Bay Area Air Quality Management District

939 Ellis Street
San Francisco, CA 94109
(415) 771-6000

Permit Evaluation
and
Statement of Basis
for
MAJOR FACILITY REVIEW PERMIT

for

Ameresco Keller Canyon, LLC
Facility #B7667

Facility Address:
901 Bailey Road
Pittsburg, CA 94565

Mailing Address:
111 Speen Street, Suite 410
Framingham, MA 01701

August 2014

Application Engineer: Carol Allen
Site Engineer: Carol Allen

Application: 17615

TABLE OF CONTENTS

PERMIT EVALUATION AND STATEMENT OF BASIS

for

INITIAL MAJOR FACILITY REVIW PERMIT

(INITIAL TITLE V PERMIT)

Ameresco Keller Canyon, LLC; SITE # B7667;

APPLICATION # 17615

A. BACKGROUND

This facility is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, Part 70 of Volume 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review (MFR) because it is a major facility as defined by BAAQMD Regulation 2-6-212. It is a major facility because it has the "potential to emit," as defined by BAAQMD Regulation 2-6-218, more than 100 tons per year of a regulated air pollutant. As shown in Table 1, this facility will be permitted to emit more than 100 tons/year of carbon monoxide (CO). Therefore, this facility is required to have an MFR permit pursuant to Regulation 2-6-301.

Major Facility Operating permits (Title V permits) must meet specifications contained in 40 CFR Part 70 as contained in BAAQMD Regulation 2, Rule 6. The permits must contain all "applicable requirements" (as defined in BAAQMD Regulation 2-6-202), monitoring requirements, recordkeeping requirements, and reporting requirements. The permit holders must submit reports of all monitoring at least every six months and compliance certifications at least every year.

In the Bay Area, state and District requirements are also applicable requirements and are included in the permit. These requirements can be federally enforceable or non-federally enforceable. All applicable requirements are contained in Sections I through VI of the permit.

Each facility in the Bay Area is assigned a facility identifier that consists of a letter and a 4-digit number. This identifier is also considered to be the identifier for the permit. The identifier for this facility is B7667.

B. FACILITY DESCRIPTION

Ameresco Keller Canyon, LLC (Facility # B7667) is a new landfill gas energy recovery facility that is located in Pittsburg, CA on property that is owned by Keller Canyon Landfill Company (KCLC), Facility # A4618.[1] Ameresco Keller Canyon's equipment is located in the northwestern section of KCLC's property near KCLC's landfill gas flares. The Ameresco Keller Canyon equipment includes two internal combustion engines (S-1 and S-2), a gas cleaning system (S-3), and a waste gas flare (A-1). Initial operation began in the summer of 2009.

The Ameresco Keller Canyon facility receives landfill gas collected from the Keller Canyon Landfill,[2] processes this landfill gas to remove contaminants, and recovers the energy in this gas by burning it in internal combustion engines that power electrical generators. The gas cleaning system and energy recovery operations are discussed in detail below.

Gas Cleaning System:

Landfill gas contains numerous contaminants such as: siloxanes, chlorinated and fluorinated compounds, hydrogen sulfide and other sulfur compounds. When landfill gas is combusted, these contaminants create particles and acid gases that can interfere with the proper functioning of internal combustion (IC) engines or damage engine parts. To extend the operating life of their engines and to minimize the risk of engine damage, Ameresco Keller Canyon uses a pre-combustion gas cleaning system that will remove the most harmful contaminants from the landfill gas.

Landfill gas collected from the Keller Canyon Landfill will first be delivered to the S-3 Temperature Swing Adsorption (TSA) Gas Cleaning System. During the gas cleaning phase of this operation, filters and condensers remove particles and water from the landfill gas, while the

[1] Keller Canyon Landfill Company (KCLC), owns and operates the Keller Canyon Landfill, which is an active municipal solid waste disposal site. The KCLC waste disposal facility has a separate owner and a separate SIC code from the Ameresco Keller Canyon energy facility. Therefore, these sites are considered to be distinct facilities for the purposes of Title V applicability. The KCLC waste disposal facility is also subject to Title V, and it has a separate Title V Operating Permit, which was last amended on January 11, 2012. The Statement of Basis for the Title V Renewal Permit for Site # A4618 contains a detailed explanation of the Title V permit for the KCLC facility.

[2] Landfills generate a mixture of gases called landfill gas (LFG) via a biological waste decomposition process. Landfill gas contains about 50% methane and 45% carbon dioxide, with the balance being nitrogen, oxygen, and trace amounts of VOCs and sulfur compounds. Without controls, landfill gas seeps from the landfill surface resulting in significant VOC, toxic, and greenhouse gas emissions. Prior to the construction of the Ameresco energy facility, KCLC controlled the landfill gas emissions from the Keller Canyon Landfill by using system of blowers and buried pipes to continuously extract landfill gas from the landfill and by burning this collected landfill gas in enclosed flares. In 2012, approximately 52% of the collected landfill gas from KCLC was diverted to Ameresco Keller Canyon for energy recovery.

activated carbon beds remove siloxanes and many VOC contaminants from the gas. The clean landfill gas exiting the carbon beds (up to 1320 scfm) is delivered to the S-1 and S-2 IC Engines for energy recovery.

However, the activated carbon beds have a limited adsorption capacity. When carbon has reached its adsorption capacity, the carbon must either be replaced or regenerated using a desorption process to remove the adsorbed compounds from the carbon. For S-3, the carbon beds will be regenerated. Desorption is accomplished by heating the carbon beds and flushing the beds with clean landfill gas. The resulting waste gas stream from the carbon desorption phase of the process will be similar to landfill gas but may contain higher concentrations of certain organic compound contaminants.

