement, the landfill owner/operator is required to maintain full-time operation of the LFG collection system and LFG flare, as well as individual extraction wells. Downtime for any of these components must be reported in the Rule 8-34 Semi-Annual Report. The downtime information is summarized below and in ***Table 1*** (attached). Records of continuously monitored parameters are available for review upon request.

3.1.1 Gas Extraction System Downtime

During the reporting period, there were instances when the LFG extraction (collection) system was shut down for scheduled maintenance or inspection; or in response to performance monitoring, or due to pre-programmed shutdowns based on parametric indicators of system components prior to non-compliance, which also included inspection and maintenance activities. Since the LFG extraction system and LFG flare (control system) are designed to work in concert, any downtime of the LFG flare also results in downtime for the extraction system. During the reporting period, all instances of collection system downtime were due to shutdown of the control system, with each

downtime event including inspection and/or maintenance activities, as required for Rule 8-34-113 downtime, with the exception of one event. Section 113 of Rule 8-34 allows landfill operators to shut down the GCCS up to 240 hours per each calendar year for inspection, maintenance, or repairs. However, per BAAQMD Compliance Advisory dated November 5, 2018, the BAAQMD does not recognize power outages to meet the 8-34-113 exemption, even if the GCCS is inspected and maintenance is performed during the shutdown or prior to restarting the system.

There were four Pacific Gas and Electric (PG&E) power outages/surges that occurred during the reporting period on March 6, 2021 from 00:09 to 06:55; July 16, 2021 from 16:48 to July 17, 2021 at 10:33; September 25, 2021 from 16:43 to September 28, 2021 at 11:17; and November 8, 2021 from 20:14 to November 9, 2021 at 11:33. On behalf of the City, SCS submitted breakdown relief forms upon discovery and confirmation of the power outages/surges. The 30-Day Breakdown Reports for these incidents are provided as ***Appendix B***.

On August 6, 2021, the BAAQMD issued NOV Number A58845 to the City for allegedly failing to operate the GCCS continuously during the July 2021 power outage event. The 10-Day Response email that was sent to the inspector, Ms. Grace Leung, on August 16, 2021, is provided in ***Appendix B.*** On November 22, 2021, the BAAQMD issued NOV Number A58784 to the City for allegedly failing to operate the GCCS continuously during the September 2021 power outage event. The 10-Day Response Letter to the NOV, dated December 1, 2021, is also provided in ***Appendix B***.

A summary of the instances when the collection system was off-line is provided in ***Table 1***, including the date the system was off-line, the reason for the downtime, and the total elapsed time of the downtime.

3.1.2 Emission Control System Downtime

A summary of each LFG flare downtime event, is provided in ***Table 1***, including the date, the reason for the downtime, and the duration of each downtime event. During the reporting period, the GCCS was offline for a total 198.97 hours. Out of the total downtime hours, 92.03 hours were allowed under Rule 8-34-113, which is within the 240 hours of allowed downtime due to scheduled maintenance or inspection; or in response to performance monitoring, or due to pre-programmed shutdowns based on parametric indicators of system components prior to non-compliance, which also included inspection and maintenance activities. The remaining 106.93 hours of downtime were due to PG&E power outages/surges which was discussed previously.

When the LFG flare device goes off-line, an automatic valve is actuated which interrupts LFG flow to that device. When the LFG flare is off-line, an electric relay is triggered, which turns off the extraction system (i.e., LFG blower). Therefore, during this reporting period, there were no instances where LFG flow passed through the flare uncontrolled (i.e., free venting), and the collected LFG stream was never diverted from the LFG flare.

3.1.3 Individual Wells Downtime

Although the entire GCCS may not go off-line, individual extraction wells are occasionally taken off-line for inspection, maintenance, or repair; or for other unforeseen circumstances. These are generally planned events, although such events can occur without notice. In each case, the City is able to bring the extraction wells back on-line and maintain compliance. During the reporting period, no individual wells were taken off-line.

3.1.4 Flow Meter and Temperature Gauge Downtime

The operation of the LFG control device (Flare A-4) is continuously monitored as required by Rule 8-34. The GCCS at the Landfill is equipped with a continuous flow measuring device and temperature gauge, which provide continuous readout displays as well as printed information on a chart recorder. The temperature gauge and flow meter were calibrated during the reporting period by SCSFS; calibration procedures can be provided upon request.

There was no flow meter or temperature gauge downtime due to breakdown, maintenance, or repair during the reporting period. Copies of chart recorder printouts are available for inspection at the site.

3.2 COMPONENT LEAK QUARTERLY MONITORING

3.2.1 First Quarter 2021 Monitoring

SCSFS monitored the Landfill GCCS components (well and valve vaults, blower/flare station piping) on January 8, 2021 for any leaks with a methane concentration greater than 1,000 parts per million by volume in air (ppmv) as required by BAAQMD Rule 8-34-503. Testing was performed using an flame ionization detector (FID), which was calibrated on the date of the monitoring event. No component leaks in excess of 1,000 ppmv were discovered during this monitoring event. Records of the component leak monitoring, including calibration records and procedures for the testing instrument, are available upon request. First quarter 2021 monitoring results are provided in *Appendix C*.

3.2.2 Second Quarter 2021 Monitoring

SCSFS monitored the Landfill GCCS components on April 30, 2021 for any leaks with a methane concentration of greater than 1,000 ppmv as required by BAAQMD Rule 8-34-503. Testing was performed using an FID, which was calibrated on the date of the monitoring event. No component leaks in excess of 1,000 ppmv were discovered during this monitoring event. Records of the component leak monitoring, including calibration records and procedures for the testing instrument, are available upon request. Second quarter 2021 monitoring results are provided in ***Appendix C.***

3.2.3 Third Quarter 2021 Monitoring

SCSFS monitored the Landfill GCCS components on July 29, 2021 for any leaks with a methane concentration of greater than 1,000 ppmv as required by BAAQMD Rule 8-34-503. Testing was performed using an FID, which was calibrated on the date of the monitoring event. No component leaks in excess of 1,000 ppmv were discovered. Records of the component leak monitoring, including calibration records and procedures for the testing instrument, are available for inspection upon request. Third quarter 2021 monitoring results are provided in *Appendix C*.

3.2.4 Fourth Quarter 2021 Monitoring

SCSFS monitored the Landfill GCCS components on October 21, 2021 for any leaks with a methane concentration of greater than 1,000 ppm as required by BAAQMD Rule 8-34-503. Testing was performed by SCSFS using an FID, which was calibrated on the date of the monitoring event. No component leaks in excess of 1,000 ppmv were discovered. Records of the component leak

monitoring, including calibration records and procedures for the testing instrument, are available upon request. Fourth quarter 2021 monitoring results are provided in ***Appendix C***.

3.3 CONTROL EFFICIENCY

Annual non-methane organic compound (NMOC) control efficiency testing for flare A-4 is not required by Rule 8-34 for small design capacity landfills per Rule 8-34-120. However, annual NMOC control efficiency testing is required per BAAQMD PTO Condition No. 1826 Part 14. As such, a source test was conducted on July 13, 2021 to demonstrate compliance with the NMOC outlet concentration of 30 ppmv of NMOC as methane (for flares) requirement stated in Condition No. 1826 Part 9. The NMOC as methane at 3% oxygen (O_2) in the flare outlet was 2.3 ppmv. As such, flare A-4 is in compliance with the aforementioned permit condition. An excerpt of the July 2021 results from the source test report dated August 31, 2021, is provided as ***Appendix D***. A complete copy of the source test report was previously submitted to the BAAQMD, and is presumably on file with the BAAQMD.

3.4 LANDFILL SURFACE MONITORING

There was no landfill surface emission testing performed for the Landfill for compliance with Rule 8-34 during the reporting period, since the testing is not required for small design capacity landfills per Rule 8-34-120; nor is it required in the site's PTO.

However, SCSFS performed the annual surface emissions monitoring (SEM) event on April 30, 2021, in accordance with California Assembly Bill (AB) 32 Landfill Methane Rule (LMR) requirements. Results showed no exceedances of the LMR instantaneous and integrated thresholds. SEM data are on file with the City and are included in an annual report to the BAAQMD as required by the LMR regulation. The AB 32 program is administered separately and is not required for BAAQMD Regulation 8, Rule 34 compliance.

3.5 GAS COLLECTION SYSTEM INSTALLATIONS AND UPGRADES

No expansions to the wellfield or modifications to the GCCS were performed during the reporting period.

3.6 WELLHEAD MONTHLY MONITORING

No wellhead monitoring was performed under Rule 8-34, since the monitoring is not required for small design capacity landfills per 8-34-120; nor is it required in the site's PTO.

3.7 COVER INTEGRITY MONITORING

SCSFS monitors the integrity of the Landfill cover on a monthly basis, in accordance with BAAQMD Rule 8-34-510, using procedures specified in the GCCS Design Plan. During the reporting period, cover integrity monitoring was conducted on the following dates: December 13, 2020, January 7, February 15, March 10, April 21, May 14, June 10, July 13, August 9, September 22, October 20, and November 9, 2021. No areas of the landfill cap were observed to be damaged or significantly compromised during this reporting period. Wet ponding in areas with squirrel holes were noted in the months of December 2020, March, November, and December 2021. The SCSFS technician conducted repairs as necessary.

3.8 GAS GENERATION ESTIMATE AND MONTHLY FLOW METER READINGS

The LFG generation rate was estimated using the United States Environmental Protection Agency (EPA) LFG generation model (LandGEM), and estimated to be 103 standard cubic feet per minute (scfm) at 50 percent (%) methane during 2021. The modeled LFG capture rate, corrected to 50% methane, is estimated at 77 scfm. These projections were based on the estimated annual waste acceptance rates provided in the GCCS Design Plan (2001) and information on filling history. Annual gas generation rate estimates for the landfill are presented in ***Appendix E***. Note that the LandGEM model uses conservative default values for estimating LFG generation and recovery by the GCCS.

A gas flow rate meter is installed on the collection system between the blower and control device. Monthly LFG flow meter readings are presented in ***Table 2***. Average LFG flow to the control device during the reporting period was approximately 41.7 scfm, (corrected to 50 % methane by volume).

3.9 ANNUAL WASTE ACCEPTANCE RATE AND REFUSE IN PLACE

The Berkeley Landfill is a closed landfill that has not accepted waste since 1983. The City does not have accurate records of the amount of refuse in place and acceptance rates in the Landfill, since wastes were disposed at the site during a time such records were not required. At closure, the site had an estimated 1.5 million tons of refuse in place.

3.9.1 Non-Degradable Waste Areas

There are no Landfill areas that are excluded from the collection system requirements. Other than perimeter soil containment berms (levees) constructed in the late 1950's and early 1960's to reclaim tidal areas and create useable waste disposal cells, no areas exclusively consisting of non-degradable waste deposition are known to exist.