This desorption phase waste gas stream will be abated by the A-1 TSA Waste Gas Flare. Ameresco Keller Canyon will own and operate this small - 8.25 MM BTU (HHV) per hour - enclosed flare. If necessary, the waste gas stream will be blended with a sufficient amount of collected (untreated) landfill gas to assure proper operation of A-1. This enclosed flare can burn up to 275 scfm of waste gas with a heat content of 500 BTU/scf.

Energy Recovery Operations:

Clean landfill gas from S-3 will be delivered to the S-1 and S-2 LFG-Fired IC Engines and Gensets, where it will be burned as fuel. The S-1 and S-2 engines are GE Jenbacher, Type 6, JGS 616 GS-L.L, lean burn, 4-stroke, 16 cylinder engines. Each engine has a maximum permitted heat input rate of 19.733 MM BTU (HHV) per hour, which is equivalent to burning 658 scfm of clean landfill gas with a heat content of 500 BTU/scf. Each IC engine has a maximum rated output of 2677 bhp. Each genset has a nominal power output of 1.914 MW (3.8 MW for the two gensets combined).

Emissions:

The maximum permitted emissions from this new facility are described in detail in the Engineering Evaluations for Applications # 14265, # 16830, #24349, and #25693 (see Appendices C-G). The maximum permitted emission levels for this facility are summarized in the following table.

Table 1. Maximum Permitted Emissions for Ameresco Keller Canyon, LLC (Site # B7667)

		CO tons/year	NO_x tons/year	SO_2 tons/year	POC tons/year	PM_{10} tons/year
S-1	LFG-Fired IC Engine	54.3	15.5	4.3	4.8	2.6
S-2	LFG-Fired IC Engine	54.3	15.5	4.3	4.8	2.6
S-3	Gas Cleaning System				0.57	
A-1	Waste Gas Flare	7.2	2.2	12.2	0.03	1.2
Total	Site # B7667	115.8	33.2	20.9	10.2	6.4

C. PERMIT CONTENT

The legal and factual basis for the permit follows. The permit sections are described in the order presented in the permit.

I. Standard Conditions

This section contains administrative requirements and conditions that apply to all facilities. If the Title IV (Acid Rain) requirements for certain fossil-fuel fired electrical generating facilities or the accidental release (40 CFR § 68) programs apply, the section will contain a standard condition pertaining to these programs. This permit does not include Title IV or accidental release provisions.

Many of these conditions derive from 40 CFR § 70.6, Permit Content, which dictates certain standard conditions that must be placed in the permit. The language that the District has developed for many of these requirements has been adopted into the BAAQMD Manual of Procedures, Volume II, Part 3, Section 4, and therefore must appear in the permit.

The standard conditions also contain references to BAAQMD Regulation 1 and Regulation 2. These are the District's General Provisions and Permitting rules.

Condition I.J has been added to clarify that the capacity limits shown in Table II-A are enforceable limits.

II. Equipment

This section of the permit lists all permitted or significant sources. Each source is identified by an S and a number (e.g., S-24).

Permitted sources are those sources that require a BAAQMD operating permit pursuant to BAAQMD Rule 2-1-302.

Significant sources are those sources that have a potential to emit of more than 2 tons of a "regulated air pollutant," as defined in BAAQMD Rule 2-6-222, per year or 400 pounds of a "hazardous air pollutant," as defined in BAAQMD Rule 2-6-210, per year. This facility has no unpermitted significant sources.

All abatement (control) devices that control permitted or significant sources are listed. Each abatement device whose primary function is to reduce emissions is identified by an A and a number (e.g., A-24). If a source is also an abatement device, such as when an engine controls VOC emissions, it will be listed in the abatement device table but will have an "S" number. An

abatement device may also be a source (such as a thermal oxidizer that burns fuel) of secondary emissions. If the primary function of a device is to control emissions, it is considered an abatement (or "A") device. If the primary function of a device is a non-control function, the device is considered to be a source (or "S").

The equipment section is considered to be part of the facility description. It contains information that is necessary for applicability determinations, such as fuel types, contents or sizes of tanks, etc. This information is part of the factual basis of the permit.

Each of the permitted sources has previously been issued either an authority to construct or a permit to operate pursuant to the requirements of BAAQMD Regulation 2, Permits. These permits are issued in accordance with state law and the District's regulations. The capacities in the permitted sources table are the maximum allowable capacities for each source, pursuant to Standard Condition I.J and Regulation 2-1-403.

Following are explanations of the differences in the equipment list between the time that the facility originally applied for a Title V permit and the permit proposal date. The District has assigned a source number (S-3) to the TSA Gas Cleaning System and an abatement device number (A-1) to the TSA Waste Gas Flare. The flare was described in the Title V permit application but did not have an assigned A-#. The carbon desorption phase of the gas cleaning is an inherent part of this process and the operation of the A-1 Waste Gas Flare. However, the applicant did not describe this desorption step of the gas cleaning process as a separate source number from the flare. The proposed Title V permit includes all permit applications evaluated by the District to date. The permit condition revisions discussed in Applications # 24349 and #25693 were not described in the Applicant's Title V application submittal.

III. Generally Applicable Requirements

This section of the permit lists requirements that generally apply to all sources at a facility including insignificant sources and portable equipment that may not require a District permit. If a generally applicable requirement applies specifically to a source that is permitted or significant, the standard will also appear in Section IV and the monitoring for that requirement will appear in Sections IV and VII of the permit. Parts of this section apply to all facilities (e.g., particulate, architectural coating, odorous substance, and sandblasting standards). In addition, standards that apply to insignificant or unpermitted sources at a facility (e.g., refrigeration units that use more than 50 pounds of an ozone-depleting compound) are placed in this section.