Tables

Table 1. GCCS Downtime
Berkeley Marina Landfill, Berkeley, California
(December 1, 2020 through November 30, 2021)

Date Offline	Date Online	Hours Down	Reason/Corrective Action
12/3/2020 10:33	12/4/2020 10:42	24.15	Planned flame failure shutdown detected by parametric monitoring device. Shutdown was pre-programmed to avoid non-compliance with temperature limit. SCS restarted the flare.
12/31/2020 0:10	12/31/2020 7:24	7.23	Planned flame failure shutdown detected by parametric monitoring device. Shutdown was pre-programmed to avoid non-compliance with temperature limit. SCS restarted the flare.
1/6/2021 13:57	1/6/2021 14:21	0.40	Planned remote shutdown to reset the programmable logic controller (PLC). Flare restarted after completing maintenance.
1/18/2021 23:36	1/19/2021 17:25	17.82	Planned remote shutdown to reset the PLC. Flare restarted after completing maintenance.
3/6/2021 0:09	3/6/2021 6:55	6.77	PG&E Utility Outage (Breakdown Relief Request Submitted)
4/16/2021 10:11	4/16/2021 10:37	0.43	Propane system maintenance was conducted and the flare was restarted after parts were acquired and maintenance was completed.
4/16/2021 10:50	4/16/2021 10:58	0.13	Planned System testing was conducted and the flare was restarted after testing was completed.
4/16/2021 17:13	4/16/2021 17:18	0.08	Planned System testing was conducted and the flare was restarted after testing was completed.
4/16/2021 18:08	4/16/2021 18:10	0.03	Propane system maintenance and testing was conducted and the flare was restarted after parts were acquired and testing was completed.
6/14/2021 8:37	6/14/2021 10:09	1.53	Planned shutdown for flow meter calibration. Flare was manually restarted.
7/16/2021 16:13	7/17/2021 10:33	18.33	PG&E Utility Outage (Breakdown Relief Request Submitted)
8/11/2021 6:39	8/11/2021 10:28	3.82	Planned remote shutdown to reset the PLC. Flare restarted after completing maintenance.
9/25/2021 16:48	9/28/2021 11:17	66.48	PG&E Utility Outage; call box malfunction; air compressor malfunction. (Breakdown Relief Request Submitted)
10/10/2021 4:07	10/10/2021 11:20	7.22	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to low flame temperature shutdown. Flare was manually restarted.
10/25/2021 11:11	10/25/2021 13:15	2.07	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to low flame temperature shutdown. Flare was manually restarted.
11/8/2021 20:12	11/9/2021 11:33	15.35	PG&E Utility Outage (Breakdown Relief Request Submitted)
11/21/2021 8:22	11/22/2021 10:57	26.58	Scheduled maintenance shutdown. Flare was manually restarted.
11/23/2021 9:11	11/23/2021 9:15	0.07	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to thermocouple malfunction. Flare automatically restarted.

Table 1. GCCS Downtime
Berkeley Marina Landfill, Berkeley, California
(December 1, 2020 through November 30, 2021)

Date Offline	Date Online	Hours Down	Reason/Corrective Action
11/23/2021 14:56	11/23/2021 15:00	0.07	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to thermocouple malfunction. Flare automatically restarted.
11/23/2021 15:01	11/23/2021 15:04	0.05	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to thermocouple malfunction. Flare automatically restarted.
11/23/2021 15:05	11/23/2021 15:08	0.05	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to thermocouple malfunction. Flare automatically restarted.
11/23/2021 15:19	11/23/2021 15:37	0.30	Planned flame failure shutdown detected by parametric monitoring device. Flare shutdown due to thermocouple malfunction. Flare automatically restarted.
No Downtime in February, and May 2021.			
Total Downtime		**198.97**	

Table 2. Monthly LFG Flow Data
Berkeley Marina Landfill, Berkeley, California
(December 1, 2020 through November 30, 2021)

Month	Average Methane Content (%)	Average Flow Rate (scfm)	Flow Rate @ 50% Methane
Dec-20	36.6	58.6	42.9
Jan-21	36.5	51.0	37.2
Feb-21	35.6	55.5	39.5
Mar-21	36.7	54.8	40.2
Apr-21	33.4	57.4	38.4
May-21	32.4	65.8	42.5
Jun-21	28.6	65.8	37.6
Jul-21	28.8	71.2	41.0
Aug-21	30.7	73.3	44.9
Sep-21	35.5	70.2	49.9
Oct-21	30.5	68.1	41.5
Nov-21	39.2	57.0	44.7
Annual Average	**33.7**	**62.4**	**41.7**

Appendix A – GCCS Drawing

APPROXIMATE SCALE IN FEET

250 0 250

APPROXIMATE LIMITS OF BERKELEY LANDFILL
(FACILITY NO. 01-AC-0001)

PG&E POWER (UG)

BLOWER/FLARE STATION

VERTICAL EXTRACTION WELLS (TYP.)

SUMP/ IMPINGEMENT (TYP. OF 8)

BERKELEY MARINA

MARINA

SPINNAKER WAY

LEGEND

- GAS COLLECTION HEADER/LATERALS (BELOW GRADE)
- 40 ⊙ VERTICAL LFG GAS EXTRACTION WELL
- TW-4 HORIZONTAL TRENCH WELL (MARINA PROPERTY)
- HC-1 HORIZONTAL COLLECTOR PIPE (MARINA PROPERTY)
- ⊕ Probe 5 LFG MONITORING WELL (MARINA PROPERTY)

SCS ENGINEERS
Environmental Consultants and Contractors
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(925) 426-0080 FAX: (925) 426-0707

PROJ. NO.	DWN. BY:	ACAD FILE:
01210112.02 T12	HLG/MJE	FIG-1 LFG PLAN_061118
DSN. BY: JJM/MJE	CHK. BY: MJE	APP. BY: J. MILLER

NOTE:
ORIGINAL TOPOGRAPHY BY AERIAL METHODS 1992. BASE MAP PROVIDED BY CITY OF BERKELEY.

SHEET TITLE: LANDFILL GAS SYSTEM PLAN

PROJECT TITLE: BERKELEY LANDFILL
CITY OF BERKELEY

NO.	REVISION	DATE

DATE: 6/11/18

SCALE: AS SHOWN

FIGURE NO. 1

Appendix B – 30-Day Breakdown Reports for Utility Outages and 10-Day NOV Response Letters

March 26, 2021
Project No. 01210112.02 Task 10

Ms. Grace Leung
Compliance and Enforcement Division
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105

Subject: **30-DAY BREAKDOWN REPORT FOR THE CLOSED BERKELEY LANDFILL FACILITY NO. 3590; REFERENCE IDs 07Y64 and 07Y65**

Dear Ms. Leung:

On behalf of the City of Berkeley (Berkeley), SCS Engineers (SCS) is submitting this 30-day follow-up breakdown report to the Bay Area Air Quality Management District (BAAQMD or District). This letter was prepared in response to a reportable compliance activity (RCA) that occurred at the Berkeley Landfill (Landfill) on March 6, 2021, and pursuant to District Regulation 1, Section 433.

The RCA event was a shutdown of the Landfill's landfill gas (LFG) collection and control system (GCCS) caused by a power outage. Upon discovery of the power outage, SCS notified the District of an after-hour RCA event by e-mail, and indicated the City was requesting breakdown relief. The City contracts with SCS for operation and maintenance (O&M) of the GCCS. Mr. Stephen Harquail, the GCCS O&M manager, notified the District of the shutdown via email to rca@baaqmd.gov on March 8, 2020, shortly after the GCCS was brought back online. The BAAQMD assigned breakdown reference ID 07Y64 and monitored excursion ID 07Y65.

DISCUSSION OF BREAKDOWN

The closed Berkeley Landfill (Landfill or Site) is equipped with a GCCS with a 2.4 million British thermal units per hour (MMBtu/hour) LFG flare (A-4) as the control device. On March 6, 2021, the GCCS shutdown at approximately 00:09 due to a utility power outage. Per correspondence with the BAAQMD inspector, it is understood that Pacific Gas & Electric Company (PG&E) has confirmed with the District that a downed power line led to a preventative shutdown for repairs unrelated to the facility.

The blower flare station (BFS) is equipped with a callout system that sends an email notification to SCS O&M personnel when the flare shuts down. This enables SCS to respond to any unplanned GCCS downtime in a timely manner and perform the necessary corrective actions to bring the GCCS back online as soon as possible. A SCS technician was immediately notified of the shutdown and mobilized to the Landfill in the morning once it was light, and therefore sufficiently safe to inspect the flare. When the technician arrived at the site, power had been already restored by the utility, PG&E. The technician inspected the flare and flare station equipment, and was able to re-start the flare. The GCCS was brought back online at approximately 6:55, with no further issues, for a total GCCS downtime of 6 hours and 46 minutes.

Please note that when the flare shuts down, LFG flow is automatically and immediately stopped, which prevents LFG from passing through the control device uncontrolled (i.e., free venting). Therefore, during this downtime event there was no free venting of LFG and no excess emissions.

According to BAAQMD Regulation 1-208, a breakdown is defined as any unforeseeable failure or malfunction of any air pollution control equipment or operating equipment, which causes a violation of any emission standard prescribed by District, California, or federal rules, regulations, or laws. As mentioned previously, there were no excess emissions associated with this shutdown. Additionally, residual vacuum remained on the GCCS when the flare shut down and valves were closed, creating an inward draw effect on the wellfield and further mitigating the potential for surface emissions. This downtime event did not involve a breakdown or malfunction of any of the site's emission control equipment, and the cause of the downtime was out of the site's control to prevent. However, the site is required by BAAQMD Regulation 8 Rule 34 (8-34) to maintain continuous operation of the GCCS. Section 113 of Rule 8-34 allows landfill operators to shut down the GCCS up to 240 hours per each calendar year for inspection, maintenance, or repairs. However, per BAAQMD Compliance Advisory dated November 5, 2018, the District no longer recognizes power disruptions as qualifying for the 8-34-113 exemption, and all power irregularities resulting in a GCCS shutdown must now be reported as deviations. As this shutdown event was caused by a PG&E power outage, the City notified the BAAQMD in order to seek breakdown relief under District Regulation 1, Section 112.

According to District Regulation 1, Section 431, facilities seeking breakdown relief must notify the BAAQMD of the breakdown condition immediately, with due regard for public safety. The power outage occurred on a Saturday, outside of BAAQMD business hours, so the BAAQMD was unavailable by phone. After the SCS technician re-started the flare, the District was notified of an after-hour RCA event by e-mail, and indicated the City was requesting breakdown relief. On Monday, March 8, 2020, SCS submitted a completed RCA Form via email to rca@baaqmd.gov. The BAAQMD assigned breakdown reference ID 07Y64 and monitored excursion reference ID 07Y65.

In addition, according to District Regulation 1, Section 113, the District is required to deem a breakdown of over 24 hours a violation. As the duration of the downtime event was well under 24 hours and the District was notified of the shutdown shortly after resolving the breakdown, on the same day as the occurrence, it is SCS' and the City's understanding this shutdown event is eligible for breakdown relief.

Excess Emissions

As previously discussed, no excess emissions occurred during this breakdown event.

CONCLUSION

The downtime event described herein lasted approximately 7 hours, was quickly remedied once the O&M technician arrived at the Landfill, and resulted in no excess emissions. The City's O&M contractor followed up by timely submitting an RCA form requesting breakdown relief, per the compliance advisory issued November 2018 indicating power outages are considered to be a breakdown per BAAQMD Reg. 1 Section 112. The parametric excursion event item on the RCA form was also checked, specifically because of prior directives from BAAMQD inspectors, and out of an abundance of caution. A copy of the submitted RCA form is enclosed.

A request for breakdown relief was submitted for this utility power-based downtime; however, the site does not believe that filing for breakdown relief was the appropriate measure, as there was no "breakdown" of any site-owned control device. Nor do we believe that a parametric excursion occurred when the flare was offline, because there was no excursion from operating limits and no missing operating data. SCS believes Rule 1-523.3 only requires the reporting of parametric monitoring excursions when the monitoring equipment shows an exceedance of a permit condition when the flare is operating, not when it is shut down.

With the submittal of this combined breakdown notification and report, the site has completed all reporting requirements for this event within the required timeframes. The site is committed to operating its systems in compliance with all applicable regulations and will continue to ensure future compliance.

We trust that this letter satisfies the 30-day breakdown reporting requirements specified by District regulations. Please contact the undersigned at 707-536-6857 if you have any questions or wish to discuss this matter further.

Sincerely,

Michael O'Connor
Project Manager, CAPP
SCS Engineers

cc: Reeve Battle, City of Berkeley
Samantha Kinstrey, City of Berkeley
Stephen Harquail, SCS

Enclosure

RCA Form

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

COMPLIANCE & ENFORCEMENT DIVISION

Notification Form

Reportable Compliance Activity (RCA)

See back of form for instructions →

1. ■ **BREAKDOWN RELIEF:** ***District Use Only*** **BREAKDOWN REFERENCE #:**

2. ■ **MONITOR EXCESS EMISSION or EXCURSION:** ***District Use Only*** **REFERENCE #:**

3. ■ **MONITOR IS INOPERATIVE:** ***District Use Only*** **REFERENCE #:**

4. ☐ **PRESSURE RELIEF DEVICE (PRD):** ***District Use Only*** **PRD REFERENCE #:**

SITE INFORMATION AND DESCRIPTION INFORMATION (REQUIRED)

Company	City of Berkeley	Site #	3590
Address	11 Spinnaker Way; Berkeley, CA	Source #	A-4
Reported by	Stephen Harquail, SCS Engineers (rca@baaqmd.gov)	Phone #	(503) 867-2369
Indicated Excess	Utility Power Outage	Fax #	
Allowable Limit	Continuous Gas System Operation	Averaging Time	N/A
Start Time/Date	3/6/21 12:09 a.m.	Clear Time	3/6/21 6:55 a.m.

Monitor/device type(s): ☐ ▶CEM ☐ ▶GLM [x] ▶Parametric ☐ ▶PRD ☐ ▶Non-monitor

Monitor description(s):

Parameter(s) exceeded or not functioning due to inoperation

☐ ▶NO_x ☐ ▶SO_2 ☐ ▶CO ☐ ▶CO_2 ☐ ▶H_2S ☐ ▶TRS ☐ ▶NH_3
☐ ▶O_2 ☐ ▶H_2O ☐ ▶Opacity ☐ ▶Lead ☐ ▶Gauge Pressure [X] ▶Flow
☐ ▶Hydrocarbon Breakthrough (VOC) [X] ▶Temperature ☐ ▶Wind Speed
☐ ▶Wind Direction ☐ ▶Steam ☐ ▶Other

Unit(s) of Measurement

☐ ▶ppm ☐ ▶ppb ☐ ▶min/hr > 20% ☐ ▶inches H_2O ☐ ▶mmHg
☐ ▶psig ☐ ▶pH [x] ▶^{0}Fahrenheit [X] ▶Other (describe) scfm

Event Description: The City of Berkeley submits this RCA/breakdown relief request to the BAAQMD for landfill gas (LFG) collection and control system (GCCS) downtime that occurred at the Berkeley Landfill on the morning of March 6, 2021, commencing at just past midnight and ending at 6:55 a.m. on the same day. This downtime was due to a utility power outage. A technician was automatically notified of the shutdown and arrived at the site after power had been restored by Pacific Gas & Electric Company. After inspection of the GCCS, the flare was restarted at 6:55 a.m., with no further issues. There is no reason to believe there were any excess LFG emissions during the downtime, as the GCCS valves worked as designed and automatically shut off all gas flow when the power went out.

District Use Only

Received by Date Time

General Instructions

November 8, 2021
Project No. 01210112.02 Task 10

Mr. Jeffrey Gove
Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105

Subject: **30-DAY BREAKDOWN REPORT FOR THE CLOSED BERKELEY LANDFILL FACILITY NO. 3590; REFERENCE IDs 08C35 and 08C36**

Dear Mr. Gove:

On behalf of the City of Berkeley (Berkeley), SCS Engineers (SCS) is submitting this 30-day follow-up breakdown report to the Bay Area Air Quality Management District (BAAQMD or District). This letter was prepared in response to a reportable compliance activity (RCA) event that occurred at the Berkeley Landfill (Landfill) on September 25, 2021, which was discovered on October 11, 2021, pursuant to District Regulation 1, Section 433.

The RCA event was a shutdown of the Landfill's landfill gas (LFG) collection and control system (GCCS) caused by a power outage. Upon discovery of the power outage on October 11, 2021, SCS air compliance staff notified the District of an after-hour RCA event by e-mail, and indicated the City was requesting breakdown relief on October 12, 2021. On the same day, SCS submitted an RCA form to rca@baaqmd.gov requesting breakdown relief. The BAAQMD assigned breakdown reference ID 08C35 and monitored excursion ID 08C36.

DISCUSSION OF BREAKDOWN

The closed Berkeley Landfill (Landfill or Site) is equipped with a GCCS with a 2.4 million British thermal units per hour (MMBtu/hour) LFG flare (A-4) as the control device. The City contracts with SCS for operation and maintenance (O&M) of the GCCS. On September 25, 2021, the GCCS shutdown at approximately 16:43 due to a utility power outage.

The blower flare station (BFS) is equipped with a callout system that sends an email notification to SCS O&M personnel when the flare shuts down. This enables SCS to respond to any unplanned GCCS downtime in a timely manner and perform the necessary corrective actions to bring the GCCS back online as soon as possible. Due to failure of the battery backup for the automatic notification system, no notification was transmitted. A GCCS technician discovered the shutdown during routine site activities on September 28, 2021, and after completing an inspection, restarted the flare and restored the GCCS to full operation. The GCCS was brought back online at approximately 11:17 on September 28, 2021, with no further issues, for a total GCCS downtime of 66.57 hours.

Please note that when the flare shuts down, LFG flow is automatically and immediately stopped, which prevents LFG from passing through the control device uncontrolled (i.e., free venting). Therefore, during this downtime event there was no free venting of LFG and no excess emissions.

According to BAAQMD Regulation 1-208, a breakdown is defined as any unforeseeable failure or malfunction of any air pollution control equipment or operating equipment, which causes a violation of any emission standard prescribed by District, California, or federal rules, regulations, or laws. As mentioned previously, there were no excess emissions associated with this shutdown. Additionally, residual vacuum remained on the GCCS when the flare shut down and valves were closed, creating an inward draw effect on the wellfield and further mitigating the potential for surface emissions. This downtime event was out of the site's control to prevent as it was due to utility outage. However, the site is required by BAAQMD Regulation 8 Rule 34 (8-34) to maintain continuous operation of the GCCS. Section 113 of Rule 8-34 allows landfill operators to shut down the GCCS up to 240 hours per each calendar year for inspection, maintenance, or repairs. However, per BAAQMD Compliance Advisory dated November 5, 2018, the District no longer recognizes power disruptions as qualifying for the 8-34-113 exemption, and all power irregularities resulting in a GCCS shutdown must now be reported as deviations. As this shutdown event was caused by a PG&E power outage, the City notified the BAAQMD in order to seek breakdown relief under District Regulation 1, Section 112.

According to District Regulation 1, Section 431, facilities seeking breakdown relief must notify the BAAQMD of the RCA event immediately, with due regard for public safety. The power outage occurred on September 25, 2021; however, it was not identified as possibly having been caused by a power outage until October 11, 2021, as previously noted. Upon confirmation of the power outage, SCS Air Compliance Staff notified the District by e-mail that the City was requesting breakdown relief on October 12, 2021. On the same day, SCS submitted a completed RCA Form via email to rca@baaqmd.gov. The BAAQMD assigned breakdown reference ID 08C35 and monitored excursion ID 08C36.

Following the RCA event, the City has procured new, upgraded equipment for the notification system at the flare station. Future notifications regarding power outage events will be sent to the O&M provider, air compliance staff, and City staff to ensure outages are discovered in a timely fashion. The City will notify the BAAQMD once the new system is in installed.

Excess Emissions

As previously discussed, no excess emissions occurred during this breakdown event.

CONCLUSION

The downtime event described herein lasted approximately 66. 57 hours, was quickly remedied once the O&M technician discovered the event at the Landfill, and resulted in no excess emissions. The City's air compliance contractor followed up by timely submitting an RCA form requesting breakdown relief, per the compliance advisory issued November 2018 indicating power outages are considered to be RCAs per BAAQMD Reg. 1 Section 112. The parametric excursion event item on the RCA form was also checked, specifically because of prior directives from BAAMQD inspectors, and out of an abundance of caution. A copy of the submitted RCA form is enclosed.

A request for breakdown relief was submitted for this utility power-based downtime under an abundance of caution. A detailed inspection of the automatic notification system and battery backup system has been completed. The site does not believe that parametric excursion occurred when the flare was offline, because there was no excursion from operating limits and no missing operating data. SCS believes Rule 1-523.3 only requires the reporting of parametric monitoring excursions

when the monitoring equipment shows an exceedance of a permit condition when the flare is operating, not when it is shut down.

With the submittal of this RCA follow-up report, the site has completed all reporting requirements for this event within the required timeframes. The site is committed to operating its systems in compliance with all applicable regulations and will continue to ensure future compliance.

We trust that this letter satisfies the 30-day breakdown reporting requirements specified by District regulations. Please contact the undersigned Michael O'Connor at 707-536-6857 or at moconnor@scsengineers.com if you have any questions or wish to discuss this matter further.