Unpermitted sources are exempt from normal District permits pursuant to an exemption in BAAQMD Regulation 2, Rule 1. They may, however, be specifically described in a Title V permit if they are considered "significant sources" as defined in BAAQMD Regulation 2-6-239. This facility has no unpermitted significant sources.

IV. Source-Specific Applicable Requirements

This section of the permit lists the applicable requirements that apply to permitted or significant sources. These applicable requirements are contained in tables that pertain to one or more sources that have the same requirements. The order of the requirements is:

- District Rules.
- SIP Rules (if any) are listed following the corresponding District rules. SIP rules are District rules that have been approved by EPA for inclusion in the California State Implementation Plan. SIP rules are "federally enforceable" and a "Y" (yes) indication will appear in the "Federally Enforceable" column. If the SIP rule is the current District rule, separate citation of the SIP rule is not necessary and the "Federally Enforceable" column will have a "Y" for "yes". If the SIP rule is not the current District rule, the SIP rule or the necessary portion of the SIP rule is cited separately after the District rule. The SIP portion will be federally enforceable; the non-SIP version will not be federally enforceable, unless EPA has approved it through another program.
- Other District requirements, such as the Manual of Procedures, as appropriate.
- Federal requirements (other than SIP provisions).
- BAAQMD permit conditions. The text of BAAQMD permit conditions is found in Section VI of the permit.
- Federal permit conditions. The text of Federal permit conditions, if any, is found in Section VI of the permit.

Section IV of the permit contains citations to all of the applicable requirements. The text of the requirements is found in the regulations, which are readily available on the District or EPA websites, or in the permit conditions, which are found in Section VI of the permit. All monitoring requirements are cited in Section IV. Section VII is a cross-reference between the limits and monitoring requirements. A discussion of monitoring is included in Section C.VII of this permit evaluation and statement of basis.

Complex Applicability Determinations:

The NSPS requirements for MSW Landfills (40 CFR Part 60, Subpart WWW) do not apply to the S-1 and S-2 LFG-Fired IC Engines or the S-3 Gas Cleaning System, because the landfill gas that is burned in these engines has been purchased from a separate entity: Keller Canyon Landfill Company. Keller Canyon Landfill Company has satisfied the requirements of 40 CFR Part 60.752(b)(2)(iii) by routing the gas to a treatment system that processes the collected gas for subsequent sale or use.

The NSPS requirements for Stationary Spark Ignition Internal Combustion Engines (40 CFR Part 60, Subpart JJJJ) applies to new spark-ignited internal combustion engines that have a maximum power of 500 bhp or more if the engine was manufactured on or after July 1, 2007. While the S-1 and S-2 engines at this facility actually have an original manufacture date of June 2007 and

would normally not be subject to Subpart JJJJ, these engines are subject to Subpart JJJJ requirements because of the National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (40 CFR, Part 63, Subpart ZZZZ). The Subpart ZZZZ NESHAP defines new area source engines as engines that commenced construction on or after June 12, 2006 (40 CFR Part 63.6590(a)(2)(iii)). The S-1 and S-2 engines at this facility commenced construction in 2008 and are therefore considered new engines under the Subpart ZZZZ NESHAP. In accordance with 40 CFR Part 63.6590(c), new RICE must comply with Subpart ZZZZ by meeting the requirements of 40 CFR Part 60, Subpart JJJJ. The applicable sections of the NSPS and NESHAP are identified in Table IV-A.

V. Schedule of Compliance

A schedule of compliance is required in all Title V permits pursuant to BAAQMD Regulation 2-6-409.10 which provides that a major facility review permit shall contain the following information and provisions:

"409.10 A schedule of compliance containing the following elements:

10.1 A statement that the facility shall continue to comply with all applicable requirements with which it is currently in compliance;

10.2 A statement that the facility shall meet all applicable requirements on a timely basis as requirements become effective during the permit term; and

10.3 If the facility is out of compliance with an applicable requirement at the time of issuance, revision, or reopening, the schedule of compliance shall contain a plan by which the facility will achieve compliance. The plan shall contain deadlines for each item in the plan. The schedule of compliance shall also contain a requirement for submission of progress reports by the facility at least every six months. The progress reports shall contain the dates by which each item in the plan was achieved and an explanation of why any dates in the schedule of compliance were not or will not be met, and any preventive or corrective measures adopted."

Since the District has not determined that the facility is out of compliance with an applicable requirement, the schedule of compliance for this permit contains only sections 2-6-409.10.1 and 2-6-409.10.2.

The BAAQMD Compliance and Enforcement Division has conducted a review of compliance. The compliance report is contained in Appendix A of this permit evaluation and statement of basis.

VI. Permit Conditions

During the Title V permit development, the District has reviewed the existing permit conditions, deleted the obsolete conditions, and, as appropriate, revised the conditions for clarity and enforceability. Each permit condition is identified with a unique numerical identifier, up to five digits.

When necessary to meet Title V requirements, additional monitoring, recordkeeping, or reporting requirements have been added to the permit.

All changes to existing permit conditions are clearly shown in "strike-out/underline" format in the proposed permit. When the permit is issued, all "strike-out" language will be deleted and all "underline" language will be retained, subject to consideration of comments received.