Sincerely,

Anne Liu
Staff Professional
SCS Engineers

cc: Samantha Kinstrey, City of Berkeley
Grace Leung, BAAQMD
Michael O'Connor, SCS
Stephen Harquail, SCS

Enclosure

RCA Form

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

COMPLIANCE & ENFORCEMENT DIVISION

Notification Form

Reportable Compliance Activity (RCA)

See back of form for instructions →

1. ■ **BREAKDOWN RELIEF:** ***District Use Only*** **BREAKDOWN REFERENCE #:**

2. ■ **MONITOR EXCESS EMISSION or EXCURSION:** ***District Use Only*** **REFERENCE #:**

3. ☐ **MONITOR IS INOPERATIVE:** ***District Use Only*** **REFERENCE #:**

4. ☐ **PRESSURE RELIEF DEVICE (PRD):** ***District Use Only*** **PRD REFERENCE #:**

SITE INFORMATION AND DESCRIPTION INFORMATION (REQUIRED)

Company	City of Berkeley	Site #	3590
Address	11 Spinnaker Way; Berkeley, CA	Source #	A-4
Reported by	Michael O'Connor, SCS Engineers (rca@baaqmd.gov)	Phone #	(707) 536-6857
Indicated Excess	Utility Power Outage	Fax #	
Allowable Limit	Continuous Gas System Operation	Averaging Time	N/A
Start Time/Date	9/25/21 approx. 4:43 p.m.	Clear Time	9/28/21 11:17 a.m.
Monitor/device type(s)	☐ ▶CEM ☐ ▶GLM X ▶Parametric ☐ ▶PRD ☐ ▶Non-monitor		
Monitor description(s)			

Parameter(s) exceeded or not functioning due to inoperation

☐ ▶NO_x	☐ ▶SO_2	☐ ▶CO	☐ ▶CO_2	☐ ▶H_2S	☐ ▶TRS	☐ ▶NH_3
☐ ▶O_2	☐ ▶H_2O	☐ ▶Opacity	☐ ▶Lead	☐ ▶Gauge Pressure		X ▶Flow
☐ ▶Hydrocarbon Breakthrough (VOC)			X ▶Temperature	☐ ▶Wind Speed		
☐ ▶Wind Direction			☐ ▶Steam	☐ ▶Other		

Unit(s) of Measurement

☐ ▶ppm	☐ ▶ppb	☐ ▶min/hr > 20%	☐ ▶inches H_2O	☐ ▶mmHg
☐ ▶psig	☐ ▶pH	x ▶^{0}Fahrenheit	X ▶Other (describe) scfm	

Event Description: SCS Engineers, on behalf of the City of Berkeley, submits this RCA/breakdown relief request to the BAAQMD for landfill gas (LFG) collection and control system (GCCS) downtime that occurred at the Berkeley Landfill on September 25, 2021, commencing at approximately 4:43 p.m., and ending at approximately 11:17 a.m. on September 28, 2021. This downtime is believed to have been causedd by a utility power outage. Due to failure of the battery backup for the automatic notification system, no notification was transmitted. A GCCS technician discovered the shutdown during routine site activities on September 28, 2021, and after completing an inspection, restarted the flare and restored the GCCS to full operation. Upon subsequent review of flare data on October 11, 2021, the date and time of the initial shutdown was determined; and a utility power outage was determined to be the most likely cause. A detailed inspection of the automatic notification system, including batter backup, is underway. Once the cause of failure of the notification system has been confirmed, all necessary repairs, including replacement of the battery backup system, if warranted, will be completed. A written follow-up report will be submitted within 30 days, as required, and will include a detailed description of the causes of the downtime and notification malfunction, and corrective actions taken to prevent recurrences. Once the GCCS was restarted, it resumed operation with no further issues. There is no reason to believe there were any excess LFG emissions during the downtime, as the GCCS valves worked as designed and automatically shut off all gas flow when the power went out..

District Use Only		
Received by	Date	Time

General Instructions

December 1, 2021
Project No. 01210112.02 Task 10

Mr. Jeffrey Gove
Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105

Subject: **30-DAY BREAKDOWN REPORT FOR THE CLOSED BERKELEY LANDFILL FACILITY NO. 3590; REFERENCE IDs 08D46 and 08D47**

Dear Mr. Gove:

On behalf of the City of Berkeley (City), SCS Engineers (SCS) is submitting this 30-day follow-up breakdown report to the Bay Area Air Quality Management District (BAAQMD or District). This letter was prepared in response to a reportable compliance activity (RCA) event that occurred at the Closed Berkeley Landfill (Landfill) on November 8, 2021, which was discovered on November 10, 2021, pursuant to District Regulation 1, Section 433.

The RCA event was a shutdown of the Landfill's landfill gas (LFG) collection and control system (GCCS) caused by a power surge. Upon discovery of the power surge on November 10, 2021, SCS air compliance staff notified the District of an after-hour RCA event by e-mail, and indicated the City was requesting breakdown relief on the same day. On the same day, SCS also submitted an RCA form to rca@baaqmd.gov requesting breakdown relief. The BAAQMD assigned breakdown reference ID 08D46 and monitored excursion ID 08D47.

DISCUSSION OF BREAKDOWN

The Landfill is equipped with a GCCS with a 2.4 million British thermal units per hour (MMBtu/hour) LFG flare (A-4) as the control device. The City contracts with SCS for operation and maintenance (O&M) of the GCCS. On November 8, 2021, the GCCS shutdown at approximately 20:14 due to a utility power surge.

The blower flare station (BFS) is equipped with a callout system that sends an email notification to SCS O&M personnel when the flare shuts down. This system enables SCS to respond to any unplanned GCCS downtime in a timely manner and perform the necessary corrective actions to bring the GCCS back online as soon as possible. Due to a malfunction of components of the automatic notification system, no notification was transmitted. A GCCS technician discovered the shutdown during routine site activities following review of the flare shutdown history on November 10, 2021 at approximately 08:00. The GCCS automatically restarted at approximately 11:33 on November 9, 2021, with no further issues, for a total GCCS downtime of 15.32 hours.

Please note that when the flare shuts down, LFG flow is automatically and immediately stopped, which prevents LFG from passing through the control device uncontrolled (i.e., free venting). Therefore, during this downtime event there was no free venting of LFG and no excess emissions.

According to BAAQMD Regulation 1-208, a breakdown is defined as any unforeseeable failure or malfunction of any air pollution control equipment or operating equipment, which causes a violation of any emission standard prescribed by District, California, or federal rules, regulations, or laws. As mentioned previously, there were no excess emissions associated with this shutdown. Additionally, residual vacuum remained on the GCCS when the flare shut down and valves were closed, creating an inward draw effect on the wellfield and further mitigating the potential for surface emissions. This downtime event was out of the site's control to prevent as it was due to utility surge. However, the site is required by BAAQMD Regulation 8 Rule 34 (8-34) to maintain continuous operation of the GCCS, unless one or more of the Rule's several exemption provisions apply. Section 113 of Rule 8-34 allows landfill operators to shut down the GCCS up to 240 hours per each calendar year for inspection, maintenance, or repairs. However, per BAAQMD Compliance Advisory dated November 5, 2018, the District no longer recognizes power disruptions as qualifying for the 8-34-113 exemption, and all power irregularities resulting in a GCCS shutdown must now be reported as deviations. As this shutdown event was caused by a PG&E power surge, the City notified the BAAQMD in order to seek breakdown relief under District Regulation 1, Section 112.

According to District Regulation 1, Section 431, facilities seeking breakdown relief must notify the BAAQMD of the RCA event immediately, with due regard for public safety. The power surge occurred during the evening of November 8, 2021; however, the power surge was not identified until November 10, 2021, as previously noted. Upon confirmation of the power surge, SCS Air Compliance Staff notified the District by e-mail that the City was requesting breakdown relief on November 10, 2021 at 08:18, 18 minutes following discovery of the power surge. On the same day, SCS submitted a completed RCA Form via email to rca@baaqmd.gov. The BAAQMD assigned breakdown reference ID 08D46 and monitored excursion ID 08D47.

The City has procured new, upgraded equipment for the notification system at the flare station following the RCA event. Future notifications regarding power surge events will be sent to the O&M provider, air compliance staff, and City staff to ensure surges are discovered in a timely fashion. As of November 23, 2021, the new, upgraded equipment has been successfully installed and the notification system is operational.

Excess Emissions

As previously discussed, no excess emissions occurred during this breakdown event.

CONCLUSION

The downtime event described herein lasted approximately 15.32 hours, and resulted in no excess emissions. The City's air compliance contractor followed up by submitting an RCA form requesting breakdown relief in a timely manner, per the compliance advisory issued November 2018 indicating power outages are considered to be RCAs per BAAQMD Reg. 1 Section 112. The parametric excursion event item on the RCA form was also checked, specifically because of prior directives from BAAMQD inspectors, and out of an abundance of caution. A copy of the submitted RCA form is enclosed.

A request for breakdown relief was submitted for this utility power-based downtime under an abundance of caution. A detailed inspection of the automatic notification system and battery backup system has been completed. The City and SCS do not believe that a parametric excursion occurred when the flare was offline, because there was no excursion from operating limits and no missing

operating data. SCS believes Rule 1-523.3 only requires the reporting of parametric monitoring excursions when the monitoring equipment shows an exceedance of a permit condition when the flare is operating, not when it is shut down.

With the submittal of this RCA follow-up report, the City has completed all reporting requirements for this event within the required timeframes. The City is committed to operating its systems in compliance with all applicable regulations and will continue to ensure future compliance.

We trust that this letter satisfies the 30-day breakdown reporting requirements specified by District regulations. Please contact Michael O'Connor at 707-536-6857 or at moconnor@scsengineers.com or Anne Liu at 669-213-3407 or at aliu@scsengineers.com if you have any questions or wish to discuss this matter further.

Sincerely,

Anne Liu
Staff Professional
SCS Engineers

cc: Samantha Kinstrey, City of Berkeley
Grace Leung, BAAQMD
Michael O'Connor, SCS
Stephen Harquail, SCS

Enclosure

RCA Form

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

COMPLIANCE & ENFORCEMENT DIVISION

Notification Form

Reportable Compliance Activity (RCA)

See back of form for instructions →

1. ■ **BREAKDOWN RELIEF: *District Use Only* BREAKDOWN REFERENCE #:**

2. ■ **MONITOR EXCESS EMISSION or EXCURSION: *District Use Only* REFERENCE #:**

3. ☐ **MONITOR IS INOPERATIVE: *District Use Only* REFERENCE #:**

4. ☐ **PRESSURE RELIEF DEVICE (PRD): *District Use Only* PRD REFERENCE #:**

SITE INFORMATION AND DESCRIPTION INFORMATION (REQUIRED)			
Company	City of Berkeley	Site #	3590
Address	11 Spinnaker Way; Berkeley, CA	Source #	A-4
Reported by	Michael O'Connor, SCS Engineers (rca@baaqmd.gov)	Phone #	(707) 536-6857
Indicated Excess	Utility Power Outage	Fax #	
Allowable Limit	Continuous Gas System Operation	Averaging Time	N/A
Start Time/Date	11/8/2021 approx. 8:14 p.m.	Clear Time	11/9/21 approx. 11:33 a.m.
Monitor/device type(s)	☐ ▶CEM ☐ ▶GLM X ▶Parametric ☐ ▶PRD ☐ ▶Non-monitor		
Monitor description(s)			

Parameter(s) exceeded or not functioning due to inoperation

☐ ▶NO_x ☐ ▶SO_2 ☐ ▶CO ☐ ▶CO_2 ☐ ▶H_2S ☐ ▶TRS ☐ ▶NH_3
☐ ▶O_2 ☐ ▶H_2O ☐ ▶Opacity ☐ ▶Lead ☐ ▶Gauge Pressure X ▶Flow
☐ ▶Hydrocarbon Breakthrough (VOC) X ▶Temperature ☐ ▶Wind Speed
☐ ▶Wind Direction ☐ ▶Steam ☐ ▶Other

Unit(s) of Measurement

☐ ▶ppm ☐ ▶ppb ☐ ▶min/hr > 20% ☐ ▶inches H_2O ☐ ▶mmHg
☐ ▶psig ☐ ▶pH X ▶^{0}Fahrenheit X ▶Other (describe) scfm

Event Description: SCS Engineers (SCS), on behalf of the City of Berkeley, submits this RCA/breakdown relief request to the BAAQMD for landfill gas (LFG) collection and control system (GCCS) downtime that occurred at the Berkeley Landfill on November 8, 2021, commencing at approximately 8:14 p.m., and ending at approximately 11:33 a.m. on November 9, 2021. This downtime is believed to have been caused by a utility power surge/spike. Due to failure of the automatic notification system, no notification was transmitted. A GCCS technician discovered the shutdown during routine site activities, during review of the flare shutdown alarm history, on November 10, 2021 at approximately 8:00 a.m.. SCS promptly notified the BAAQMD and requested breakdown relief at 8:18 a.m. the same day. After completing an inspection of the flare station, the technician ensured the GCCS was operating under normal conditions. Upon subsequent review of flare data on November 10, 2021, the date and time of the initial shutdown was determined; and a utility surge/spike was determined to be the most likely cause. The site was already in the process of addressing issues with the notification system, and so has procured new, upgraded equipment for the notification system at the flare station. It is awaiting installation. A written follow-up report will be submitted within 30 days, as required, and will include a detailed description of the causes of the downtime and notification malfunction, and corrective actions taken to prevent recurrences. Once the GCCS was restarted, it resumed operation with no further issues. There is no reason to believe there were any excess LFG emissions during the downtime, as the GCCS valves worked as designed and automatically shut off all gas flow when the power went out.