The existing permit conditions are derived from previously issued District Authorities to Construct (A/C) or Permits to Operate (P/O). Permit conditions may also be imposed or revised as part of the annual review of the facility by the District pursuant to California Health and Safety Code (H&SC) § 42301(e), through a variance pursuant to H&SC § 42350 et seq., an order of abatement pursuant to H&SC § 42450 et seq., or as an administrative revision initiated by District staff. After issuance of the Title V permit, permit conditions will be revised using the procedures in Regulation 2, Rule 6, Major Facility Review.

Conditions may also be deleted due to the following:

- Redundancy in recordkeeping requirements.
- Redundancy in other conditions, regulations and rules.
- The condition has been superseded by other regulations and rules.
- The equipment has been taken out of service or is exempt.
- The event has already occurred (i.e. initial or start-up source tests).

The regulatory basis is listed following each condition. The regulatory basis may be a rule or regulation. The District is also using the following terms for regulatory basis:

- BACT: This term is used for a condition imposed by the Air Pollution Control Officer (APCO) to ensure compliance with the Best Available Control Technology in Regulation 2-2-301.
- Cumulative Increase: This term is used for a condition imposed by the APCO which limits a source's operation to the operation described in the permit application pursuant to BAAQMD Regulation 2-1-403.
- Offsets: This term is used for a condition imposed by the APCO to ensure compliance with the use of offsets for the permitting of a source or with the banking of emissions from a source pursuant to Regulation 2, Rules 2 and 4.
- PSD: This term is used for a condition imposed by the APCO to ensure compliance with a Prevention of Significant Deterioration permit issued pursuant to Regulation 2, Rule 2.
- TRMP: This term is used for a condition imposed by the APCO to ensure compliance with limits that arise from the District's Toxic Risk Management Policy, which has been superceded by BAAQMD Regulation 2, Rule 5.

In the case of this proposed initial Title V permit for Site # B7667, the only permit condition changes were to clarify the fuel restrictions and limit the time for S-3 bypass events in Condition # 23400, Part 1 and to correct the bases for several parts of Conditions # 23400 and # 23962.

VII. Applicable Limits and Compliance Monitoring Requirements

This section of the permit is a summary of numerical limits and related monitoring requirements for each source. The summary includes a citation for each monitoring requirement, frequency of monitoring, and type of monitoring. The applicable requirements for monitoring are completely contained in Sections IV, Source-Specific Applicable Requirements, and VI, Permit Conditions, of the permit.

The District has reviewed all monitoring and has determined the existing monitoring is adequate with the following exceptions.

The tables below contain only the limits for which there is no monitoring or inadequate monitoring in the applicable requirements. The District has examined the monitoring for other limits and has determined that monitoring is adequate to provide a reasonable assurance of compliance. Calculations for potential to emit will be provided in the discussion when no monitoring is proposed due to the size of a source.

Monitoring decisions are typically the result of a balancing of several different factors including: 1) the likelihood of a violation given the characteristics of normal operation, 2) degree of variability in the operation and in the control device, if there is one, 3) the potential severity of impact of an undetected violation, 4) the technical feasibility and probative value of indicator monitoring, 5) the economic feasibility of indicator monitoring, and 6) whether there is some other factor, such as a different regulatory restriction applicable to the same operation, that also provides some assurance of compliance with the limit in question.

These factors are the same as those historically applied by the District in developing monitoring for applicable requirements**.** It follows that, although Title V calls for a re-examination of all monitoring**,** there is a presumption that these factors have been appropriately balanced and incorporated in the District's prior rule development and/or permit issuance. It is possible that, where a rule or permit requirement has historically had no monitoring associated with it, no monitoring may still be appropriate in the Title V permit if, for instance, there is little likelihood of a violation**.** Compliance behavior and associated costs of compliance are determined in part by the frequency and nature of associated monitoring requirements. As a result, the District will generally revise the nature or frequency of monitoring requirements only when it can support a conclusion that existing monitoring is inadequate**.**

SO_2 Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
LFG-Fired IC Engines (S-1 and S-2) and Waste Gas Flare (A-1)	BAAQMD 9-1-301	Property Line Ground Level Limits: ≤ 0.5 ppm for 3 minutes, AND ≤ 0.25 ppm for 60 minutes, AND ≤0.05 ppm for 24 hours	None

SO_2 Discussion:

Potential to Emit for S-1 LFG-Fired IC Engine [(1)]: 4.318 tons/year of SO_2
Potential to Emit for S-2 LFG-Fired IC Engine [(1)]: 4.318 tons/year of SO_2
Potential to Emit for A-1 Waste Gas Flare [(2)]: 12.247 tons/year of SO_2

(1) Maximum potential annual SO_2 emissions from the engines were determined based on the maximum possible operating rate and the annual average sulfur content limit for the fuel (150 ppmv of sulfur).

(19.733 MM BTU/hour)/(496.9 MM BTU/MM ft^3 LFG)*(150 ft^3 S/MM ft^3 LFG)*(1 ft^3 SO_2/1 ft^3 S)/(387 ft^3 SO_2/1 lbmol SO_2)*(64.06 lbs SO_2/1 lbmol)*(8760 hours/year)/(2000 lbs/ton)
= 4.318 tons/year of SO_2 per engine

(2) Maximum potential annual SO_2 emissions from the flare were determined based on the maximum landfill gas sulfur content for Keller Canyon Landfill Gas (300 ppmv of TRS), the maximum possible landfill gas throughput rate to Ameresco (418,000 MM BTU/year), and the engine emissions above (8.637 tons/year for two engines).
(418,000 MM BTU/year)*(1E6 BTU/1 MM BTU)/(496.9 BTU/ft^3 LFG)*(300 ft^3 S/1E6 ft^3 LFG)/
(387 ft^3 S/1 lbmol S)*(1 lbmol SO_2/1 lbmol S)*(64.06 lbs SO_2/1 lbmol SO_2)/(2000 lbs SO_2/ton SO_2)
= 20.884 tons/year of SO_2 total for Ameresco Keller Canyon Site

(20.884 tons/year) - (8.637 tons/year) = 12.247 tons/year of SO_2 from A-1 Flare

BAAQMD 9-1-301: As shown above, the SO_2 emissions from these landfill gas fired combustion devices are not substantial. In addition, this facility is subject to federally enforceable limits that will ensure compliance with the Regulation 9-1-302 gas stream emission limit of 300 ppmv of SO_2 in the exhaust from the flare and each engine. Based on the source-specific landfill gas sulfur content limits, the SO_2 concentrations in the exhaust streams from the engines are expected to be less than 10% of this 9-1-302 outlet SO_2 concentration limit. Based on the maximum annual sulfur throughout data above, the concentration of SO_2 in the flare exhaust is expected to be an average of 213 ppmv at 0% O_2, or about 111 ppmv of SO_2 at a typical flare exhaust oxygen concentration of 10%, which is 47% of the 9-1-302 limit. Modeling analyses conducted at another landfill site found that sources such as landfill gas flares that are complying with the Regulation 9-1-302 limit will also comply with the ground level concentration limits

listed in Regulation 9-1-301. Since the landfill gas combustion devices have a medium to high margin of compliance with the Regulation 9-1-302 outlet SO_2 concentration limit, the District expects that these devices will also have a medium to high margin of compliance with the Regulation 9-1-301 ground level concentration limit based on the modeling analysis discussed above. This facility is currently required to monitor the sulfur content in the raw and treated landfill gases on a monthly basis to demonstrate compliance with the annual average sulfur content limits, and this facility is required to conduct annual SO_2 testing on the engines and flare. Monitoring for ground level SO_2 concentrations in addition to this existing sulfur content and SO_2 emissions monitoring would not be appropriate given the medium to high margin of compliance expected for these ground level SO_2 limits.

PM Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
LFG-Fired IC Engines (S-1 and S-2) and Waste Gas Flare (A-1)	BAAQMD 6-1-301 and SIP 6-301	No darker than: Ringelmann 1.0 for 3 minutes in any hour	None
LFG-Fired IC Engines (S-1 and S-2) and Waste Gas Flare (A-1)	BAAQMD 6-1-310 and SIP 6-310	$\leq$ 0.15 grains/dscf	None

PM Discussion:

Potential to Emit for S-1 LFG-Fired IC Engine [(1)]: 2.585 tons/year of PM_{10}
Potential to Emit for S-2 LFG-Fired IC Engine [(1)]: 2.585 tons/year of PM_{10}
Potential to Emit for A-1 Waste Gas Flare [(2)]: 1.212 tons/year of PM_{10}

(1) Maximum potential PM_{10} emissions for these engines are based on the maximum possible operating rate and the manufacturer's guaranteed emission limit of 0.1 g/bhp-hr.

(2677 bhp)*(0.1 g/bhp-hr)*(8760 hrs/yr)/(453.6 g/lbs)/(2000 lbs/ton) = 2.585 tons/year of PM_{10}

(2) Maximum potential PM_{10} emissions from the flare were determined based on the maximum possible operating rate and the manufacturer's guaranteed emission limit of 0.001 lbs/hr/scfm of LFG, which is equal to 33 lbs/MM scf of CH4. This is about twice the AP-42 emission factor of 17 lbs/MM scf of CH4.

(0.001 lbs/hr / scfm of LFG)*(276.7 scfm LFG)*(8760 hours/year)/(2000 lbs/ton) = 1.212 tons/year of PM_{10}

BAAQMD 6-1-301 and SIP 6-301 for Landfill Gas Combustion Devices: Visible particulate emissions are not normally associated with combustion of gaseous fuels, such as natural gas, propane, or landfill gas. Since particulate emissions from each unit are not substantial (< 3

tons/year per unit), and it is highly unlikely that violations of the Ringelmann 1.0 limit would occur, periodic monitoring for the Ringelmann 1.0 limit is not justified.

BAAQMD 6-1-310 and SIP 6-310 for Landfill Gas Combustion Devices: BAAQMD Regulation 6-1-310 and SIP 6-310 limit filterable particulate (FP) emissions in the stack from any source to 0.15 grains per dry standard cubic foot (gr/dscf) of exhaust volume. Based on the manufacturer's guaranteed emission rates for these devices, the IC engines will each emit 0.022 gr/dscf of exhaust at 0% oxygen and the flare will emit 0.024 gr/dscf of exhaust at 0% oxygen. The grain loading limit (0.15 gr/dscf) is far above any expected PM emissions for these devices, and the compliance ratio is at least 6:1. Since maximum potential PM emissions from the landfill gas combustion devices are not substantial, an excess of the emission standard is highly unlikely, and PM_{10} monitoring is costly, it would not be appropriate to require periodic monitoring for PM_{10} emissions from the landfill gas combustion devices listed above.