District Use Only		
Received by	Date	Time

General Instructions

Combined 30-Day Breakdown Report and NOV A58845 10-day Response Letter for July 16, 2021 RCA Event

From: O'Connor, Michael
Sent: Monday, August 16, 2021 7:40 PM
To: Grace Leung
Cc: Harquail, Stephen; Kinstrey, Samantha
Subject: Berkeley RCA event - gas system shutdown due to power outage

Tracking:

Recipient	Delivery
Grace Leung	
Harquail, Stephen	Delivered: 8/16/2021 7:40 PM
Kinstrey, Samantha	

Ms. Leung –

SCS Engineers (SCS) is providing this email to summarize the circumstances of the shutdown of the gas system at the City of Berkeley Landfill on July 16, 2021, and the subsequent actions taken to bring the system back online. The following discussion includes follow-up information previously provided in SCS' email communications with the District subsequent to the event in question (on July 26 and 29, and August 2 and 4).

On 7/16/21 SCS personnel received an automatic email notification at approximately 4 am that the flare had shutdown. SCS dispatched a technician to the site to investigate and, if possible, to restart the flare. The technician was on site from approximately 5 to 5:30 am, including time spent getting to and from the truck and the flare station. According to our records, the power was partially restored at approximately 5:34 am. However, SCS had already departed. The power was apparently on as of that time, but apparently at a reduced level such that it could not fully activate all gas system infrastructure; and so the gas system was not able to reset. Therefore, the system would not auto-restart. A technician subsequently returned to the site on Saturday at approximately 10 am. The flare was restarted manually after resetting the CPU battery backup and the microcomputer PC power back up. Proper operation was verified and SCS departed.

As previously communicated to the District, it was not possible to re-start the system during the technician's initial trip to the site. An attempt was made and it was unsuccessful. The technician originally mobilized to the site with the goal of ensuring it was safe to operate the system, and to get it back online. There would have been no conceivable motivation for the technician to leave the site with the gas system offline, if it could have been re-started. Indeed, a follow-up trip to the site was required because the gas system could not be started up during the initial site visit, and the auto-restart could not activate it after the technician left the site.

SCS was surprised and dismayed that an NOV was issued by the District during ongoing communications with the District about the circumstances associated with this downtime event.

Sincerely,
Michael O'Connor and Stephen Harquail

Michael O'Connor
SCS Engineers
Office: 707.546.9461 x5223
Direct: 707.236.3791
Mobile: 707.536.6857
moconnor@scsengineers.com

December 1, 2021
Project No. 01210112.02 Task 10

Mr. Jeffrey Gove
Director of Compliance and Enforcement
Bay Area Air Quality Management District
375 Beale Street, Suite 600
San Francisco, CA 94105

Subject: **10-DAY RESPONSE TO NOTICE OF VIOLATION NUMBER A58784 FOR THE CLOSED BERKELEY LANDFILL, FACILITY NO. 3590**

Dear Mr. Gove:

On behalf of the City of Berkeley (City), SCS Engineers (SCS) is submitting this 10-Day Response to Notice of Violation (NOV) Number A58784, which was issued by Bay Area Air Quality Management District (BAAQMD) Inspector, Ms. Grace Leung, to the closed Berkeley Landfill (Landfill) on November 22, 2021. Pursuant to BAAQMD Regulation 8, Rule 34, Section 8-34-301.1, the gas collection and control system (GCCS) shall remain in continuous operation, except as allowed under one or more of the Rule's exemption provisions.

NOV No. A58784

NOV No. A58784 was issued by BAAQMD inspector Ms. Grace Leung for an alleged violation of BAAQMD Regulation 8, Rule 34, Section 304.1 and California Code of Regulations (CCR) Title 17 Section 95464(b)(1)(A). Please note the correct section in BAAQMD Regulation 8, Rule 34 for continuous GCCS operation is Section 301.1 (Landfill Gas Collection and Emission Control Requirements). Per the NOV, the Landfill allegedly failed to operate the GCCS continuously during Reportable Compliance Activity (RCA) event 08C35 and 08C36. A copy of the NOV can be found in *Attachment A*.

The closed Berkeley Landfill (Landfill or Site) is equipped with a GCCS with a 2.4 million British thermal units per hour (MMBtu/hour) LFG flare (A-4) as the control device. The City contracts with SCS for operation and maintenance (O&M) of the GCCS. On September 25, 2021, the GCCS shut down at approximately 16:43 due to a utility power outage.

The blower flare station (BFS) is equipped with a callout system that sends an email notification to SCS O&M personnel when the flare shuts down. This system enables SCS to respond to any unplanned GCCS downtime in a timely manner and perform the necessary corrective actions to bring the GCCS back online as soon as possible. Due to a malfunction of components of this automatic notification system, no notification was transmitted. A GCCS technician discovered the shutdown during routine site activities on September 28, 2021, and after completing an inspection, restarted the flare and restored the GCCS to full operation. The GCCS was brought back online at approximately 11:17 on September 28, 2021, with no further issues, for a total GCCS downtime of 66.57 hours.

Please note that LFG flow to the flare is automatically stopped when the flare shutdown, thus preventing LFG flow from passing through the control device uncontrolled (i.e., free venting). Therefore, during this downtime event there was no free venting of LFG and no excess emissions.

According to District Regulation 1, Section 431, facilities seeking breakdown relief must notify the BAAQMD of the RCA event immediately, with due regard for public safety. The power outage occurred on September 25, 2021; however, it was not identified as possibly having been caused by a power outage until October 11, 2021. Upon confirmation of the power outage, SCS Air Compliance Staff notified the District by e-mail that the City was requesting breakdown relief on October 12, 2021. On the same day, SCS submitted a completed RCA Form via email to rca@baaqmd.gov. The BAAQMD assigned breakdown reference ID 08C35 and monitored excursion ID 08C36. A 30-Day Breakdown Report was submitted on November 8, 2021.

CORRECTIVE ACTION AND PREVENTATIVE MEASURES

In response to this RCA event, the City has procured new, upgraded equipment for the notification system at the flare station. Future notifications of GCCS shutdowns, including those caused by power outage events, will be sent to the O&M provider, air compliance staff, and City staff to ensure outages are discovered in a timely fashion. As of November 23, 2021, the new, upgraded equipment has been successfully installed and the notification system is operational.

In addition, SCS is discussing with the City pursuing District approval for a Less than Continuous Operation (LTCO) allowance pursuant to District Regulation 8, Rule 34, Section 404, so that the Landfill can again operate the GCCS intermittently, as had previously been allowed by the District under an approved LTCO petition from April 2009 until installation of the new, smaller flare was competed in May 2019. SCS intends to request such an allowance to operate the new flare less than continuously.

CONCLUSION

The downtime event described herein lasted approximately 66.57 hours, was quickly remedied once the O&M technician discovered the shutdown, and resulted in no excess emissions. Pursuant to BAAQMD Regulation 1, Sections 112 and 113, appropriate corrective measures were taken to address the shutdown of the GCCS. The Landfill completed all necessary reporting requirements pursuant to BAAQMD Regulation 1, Sections 430, 431, and 432 within the required timeframes upon discovery and confirmation of the event. SCS notified the BAAQMD immediately via email and submitted a subsequent RCA form within the required 24-hour timeframe. The 30-Day Follow-Up Notification was submitted to the BAAQMD as required. The City therefore respectfully requests that NOV A58784 be rescinded, and that breakdown relief be granted by the District.

The City is committed to operating its systems in compliance with all applicable regulations and will continue to make every effort to ensure future compliance.

We trust that this letter satisfies the 10-day NOV response reporting requirements specified by District regulations. Please contact Michael O'Connor at 707-536-6857 or at moconnor@scsengineers.com or Anne Liu at 669-213-3407 or at aliu@scsengineers.com if you have any questions or wish to discuss this matter further.

Sincerely,

Anne Liu
Staff Professional
SCS Engineers

cc: Samantha Kinstrey, City of Berkeley
Grace Leung, BAAQMD
Michael O'Connor, SCS
Stephen Harquail, SCS

Enclosure

Attachment
NOV A58784

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
375 Beale Street, Suite 600, San Francisco, CA 94105
(415) 749-5000

NOTICE OF VIOLATION

No. A58784

ISSUED TO: City of Berkeley/Engr Div/Public Works ☑ P ☐ G ☐ N# A3590

ADDRESS: 1947 Center St, 4th Floor

CITY: Berkeley STATE: CA ZIP: 94704

PHONE: (510) 981-6336

☐ N# Mailing Address on F61

OCCURRENCE

NAME: Berkeley Landfill

ADDRESS: Cesar Chavez Park ☐ Same As Above

CITY: Berkeley ZIP 94704

SOURCE: S# 1 NAME: Landfill

EMISSION PT: P# NAME:

DATE: 9/25/2021 - 9/28/2021 TIME: HRS

☐ REG 2 RULE 1 SEC 301
No Authority to Construct

☐ REG 2 RULE 1 SEC 302
No Permit to Operate

☐ REG 1 SEC 301
H & S CODE - 41700
Public Nuisance

☑ REG 2 RULE 1 SEC 307
Failure to Meet Permit Condition

☐ REG 5 SEC 301
Prohibited Open Burning

☐ REG 6 RULE 1 SEC 301
Excessive Visible Emissions

☑ REG 8 RULE 34 SECTION 304.1 CODE

☐ REG CCR RULE Title 17 SECTION 95464(b)(1)(A) CODE

Details: P/C #1826.3 non-continuous operation of flare

RECIPIENT NAME: Stephen Harquail

TITLE: SCS Project Manager

SIGNING THIS NOTICE IS NOT AN ADMISSION OF GUILT X

→ WITHIN 10 DAYS, RETURN A COPY OF THIS NOTICE WITH A WRITTEN DESCRIPTION OF THE IMMEDIATE CORRECTIVE ACTION YOU HAVE TAKEN TO PREVENT CONTINUED OR RECURRENT VIOLATION. **THIS VIOLATION IS SUBJECT TO SUBSTANTIAL PENALTY.** YOUR RESPONSE DOES NOT PRECLUDE FURTHER LEGAL ACTION.