H_2S Sources

S# & Description	Emission Limit Citation	Non-Federally Enforceable Emission Limit	Monitoring
LFG-Fired IC Engines (S-1 and S-2) and Waste Gas Flare (A-1)	BAAQMD 9-2-301	Property Line Ground Level Limits: $\leq$ 0.06 ppm, averaged over 3 minutes and $\leq$ 0.03 ppm, averaged over 60 minutes	None

H_2S Discussion:

Potential to Emit for S-1 LFG-Fired IC Engine: 0.115 tons/year of H_2S
Potential to Emit for S-2 LFG-Fired IC Engine: 0.115 tons/year of H_2S
Potential to Emit for A-1 Waste Gas Flare: 0.222 tons/year of H_2S

BAAQMD 9-2-301: BAAQMD Regulation 9-2-301 limits the ground level concentration of hydrogen sulfide (H_2S) at the property line of each facility. Since landfill gas contains H_2S, any source that processes landfill gas at this site may result in H_2S emissions. During combustion, H_2S is readily converted to SO_2 and very little residual H_2S remains in the combustion exhaust streams. In addition, combustion exhaust streams undergo significant dispersion between the exhaust point and the property line. The District expects these combustion sources to result in negligible ground level H_2S concentrations at the property line. The health risk screening analysis for this facility confirmed that ground level H_2S concentrations are expected to be well below the reference exposure levels for H_2S, on which the above limits were based. Since ground level H_2S monitoring would be very expensive and violations of these limits are highly unlikely, it would not be appropriate to require this facility to conduct fence-line H_2S monitoring.

VIII. Test Methods

This section of the permit lists test methods that are associated with standards in District or other rules. It is included only for reference. In most cases, the test methods in the rules are source test methods that can be used to determine compliance but are not required on an ongoing basis. They are not "applicable requirements" as defined by Regulation 2-6-239.

If a rule or permit condition requires ongoing testing, the requirement will also appear in Section IV of the permit.

IX. Permit Shield

The District rules allow two types of permit shields. The permit shield types are defined as follows: (1) A provision in a major facility review permit explaining that specific federally enforceable regulations and standards do not apply to a source or group of sources, or (2) A provision in a major facility review permit explaining that specific federally enforceable applicable requirements for monitoring, recordkeeping and/or reporting are subsumed because other applicable requirements for monitoring, recordkeeping, and reporting in the permit will assure compliance with all emission limits.

The second type of permit shield is allowed by EPA's "White Paper 2 for Improved Implementation of the Part 70 Operating Permits Program." The District uses the second type of permit shield for all streamlining of monitoring, recordkeeping, and reporting requirements in Title V permits. The District's program does not allow other types of streamlining in Title V permits.

This facility has no permit shields.

X. Revision History

This section of the permit summarizes each revision to the permit. The District is proposing to modify the existing permit conditions by correcting the bases for several parts. This change is identified here in Section X.

XI. Glossary

This section of the permit defines and explains acronyms, abbreviations, and other terms that are used in this permit.

D. ALTERNATIVE OPERATING SCENARIOS

As discussed in the Background Section, the S-1 and S-2 Engines are typically fuelled on treated landfill gas that is delivered to the engines from the S-3 TSA Gas Cleaning System. During review of this initial Title V permit, the District was notified that the S-1 and S-2 Engines could also be fueled on minimally treated landfill gas that had bypassed the S-3 TSA Gas Cleaning System. The District realized that the fuel restrictions in Condition # 23400, Part 1 were not consistent with the typical operating scenario and did not identify the combustion of minimally treated landfill gas that had bypassed the S-3 gas treatment system as an approved alternative operating scenario for the engines. The District is proposing changes to Condition # 23400, Part 1 to correct these errors.

During an S-3 Bypass Event, the engines would be fueled on landfill gas that has undergone minimal treatment (filtering and dewatering). The concentrations of toxic air contaminants in this minimally treated gas are higher than the treated gas from S-3 that the engines are usually fired on. Thus, toxic air contaminant emissions from S-1 and S-2 would be higher during an S-3 Bypass Event. However, the A-1 Flare would not be operating during an S-3 Bypass Event since no gas is being treated and waste gas is not being generated. The District evaluated this alternative operating scenario (where an S-3 Bypass Event is occurring, S-1 and S-2 have higher TAC emissions, but A-1 is not operating) and found that health impacts would be 13% higher, if these bypass events were not limited. To ensure compliance with the District's Regulation 2, Rule 5 project risk limits, the District is proposing to limit the operating time for these S-3 Bypass Events to no more than 130 hours during any consecutive 12-month period. This limit and record keeping requirements are proposed in Condition # 23400, Part 1.

E. COMPLIANCE STATUS

A July 21, 2014 office memorandum from the Director of Compliance and Enforcement, to the Director of Engineering, presents a review of the compliance record of Ameresco Keller canyon, LLC (Site # B7667). This review was initiated as part of the District evaluation of an application for an initial Title V permit and is contained in Appendix A.

The Compliance and Enforcement Division staff has reviewed the compliance history for Ameresco Keller Canyon, LLC for the prior five-year. Most recently, the owner certified that all equipment was operating in compliance on April 25, 2014. The Compliance and Enforcement Division staff found no on-going non-compliance and no recurring pattern of violations.

The Compliance and Enforcement Division staff reviewed the compliance history for this site from June 1, 2006 through July 21, 2014. During this period, activities known to the District include:

- The District issued 5 Notices of Violation. Four violations were issued for failure to meet a permit condition limit. The limit was revised and the facility was found to be in compliance with the new limit. One violation was for failure to meet a parametric monitoring limit (minimum temperature at the flare) and for failing to report the excursion. The facility corrected this problem and has had no excursions of this temperature limit since March 2014.
- The District received no air pollution complaints alleging Ameresco Keller Canyon, LLC as the source of odors.
- The District received 122 notifications of a Reportable Compliance Activity (RCA) during this period. One notice of violation was issued for 96 days of violation. The remaining 26 RCA's were determined not to be in violation.
- The facility is not operating under an Enforcement Agreement, a Variance, or an Order of Abatement.

The Compliance and Enforcement Division has determined that for the periods reviewed, Ameresco Keller Canyon, LLC was in intermittent compliance. However, there is no evidence of on-going non-compliance and no recurring pattern of violations that would warrant consideration of a Title V permit compliance schedule.

F. DIFFERENCES BETWEEN THE APPLICATION AND THE PROPOSED PERMIT

The Title V permit application was originally submitted on March 17, 2008, before the facility had been constructed. This version is the basis for constructing the proposed Title V permit. Changes to the equipment descriptions and permit conditions include the following:

The District has assigned a source number (S-3) to the TSA Gas Cleaning System and an abatement device number (A-1) to the TSA Waste Gas Flare. The flare was described in the Title V permit application but did not have an assigned A-#. The carbon desorption phase of the gas cleaning is an inherent part of this process and the operation of the A-1 Waste Gas Flare. However, the applicant did not describe this desorption step of the gas cleaning process as a separate source number from the flare.

The District has approved modifications to the permit conditions for the equipment at this facility after the authority to construct was first issued and after the permit to operate was issued. All permit condition modifications are discussed in the reports in the attached appendices, except for the District's proposed changes to Condition # 23400, Part 1, which are discussed above in Section D Alternative Operating Scenarios.

APPENDIX A

BAAQMD COMPLIANCE REPORT

COMPLIANCE & ENFORCEMENT DIVISION

Inter-Office Memorandum

July 21, 2014

TO: JIM KARAS – DIRECTOR OF ENGINEERING

FROM: WAYNE KINO – DIRECTOR OF COMPLIANCE & ENFORCEMENT

SUBJECT: REVIEW OF COMPLIANCE RECORD OF:

AMERESCO KELLER CANYON, LLC; SITE #B7667

Background

This review was initiated as part of the District evaluation of an application by AMERESCO KELLER CANYON, LLC (AMERESCO) for a Title V Permit. It is standard practice of the Compliance and Enforcement Division to undertake a compliance record review in advance of a renewal of a Title V Permit. The purpose of this review is to assure that any non-compliance problems identified during the prior five-year permit term have been adequately addressed, or, if non-compliance persists, that a schedule of compliance is properly incorporated into the Title V permit compliance schedule. In addition, the review checks for patterns of recurring violation that may be addressed by additional permit terms. Finally, the review is intended to recommend, if necessary, any additional permit conditions and limitations to improve compliance.

AMERESCO is a landfill gas-to-electricity power plant located in Pittsburg, CA. AMERESCO can produce approximately 3.8 Megawatts of electricity using landfill gas.

Compliance Review

Compliance records were reviewed for the time period from 6/1/2006 through 7/21/2014. The results of this review are summarized as follows.

1. Violation History

Staff reviewed AMERESCO Annual Compliance Certifications and found no ongoing non-compliance and no recurring pattern of violations.

Staff also reviewed the District compliance records for the review period. During this period AMERESCO activities known to the District include:

H:\Enforcement\Title V Cert\Title_V_Compliance_Review_Ameresco Keller_B7667.doc

REVIEW OF COMPLIANCE RECORD OF
Ameresco Keller Canyon, LLC; SITE #B7667
July 21, 2014
Page 2 of 3

District-issued **5** Notice of Violations:

NOV#	Regulation	Date Occur	# of Days	Comments	Disposition
A50412A	2-1-307	8/31/10	1	Failed ST; Formaldehyde	Resolved
A50413A	2-1-307	8/31/10	1	Failed ST; Formaldehyde	Resolved
A52982A	2-6-307	10/2/13	2	Failed ST; Formaldehyde	Pending
A52983A	2-6-307	10/2/13	2	Failed ST; Formaldehyde	Pending
A53169A	1-523.3	8/3/09	96	Late reporting, Parametric	Pending
A53169B	2-6-307	7/30/09	96	Below temperature limit	Pending

NOV A50412 and NOV A50413 indicate that Formaldehyde emissions did not meet permit condition limits on a source test conducted 8/31/2010. NOV A52982 and NOV A52983 indicate that Formaldehyde emissions did not meet permit condition limits on a source test conducted 10/2/2013. The engines were tested a third time on February 5, 2014 by a third party contractor and both engines met the existing Formaldehyde emission limits and achieved compliance. NOV A53169 (A&B) was issued for 96 days from July 30, 2009 to March 1, 2014 for failure to maintain minimum temperature and for failure to report the indicated excess. All the above violations have achieved compliance. There have been no temperature excursions since March 1, 2014.

2. Complaint History

The District did not receive any air pollution complaints alleging AMERESCO as the source.

3. Reportable Compliance Activity

Reportable Compliance Activity (RCA), also known as "Episode" reporting, is the reporting of compliance activities involving a facility as outlined in District Regulations and State Law. Reporting covers breakdown requests, indicated monitor excesses, pressure relief device releases, inoperative monitor reports and flare monitoring.

Within the review period, the District received **122** notifications (failure to maintain minimum temperature and failure to report) for RCA's. One NOV was issued for 96 days of violation as a result of these RCA's. The 26 remaining RCA's were determined not to be in violation.

4. Enforcement Agreements, Variances, or Abatement Orders

There were no enforcement agreements, variances, or abatement orders for AMERESCO over review period.