ISSUED BY: G. Leung INSP # 881

DATE: 11/22/2021 TIME: 15:00 HRS ☑ MAILED

PLEASE PRESS HARD

Continued On Reverse

Appendix C – Quarterly Component Leak Monitoring Results

Component Emissions Monitoring Results
Berkeley Marina Landfill, Berkeley, California

Field Technician and Weather Conditions						
Technician	**Date**	**Ambient Temp**	**Barometric Pressure (in - Hg)**	**General Weather**	**Wind Speed**	**Wind Direction**
D.Gibson	01/08/2021	54	30.1	cloudy	2	ses
Name	**Date**	**Well Vault (ppm)**	**Valve Vault (ppm)**	**Area Scan (ppm)**	**Re-Testing**	**Comments**
EW-01	01/08/2021	3.2 ppm	2.6 ppm	3.4 ppm	None	
EW-02	01/08/2021	3.3 ppm	2.9ppm	3.0 ppm	None	
EW-03	01/08/2021	3.1 ppm	3.0 ppm	3.3 ppm	None	
EW-04	01/08/2021	3.2 ppm	3.0 ppm	3.3 ppm	None	
EW-05	01/08/2021	3.7 ppm	3.0 ppm	3.0 ppm	None	
EW-07	01/08/2021	3.3 ppm	3.0 ppm	3.1 ppm	None	
EW-09	01/08/2021	3.3 ppm	2.9 ppm	3.0 ppm	None	
EW-10	01/08/2021	3.2 ppm	2.9 ppm	3.0 ppm	None	
EW-13	01/08/2021	3.3 ppm	2.9 ppm	3.1 ppm	None	
EW-15	01/08/2021	3.3 ppm	3.0 ppm	3.0 ppm	None	
EW-16	01/08/2021	3.1 ppm	2.9 ppm	2.9 ppm	None	
EW-17	01/08/2021	3.2 ppm	2.9 ppm	3.0ppm	None	
EW-18	01/08/2021	3.2 ppm	3.0 ppm	3.1 ppm	None	
EW-19	01/08/2021	3.1 ppm	3.0 ppm	3.3 ppm	None	
EW-20	01/08/2021	3.2 ppm	3.0 ppm	3.0 ppm	None	
EW-21	01/08/2021	3.2 ppm	3.1 ppm	3.1 ppm	None	
EW-22	01/08/2021	3.1 ppm	3.0 ppm	3.0 ppm	None	
EW-24	01/08/2021	3.3 ppm	3.0 ppm	3.2 ppm	None	
EW-25	01/08/2021	3.3 ppm	3.1 ppm	3.3 ppm	None	
EW-26	01/08/2021	3.1 ppm	3.0 ppm	3.0 ppm	None	
EW-27	01/08/2021	3.3 ppm	3.1 ppm	3.0 ppm	None	
EW-28	01/08/2021	3.2 ppm	3.2 ppm	3.1 ppm	None	
EW-30	01/08/2021	3.2 ppm	3.0 ppm	3.1 ppm	None	
EW-31	01/08/2021	3.3 ppm	3.0 ppm	3.1 ppm	None	
EW-32	01/08/2021	3.3 ppm	3.1 ppm	3.2 ppm	None	
EW-33	01/08/2021	3.2 ppm	3.3 ppm	3.0 ppm	None	
EW-34	01/08/2021	3.2 ppm	3.0 ppm	3.2 ppm	None	
EW-36	01/08/2021	3.3 ppm	2.9 ppm	3.0 ppm	None	
EW-37	01/08/2021	3.0 ppm	3.0 ppm	3.2 ppm	None	
EW-38	01/08/2021	3.3 ppm	3.2 ppm	3.3 ppm	None	
EW-39	01/08/2021	3.2 ppm	3.2 ppm	3.2 ppm	None	
EW-40	01/08/2021	3.2 ppm	2.9 ppm	3.1 ppm	None	
EW-41	01/08/2021	3.3 ppm	3.0 ppm	3.1 ppm	None	
EW-42	01/08/2021	3.2 ppm	2.9 ppm	3.1 ppm	None	
HC-1	01/08/2021	3.3 ppm	3.0 ppm	3.1 ppm	None	
HC-2	01/08/2021	3.2 ppm	2.9 ppm	3.1 ppm	None	
TW-01	01/08/2021	3.2 ppm	3.2 ppm	3.1 ppm	None	
TW-02	01/08/2021	3.3 ppm	2.9 ppm	2.9 ppm	None	
TW-03	01/08/2021	3.2 ppm	2.9 ppm	3.1 ppm	None	
TW-04	01/08/2021	3.2 ppm	3.0 ppm	3.1 ppm	None	
TW-05	01/08/2021	3.3 ppm	3.1 ppm	3.0 ppm	None	
TW-06	01/08/2021	3.2 ppm	2.8 ppm	2.9 ppm	None	
TW-07	01/08/2021	3.1 ppm	3.0 ppm	3.2 ppm	None	
TW-08	01/08/2021	3.2 ppm	3.1 ppm	3.2 ppm	None	
TW-09	01/08/2021	3.2 ppm	3.1 ppm	3.2 ppm	None	
TW-10	01/08/2021	3.2 ppm	3.1 ppm	3.3 ppm	None	
TW-11	01/08/2021	3.3 ppm	2.9 ppm	3.1 ppm	None	
TW-12	01/08/2021	3.3 ppm	3.0 ppm	2.9 ppm	None	
TW-13	01/08/2021				--	Blocked
TW-14	01/08/2021				--	Blocked
					Re-Testing	
flare	01/08/2021	**Valves**	**Piping**	**Flex hoses**	none	
		3.8	4.8	4.2		

Component Emissions Monitoring Results
Berkeley Marina Landfill, Berkeley, California

Field Technician and Weather Conditions						
Technician	**Date**	**Ambient Temp**	**Barometric Pressure (in - Hg)**	**General Weather**	**Wind Speed**	**Wind Direction**
R.Haslam/H.Ott	04/30/2021	64	29.9	Overcast	4	North
Name	**Date**	**Well Vault (ppm)**	**Valve Vault (ppm)**	**Area Scan (ppm)**	**Re-Testing**	**Comments**
EW-01	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-02	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-03	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-04	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-05	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-07	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-09	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-10	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-13	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-15	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-16	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-17	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-18	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-19	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-20	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-21	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-22	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-24	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-25	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-26	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-27	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-28	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-30	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-31	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-32	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-33	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-34	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-36	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-37	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-38	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-39	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-40	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-41	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-42	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-1	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-2	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-01	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-02	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-03	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-04	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-05	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-06	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-07	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-08	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-09	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-10	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-11	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-12	04/30/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-13	04/30/2021				None	Blocked
TW-14	04/30/2021				None	Blocked
		Valves	Piping	Flex hoses		
Flare	04/30/2021	3	3	3	None	

Component Emissions Monitoring Results
Berkeley Marina Landfill, Berkeley, California

Field Technician and Weather Conditions						
Technician	**Date**	**Ambient Temp**	**Barometric Pressure (in - Hg)**	**General Weather**	**Wind Speed**	**Wind Direction**
McGinn/Mmorris/Priver	07/29/2021	64	29.9	Overcast	4	North
Name	**Date**	**Well Vault (ppm)**	**Valve Vault (ppm)**	**Area Scan (ppm)**	**Re-Testing**	**Comments**
EW-01	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-02	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-03	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-04	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-05	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-07	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-09	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-10	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-13	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-15	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-16	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-17	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-18	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-19	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-20	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-21	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-22	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-24	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-25	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-26	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-27	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-28	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-30	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-31	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-32	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-33	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-34	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-36	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-37	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-38	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-39	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-40	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-41	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-42	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-1	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-2	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-01	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-02	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-03	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-04	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-05	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-06	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-07	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-08	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-09	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-10	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-11	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-12	07/29/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-13	07/29/2021				None	Blocked
TW-14	07/29/2021				None	Blocked
		Valves	Piping	Flex hoses		
Flare	07/29/2021	7	3	4	None	

Component Emissions Monitoring Results
Berkeley Marina Landfill, Berkeley, California

Field Technician and Weather Conditions						
Technician	**Date**	**Ambient Temp**	**Barometric Pressure (in - Hg)**	**General Weather**	**Wind Speed**	**Wind Direction**
McGinn/Mmorris/Priver	10/21/2021	64	29.9	Overcast	4	North
Name	**Date**	**Well Vault (ppm)**	**Valve Vault (ppm)**	**Area Scan (ppm)**	**Re-Testing**	**Comments**
EW-01	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-02	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-03	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-04	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-05	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-07	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-09	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-10	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-13	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-15	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-16	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-17	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-18	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-19	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-20	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-21	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-22	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-24	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-25	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-26	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-27	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-28	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-30	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-31	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-32	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-33	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-34	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-36	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-37	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-38	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-39	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-40	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-41	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
EW-42	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-1	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
HC-2	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-01	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-02	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-03	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-04	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-05	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-06	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-07	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-08	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-09	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-10	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-11	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-12	10/21/2021	1-3ppm	1-3ppm	1-3ppm	None	
TW-13	10/21/2021				None	Blocked
TW-14	10/21/2021				None	Blocked
		Valves	Piping	Flex hoses		
Flare	10/21/2021	7	3	4	None	

Appendix D – August 31, 2021 Source Test Report (Excerpt)

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

375 Beale Street, Suite 600
San Francisco, California 94105
(415) 771-6000

Contractor Source Test Supplemental Form

Site name: City of Berkeley Marina Landfill

NST number: 6595

Testing company: BEST ENVIRONMETAL

Test purpose:

- [x] Routine compliance testing
- [ ] Compliance test required after previous source test failure
- [ ] Start-up test
- [ ] Other, ex: trial testing for permit changes, engineering studies

  Please explain:
- [ ] Revised report with corrections noted

  Revision number:

Preliminary test results:

- [x] **Values within range set by rule or regulation**
- [ ] **Values outside of range set by rule or regulation**
- [ ] N/A
- [ ] Please explain:

Source Test Report

CITY OF BERKELEY MARINA LANDFILL
Berkeley, CA

Landfill Gas Fired Flare (A-4)
Emission Results & Landfill Gas Characterization
Facility # A3590, Condition # 1826
NST-6595

Test Date: July 13, 2021
Report Date: August 31, 2021

Performed and Reported by:

BEST ENVIRONMENTAL
339 Stealth Court
Livermore, CA 94551
Phone: (925) 455-9474
Fax: (925) 455-9479

Prepared For:

SCS Field Services
4730 Enterprise Way
Modesto, Ca 95956
Attn: Mr. Stephen Harquail

For Submittal To:

Bay Area Air Quality Management District
375 Beale Street, STE 600
San Francisco, CA 94185

REVIEW AND CERTIFICATION

Team Leader:

The work performed herein was conducted under my supervision, and I certify that the details and results contained within this report are to the best of my knowledge an authentic and accurate representation of the test program. If this report is submitted for compliance purposes it should only be reproduced in its entirety. If there are any questions concerning this report, please call the Team Leader or Reviewer at (925) 455-9474.

Shaun Irwin
Project Manager

Reviewer:

I have reviewed this report for presentation and accuracy of content, and hereby certify that to the best of my knowledge the information is complete and correct.

Basim (Bobby) Asfour
Principal

Source Test Information

Source Owner:	City of Berkeley/Engineering Division/Public Works 1947 Center St., 4th Fl Berkeley, CA 94704
Source Location:	Berkeley Marina Landfill Cesar Chaves Park (Berkeley Marina) Berkeley, California 94704
Engineering Firm:	SCS Field Services
Contact:	Stephen Harquail, (530) 867-2369
Source Description:	Landfill Gas Flare
PTO Number:	Plant #3590 (S-1/A-4)

Test Parameters & Limits:		**Average Result**
NOx:	**0.06 lbs/MMBtu**	**0.02 lbs/MMBtu**
CO:	**0.2 lbs/MMBtu**	**< 0.002 lbs/MMBtu**
NMOC:	**30 ppm @ 3% O_2 as methane**	**< 2.3 ppm @ 3% O_2**
CH_4:	**99% DRE**	**> 99.997% DRE**
Fuel Sulfur:	**300 ppm as H_2S**	**10.5 ppm as H_2S**

Source Testing Firm:	BEST ENVIRONMENTAL 339 Stealth Court Livermore, CA 94551 Phone (925) 455-9474 Fax (925) 455-9479
Contact:	Bobby Asfour
Test Date:	July 13, 2021
NST Number:	6595
Analytical Laboratories:	Atmospheric Analysis & Consultants (NMOC, Speciated VOC, TRS, Fixed gases,) 1534 Eastman Avenue, Ste. A Ventura, CA 93003 Attn: Eric Grossjean Phone: (805) 650-1642 BEST ENVIRONMENTAL (CH_4, NMOC, H_2S, HHV& F factor) 339 Stealth Court Livermore, CA 94551

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SECTION 1. INTRODUCTION

1.1. Test Purpose

Best Environmental (BE) was contracted by SCS Field Services to perform emissions testing on one landfill gas flare (A-4) to comply with Bay Area Air Quality Management District (BAAQMD) Regulation 8 Rule 34 Sections 301.3 & 412 as well as condition # 1826 of the permit. A copy of the Permit is included in the appendices.

1.2. Test Location

The testing was conducted on the flare located at the City of Berkeley, Ceasar Chavez Park, Berkeley Marina, CA 94704. (Facility #3590).

1.3. Test Date

Testing was conducted on July 13, 2021.

1.4. Test Parameters and Methods

The following emission parameters were measured:

Parameter	Monitoring & Analytical Protocols
NMOC, THC, NOx, CO & O_2	EPA Methods 3A, 7E, 10 & 25A
DSCFM	EPA Method 19 (exhaust)
Inlet NMOC & CH_4	EPA Method 18 & 25C
Fixed Gases, Btu/CF & F Factor	ASTM D-1945 & 3588
LFG organics & TRS	Modified EPA TO-15 & D-6228

1.5. Sampling and Observing Personnel

Sampling was performed by Bobby Asfour and Shaun Irwin of BE. The BAAQMD was notified of the test date; however, there was no representative present to witness the test program.

SECTION 2. SUMMARY OF RESULTS

2.1. Emission Results

Table 2.1 summarizes the flare outlet average test results. Triplicate 30-minute runs were performed according to BAAQMD and EPA test methods. Individual run results are presented in Table 1 on page 7. Landfill Gas Characterization results are located in Appendix B.

Table 2.1: Flare Outlet (A-4)

Parameter	Average Results	Limits
NOx, lbs/MMBtu	0.0195	**0.06**
CO, lbs/MMBtu	< 0.002	**0.20**
NMOC, ppm @ 3% O_2	< 2.3	**30**
CH_4 Destruction Efficiency	> 99.997	**≥ 99**

2.2. Process Data

Table 2.3 presents the Flare Operational Parameters. The flare temperature and fuel flow rate on the flare control panel was recorded by the flare monitoring system and provided by a facility representative. Process data and Fuel Meter calibrations can be found in Appendix E.

Table 2.3: Operational Parameters

Parameter	Fuel Flow Meter, SCFM	Flare Temp., ^oF
Run # 1	69	1,619
Run # 2	69	1,631
Run # 3	69	1,625

2.3. Allowable Emissions

See Table 2.1 above. The test results show that the flare is operating within the PTO gaseous emission limits and is therefore in compliance.

2.4. Comments: Discussion of Quality Assurance and Errors

Quality assurance procedures listed in the above referenced test methods and referenced in the Source Test Plan were performed and documented. The QA/QC procedures are described in Section 4.3 of the report. Documentation of the QA/QC is provided in Appendix A, B & D.

SECTION 3. SOURCE OPERATION

3.1. Process Description

The landfill gas fired flare is a control device for the treatment of landfill gas (mainly methane, carbon dioxide and nitrogen) that is generated from the decomposition of waste. The gas is collected in a network of interconnected pipes from several landfill gas extraction wells that draw a vacuum on the vapors in the landfill. The vapors are treated to remove condensate and particulate material, and then they are incinerated in the flare.

3.2. Flow Diagram

A digital image of the flare stack is contained in Appendix F.

3.3. Process and Control Operating Parameters

The flare was operated at ~1,625 ^{o}F at a fuel rate of ~69 SCFM according to the flare's monitoring devices. Flare monitoring data was provided by the facility and can be found in Appendix E.

3.4. Normal Operating Parameters

The flare was operating normally during the test periods.

3.5. Testing or Process interruptions and changes

There were no testing or process interruptions during the test series.

SECTION 4. SAMPLING AND ANALYSIS PROCEDURES

4.1. Port Location

Emissions from the flare were sampled via a circular stack with two ports 90^o apart located approximately 5 stack diameters downstream of the burners and 1 stack diameter upstream from the exit. Access to the sampling ports was provided using a 40-foot boom-lift.

The dimensional cross-sections of the stack are 56-inches (Area SQFT = 17.104). The fuel line to the flare is a 6-inch stainless steel pipe. A single port/tap was located on the flame arrestor, 2-feet upstream from the flare wall.

4.2. Point description/Labeling – ports/stack

The stack ports were not labeled but were designated as facing south and east.

4.3. Method Description, Equipment, Sampling, Analysis and QA/QC

Sampling and analytical procedures of the methods were followed as published in the BAAQMD Manual of Procedures, CARB Stationary Source Test Methods Volume I and the EPA "Quality Assurance Handbook for Air Pollution Measurement Systems" Volume III, US EPA 600/4-77-027b.

The following is an overview of the Testing Performed

Parameter	Location	Method(s)	Duration	# of Runs
THC, CH_4, NMOC, NO_x, CO & O_2	Exhaust	EPA Methods 3A, 7E, 10, 18 & 25A	30 mins	3
Flow Rate	Exhaust	EPA 19	30 mins	3
LFG organics & TRS compounds	Inlet	TO-15 & ASTM D-6228	30 mins	1
C1-C6, O_2, N_2, BTU-Fixed Gasses	Inlet	ASTM D-1945/3588	30 mins	1
Flow Rate & Flare Temp.	Inlet	Flare Metering System	~10 mins	3
NMOC & CH_4	Inlet	EPA Method 18 & 25C	30 mins	3

EPA Method 7E, 10 & 3A are all continuous monitoring techniques using instrumental analyzers. Sampling is performed by extracting exhaust flue gas from the stack, conditioning the sample and analyzing the flue gas using continuous monitoring gas analyzers in a CEM test van. The sampling system consists of a stainless-steel sample probe, Teflon sample line, glass-fiber particulate filter, glass moisture-knockout condensers in ice, Teflon sample transfer tubing, diaphragm pump and a stainless steel/Teflon manifold and flow control/delivery system. A constant sample and calibration gas supply pressure of 5 PSI is provided to each analyzer to avoid pressure variable response differences. The entire sampling system is leak checked prior to and at the end of the sampling program. The BE sampling and analytical system is checked for linearity with zero, mid and high-level span calibration gases, and is checked for system bias at the beginning of the test day.

System bias is determined by pulling calibration gas through the entire sampling system. Individual test run calibrations use the calibration gas, which most closely matches the stack gas effluent. The calibration gases are selected to fall approximately within the following instrument ranges; 80 to 95 percent for the high calibration, 40 to 60 percent for the mid-range and zero. Zero, calibration and bias drift values are determined for each test.

EPA 25A (THC as methane by FID) is an accepted method for the determination of Total Hydrocarbons (THC). A flame ionization detector (FID) total hydrocarbon continuous monitor is used for the sampling. The sampling and calibrations are performed through an all heated sample line connected directly to the THC analyzer. The FID in the analyzer is heated to 190 ^{o}C. The calibration gases are selected to fall within the following instrument ranges; 80 to 90 percent for the high calibration, 45 to 55 percent for the mid-range calibration, 25 to 35 percent for the low range calibration and zero. Zero and mid external calibration drift values are determined for each test run.

All BE calibration gases are EPA Protocol # 1. The analyzer data recording system consists of BE's Computer Data Acquisition System (DAS). The NO_2 converter is checked and confirmed to be > 90% efficient.

EPA Methods 7E, 10 & 3A met the following QA/QC method requirements:

System Criteria

Instrument Linearity	≤2% Calibration Span or ±0.5diff.
Instrument Bias	≤5% Calibration Span or ±0.5 diff.
NO_2 Converter Efficiency	≥90%
System Response Time	≤2 minutes

Test Criteria

Instrument Zero Drift	≤3% Calibration Span or ±0.5 diff.
Instrument Span Drift	≤3% Calibration Span or ±0.5 diff.

EPA Method 25A met the following QA/QC method requirements:

System Criteria

Instrument Linearity	≤5% Calibration Gas Conc.

Test Criteria

Instrument Zero Drift	≤3% Span Range
Instrument Span Drift	≤3% Span Range

The following continuous monitoring analyzers were used:

Parameter	Make	Model	Principle
NO_x	CAI	600CLD	Chemiluminescence
CO	TECO	48i	GFC IR analyzer
O_2	CAI	110P	Paramagnetic
THC	CAI	600	FID

EPA Method TO-15 & ASTM D-6228 analysis is used to determine emissions of Organic and inorganic compounds including sulfurs. Inlet gases are filled into tedlar bags corresponding to the test program. The bags are labeled respectively then sent to a laboratory and analyzed for GC/MS (gas chromatography/mass spectrometer) within 72 hours and GC/FPD (gas chromatography/flame photometric detector) within 24 hours for sulfur. For more information on the lab analysis, refer to Appendix B for method description and QA/QC.

EPA Method 18 is used to determine carbon speciated hydrocarbons (C_1, C_2 & C_3+) emissions by gas chromatograph / Flame Ionization Detection (GC/FID). Gaseous emissions are drawn through a Teflon sample line to a tedlar bag located in a rigid leak proof bag container. Sample is drawn into the bag by evacuating the container to stack gas pressure to allow sample flow without using a pump to avoid contamination. Negative pressure is adjusted to maintain an integrated sample flow between 20 to 60 minutes. The bag samples are taken to a laboratory and analyzed within 72 hours. The results are reported as methane with a detection limit of 0.5 ppm for non-methane non-ethane organic compounds (C_3+).

EPA Method 19 is used to determine stack gas volumetric flow rates using oxygen-based F-factors. F-factors are ratios of combustion gas volumes generated from heat input. The heating value of the fuel in Btu per cubic foot is determined from the analysis of fuel gas samples using gas chromatography (GC). Dedicated fuel meters monitor total fuel consumption for the source. The total cubic feet per hour of fuel multiplied times the Btu/CF provides million Btu per hour (MMBTU) heat input. The heat input in MMBTU/hr is multiplied by the F-factor (DSCF/MMBTU) and adjusted for the measured oxygen content of the source to determine volumetric flow rate. This procedure is proposed for pollutants whose compliance standards are based on emission rates (lb/day) or emission factors (lb/MMBtu).

EPA Method 25C is used to determine the emissions of NMOC and can also be used to identify and quantify fixed gases (O_2, CO_2, N_2& CH_4) in conjunction with **EPA Method 3C**. Gaseous emissions are drawn through Teflon sample line to a tedlar bag. Positive pressure is adjusted to maintain an integrated sample flow between 30 to 60 minutes. The bag samples are taken to a laboratory and analyzed for Non-Methane Organic Compound (NMOC) referenced to methane and fixed gases using GC/FID (gas chromatography/flame ionization detector-total combustion analysis and thermal conductivity detector (TCD) within 72 hours.

ASTM D-1945 & D-3588 analysis is used to determine the composition of fuel gas (e.g. Methane, fixed gases & BTU Content). Inlet gases are filled into a tedlar bag, the bag is labeled respectively then sent to a Laboratory and analyzed for fixed gases, methane and C_1-C_6 using GC/FID (gas chromatography/flame ionization detector). Each compound has calorific values that are used to calculate the gas higher heating values.

4.4. Analytical Laboratories

Three summa canisters were sent to AAC Lab. for EPA Method 25C, TO-15 (NMOC, organic compound analyses).

Three inlet and three outlet tedlar bag samples were brought to the BE Lab for ASTM D-1945/3588/6228 & EPA Method 18 (heat input, TRS & C_1, C_2, C_3+).

For more information on the analysis procedure and QA/QC refer to Appendix B.

TABLE #1
Berkeley Landfill
Flare
Test Results

TEST	1	2	3	AVERAGE	LIMIT
Test Location	Outlet	Outlet	Outlet		
Test Date	7/13/21	7/13/21	7/13/21		
Test Time	1116-1146	1158-1228	1238-1308		
Standard Temp., °F	70	70	70		
Process Data					
Flare Temp., ^{o}F	1,619	1,631	1,625	1,625	
Fuel F-Factor, DSCF/MMBtu @ 70^{o}F	10,660	10,495	10,468	10,541	
Inlet Methane (CH_4) Content, %	23.41	24.36	25.47	24.41	
Inlet Fuel Flow Rate, DSCFM	69	69	69	69	
Heat Input, MMBtu/hr	0.99	1.02	1.07	1.03	
Heat Input, MMBtu/day	23.65	24.54	25.63	24.61	
Outlet Flow Rate, DSCFM (M19)	480	461	481	474	
Outlet Emissions					
O_2, %	13.27	12.79	12.81	12.96	
CO, ppm	<1	<1	<1	<1	
CO, ppm @ 15% O_2	<0.77	<0.73	<0.73	<0.74	
CO, lbs/hr	<0.0003	<0.0003	<0.0003	<0.0003	
CO, lbs/MMBtu (O_2 based)	<0.0021	<0.0020	<0.0020	<0.0020	**0.20**
NO_x, ppm	9.29	9.89	9.92	9.70	
NO_x, ppm @ 15% O_2	7.19	7.19	7.23	7.20	
NO_x, lbs/hr	0.0028	0.0030	0.0030	0.0029	
NO_x, lbs/MMBtu (O_2 based)	0.0197	0.0194	0.0195	0.0195	**0.06**
THC, ppm as methane (25A)	<1.0	<1.0	<1.0	<1.0	
CH_4, ppm (M18)	<1.0	<1.0	<1.0	<1.0	
CH_4, lbs/hr	<0.001	<0.001	<0.001	<0.001	
NMOC, ppm (M25A)	<1.0	<1.0	<1.0	<1.0	
NMOC, ppm @ 3% O_2 as CH_4	<2.3	<2.2	<2.2	<2.3	**30**
VOC, lbs/hr as methane	<0.001	<0.001	<0.001	<0.001	
Inlet					
Inlet CH_4, ppm (M18)	234,100	243,600	254,700	244,133	
Inlet CH_4, lbs/hr	40.1	41.7	43.6	41.8	
Inlet VOC, ppm as methane (M25C)	139	222	169	177	
Inlet VOC, lbs/hr as methane	0.024	0.038	0.029	0.030	
Landfill Gas Sulfur Content					
Inlet Total Sulfur as H_2S, ppm	9.60	10.70	11.20	10.50	**300**
Destruction Efficiency					
CH_4, Destruction Efficiency %	>99.997%	>99.997%	>99.997%	**>99.997%**	**≥99%**
NMOC, Destruction Efficiency %	>95.0%	>97.0%	>95.9%	**>95.95%**	**≥98%**

Outlet NMOC = Total hydrocarbons (non-detect)

WHERE:

MW = Molecular Weight
DSCFM = Dry Standard Cubic Feet Per Minute
ppm = Parts Per Million Concentration
lbs/hr = Pound Per Hour Emission Rate
lbs/MMBtu = Pounds per million BTU
CO = Carbon Monoxide (MW = 28)
NOx = Oxides of Nitrogen as NO_2 (MW = 46)
THC = Total Hydrocarbons as Methane (MW = 16)
VOC = Total Non-Methane Hydrocarbons as Methane-C1 (MW = 16) CH_4

CALCULATIONS:

VOC ppm = THC ppm - CH_4 ppm
lbs/hr = ppm * DSCFM * MW *60 / 379 x 10^6 (@60^{o}F)
lbs/day = lbs/hr * 24
Removal Efficiency = (inlet lbs/hr-outlet lbs/hr) / Inlet lbs/hr
ppm @ 3% O_2 = ppm * 17.9 / (20.9-stack O_2)
lbs/MMBtu = Fd * M.W.* ppm * 2.59E-9 * (20.9/(20.9-%O_2))

Appendix E – LFG Generation Rate Estimate

LFG GENERATION / RECOVERY PROJECTION
BERKELEY LANDFILL, BERKELEY CA

	Disposal Rate	Refuse In-Place	LFG Recovery			LFG System Coverage	LFG Recovery from Existing and Planned System		
Year	(tons/yr)	(tons)	(scfm)	(mmcf/day)	(mmBtu/yr)	(%)	(scfm)	(mmcf/day)	(mmBtu/yr)
1961	45,000	45,000	0	0.00	0	0%	0	0.00	0
1962	45,000	90,000	19	0.03	5,110	0%	0	0.00	0
1963	45,000	135,000	38	0.05	10,019	0%	0	0.00	0
1964	45,000	180,000	55	0.08	14,735	0%	0	0.00	0
1965	45,000	225,000	72	0.10	19,267	0%	0	0.00	0
1966	73,000	298,000	89	0.13	23,621	0%	0	0.00	0
1967	73,000	371,000	117	0.17	30,984	0%	0	0.00	0
1968	73,000	444,000	143	0.21	38,058	0%	0	0.00	0
1969	73,000	517,000	169	0.24	44,854	0%	0	0.00	0
1970	73,000	590,000	193	0.28	51,384	0%	0	0.00	0
1971	73,000	663,000	217	0.31	57,658	0%	0	0.00	0
1972	73,000	736,000	239	0.34	63,686	0%	0	0.00	0
1973	73,000	809,000	261	0.38	69,478	0%	0	0.00	0
1974	73,000	882,000	282	0.41	75,042	0%	0	0.00	0
1975	73,000	955,000	302	0.44	80,389	0%	0	0.00	0
1976	73,000	1,028,000	322	0.46	85,525	0%	0	0.00	0
1977	73,000	1,101,000	340	0.49	90,461	0%	0	0.00	0
1978	73,000	1,174,000	358	0.52	95,203	0%	0	0.00	0
1979	73,000	1,247,000	375	0.54	99,758	0%	0	0.00	0
1980	73,000	1,320,000	392	0.56	104,136	0%	0	0.00	0
1981	73,000	1,393,000	407	0.59	108,341	0%	0	0.00	0
1982	73,000	1,466,000	423	0.61	112,382	0%	0	0.00	0
1983	73,000	1,539,000	437	0.63	116,264	0%	0	0.00	0
1984	0	1,539,000	451	0.65	119,994	0%	0	0.00	0
1985	0	1,539,000	433	0.62	115,289	0%	0	0.00	0
1986	0	1,539,000	416	0.60	110,769	0%	0	0.00	0
1987	0	1,539,000	400	0.58	106,425	0%	0	0.00	0
1988	0	1,539,000	384	0.55	102,252	75%	288	0.42	76,689
1989	0	1,539,000	369	0.53	98,243	75%	277	0.40	73,682
1990	0	1,539,000	355	0.51	94,391	75%	266	0.38	70,793
1991	0	1,539,000	341	0.49	90,690	75%	256	0.37	68,017
1992	0	1,539,000	328	0.47	87,134	75%	246	0.35	65,350
1993	0	1,539,000	315	0.45	83,717	75%	236	0.34	62,788
1994	0	1,539,000	302	0.44	80,434	75%	227	0.33	60,326
1995	0	1,539,000	291	0.42	77,281	75%	218	0.31	57,960
1996	0	1,539,000	279	0.40	74,250	75%	209	0.30	55,688
1997	0	1,539,000	268	0.39	71,339	75%	201	0.29	53,504
1998	0	1,539,000	258	0.37	68,542	75%	193	0.28	51,406
1999	0	1,539,000	248	0.36	65,854	75%	186	0.27	49,391
2000	0	1,539,000	238	0.34	63,272	75%	178	0.26	47,454
2001	0	1,539,000	229	0.33	60,791	75%	171	0.25	45,593
2002	0	1,539,000	220	0.32	58,407	75%	165	0.24	43,806
2003	0	1,539,000	211	0.30	56,117	75%	158	0.23	42,088
2004	0	1,539,000	203	0.29	53,917	75%	152	0.22	40,438
2005	0	1,539,000	195	0.28	51,803	75%	146	0.21	38,852
2006	0	1,539,000	187	0.27	49,772	75%	140	0.20	37,329
2007	0	1,539,000	180	0.26	47,820	75%	135	0.19	35,865
2008	0	1,539,000	173	0.25	45,945	75%	130	0.19	34,459
2009	0	1,539,000	166	0.24	44,143	75%	124	0.18	33,108
2010	0	1,539,000	159	0.23	42,412	75%	120	0.17	31,809
2011	0	1,539,000	153	0.22	40,749	75%	115	0.17	30,562
2012	0	1,539,000	147	0.21	39,152	75%	110	0.16	29,364
2013	0	1,539,000	141	0.20	37,617	75%	106	0.15	28,212
2014	0	1,539,000	136	0.20	36,142	75%	102	0.15	27,106
2015	0	1,539,000	131	0.19	34,724	75%	98	0.14	26,043
2016	0	1,539,000	125	0.18	33,363	75%	94	0.14	25,022
2017	0	1,539,000	121	0.17	32,055	75%	90	0.13	24,041
2018	0	1,539,000	116	0.17	30,798	75%	87	0.13	23,098
2019	0	1,539,000	111	0.16	29,590	75%	83	0.12	22,193
2020	0	1,539,000	107	0.15	28,430	75%	80	0.12	21,322
2021	**0**	**1,539,000**	**103**	**0.15**	**27,315**	**75%**	**77**	**0.11**	**20,486**
2022	0	1,539,000	99	0.14	26,244	75%	74	0.11	19,683
2023	0	1,539,000	95	0.14	25,215	75%	71	0.10	18,911
2024	0	1,539,000	91	0.13	24,226	75%	68	0.10	18,170
2025	0	1,539,000	88	0.13	23,276	75%	66	0.09	17,457
2026	0	1,539,000	84	0.12	22,364	75%	63	0.09	16,773

Methane Content of LFG Adjusted to: 50%
Selected Decay Rate Constant (k): 0.040
Selected Ultimate Methane Recovery F 2,850 cu ft/ton