REVIEW OF COMPLIANCE RECORD OF
Ameresco Keller Canyon, LLC; SITE #B7667
July 21, 2014
Page 3 of 3

Conclusion

Following the review of all available facility and District compliance records from 6/1/2006 to 7/21/2014, the District's Compliance and Enforcement Division has determined that AMERESCO was in intermittent compliance from the initial permit period through the present. AMERESCO has demonstrated no evidence of ongoing non-compliance and no recurring pattern of violations that would warrant consideration of a Title V permit compliance schedule for this facility.

3
H:\Enforcement\Title V Cert\Title_V_Compliance_Review_Ameresco Keller_B7667.doc

APPENDIX B

GLOSSARY

ACT
Federal Clean Air Act

AP-42
An EPA Document "Compilation of Air Pollution Emission Factors" that is used to estimate emissions from numerous source types. It is available electronically from EPA's web site at: http://www.epa.gov/ttn/chief/ap42/index.html

APCO
Air Pollution Control Officer: Head of Bay Area Air Quality Management District

API
American Petroleum Institute

ARB
Air Resources Board

ASTM
American Society for Testing and Materials

ATC
Authority to Construct

ATCM
Airborne Toxic Control Measure

BAAQMD
Bay Area Air Quality Management District

BACT
Best Available Control Technology

BARCT
Best Available Retrofit Control Technology

Basis
The underlying authority that allows the District to impose requirements.

C1
An organic chemical compound with one carbon atom, for example: methane

C3
An organic chemical compound with three carbon atoms, for example: propane

C5
An organic chemical compound with five carbon atoms, for example: pentane

C6
An organic chemical compound with six carbon atoms, for example: hexane

CAA
The federal Clean Air Act

CAAQS
California Ambient Air Quality Standards

CAPCOA
California Air Pollution Control Officers Association

CARB
California Air Resources Board (same as ARB)

CCR
California Code of Regulations

CEC
California Energy Commission

CEQA
California Environmental Quality Act

CEM
A "continuous emissions monitor" is a monitoring device that provides a continuous direct measurement of some pollutant (e.g. NO_x concentration) in an exhaust stream.

CFR
The Code of Federal Regulations. 40 CFR contains the implementing regulations for federal environmental statutes such as the Clean Air Act. Parts 50-99 of 40 CFR contain the requirements for air pollution programs.

CH4 or CH_4
Methane

CI
Compression Ignition

CIWMB
California Integrated Waste Management Board

CO
Carbon Monoxide

CO2 or CO_2
Carbon Dioxide

CO2e
Carbon Dioxide Equivalent. A carbon dioxide equivalent emission rate is the emission rate of a greenhouse gas compound that has been adjusted by multiplying the mass emission rate by the global warming potential of the greenhouse gas compound. These adjusted emission rates for individual compounds are typically summed together, and the total is also referred to as the carbon dioxide equivalent (CO2e) emission rate.

CT
Combustion Zone Temperature

Cumulative Increase
The sum of permitted emissions from each new or modified source since a specified date pursuant to BAAQMD Rule 2-1-403, Permit Conditions (as amended by the District Board on 7/17/91) and SIP Rule 2-1-403, Permit Conditions (as approved by EPA on 6/23/95). Used to determine whether threshold-based requirements are triggered.

District
The Bay Area Air Quality Management District

E6, E9, E12
Very large or very small number values are commonly expressed in a form called scientific notation, which consists of a decimal part multiplied by 10 raised to some power. For example, 4.53 E6 equals (4.53) x (10^6) = (4.53) x (10 x 10 x 10 x 10 x 10 x 10) = 4,530,000. Scientific notation is used to express large or small numbers without writing out long strings of zeros.

EG
Emission Guidelines

EO
Executive Order

EPA
The federal Environmental Protection Agency.

ETP
Effluent Treatment Plant

Excluded
Not subject to any District regulations.

Federally Enforceable, FE
All limitations and conditions which are enforceable by the Administrator of the EPA including those requirements developed pursuant to 40 CFR Part 51, subpart I (NSR), Part 52.21 (PSD), Part 60 (NSPS), Part 61 (NESHAPs), Part 63 (MACT), and Part 72 (Permits Regulation, Acid Rain), including limitations and conditions contained in operating permits issued under an EPA-approved program that has been incorporated into the SIP.

FP
Filterable Particulate as measured by BAAQMD Method ST-15, Particulate.

FR
Federal Register

GDF
Gasoline Dispensing Facility

GHG
Greenhouse Gas

GLM
Ground Level Monitor

grains
1/7000 of a pound

GWP
Global Warming Potential. A comparison of the ability of each greenhouse gas to trap heat in the atmosphere relative to that of carbon dioxide over a specific time period.

H2S or H_2S
Hydrogen Sulfide

H2SO4 or H_2SO_4
Sulfuric Acid

H&SC
Health and Safety Code

HAP
Hazardous Air Pollutant. Any pollutant listed pursuant to Section 112(b) of the Act. Also refers to the program mandated by Title I, Section 112, of the Act and implemented by 40 CFR Part 63.

Hg
Mercury

HHV
Higher Heating Value. The quantity of heat evolved as determined by a calorimeter where the combustion products are cooled to 60 °F and all water vapor is condensed to liquid.

IC
Internal Combustion

LEA
Local Enforcement Agency

LFG
Landfill gas

LHV
Lower Heating Value. Similar to the higher heating value (see HHV) except that the water produced by the combustion is not condensed but retained as vapor at 60 °F.

Long ton
2200 pounds

Major Facility
A facility with potential emissions of: (1) at least 100 tons per year of regulated air pollutants, (2) at least 10 tons per year of any single hazardous air pollutant, and/or (3) at least 25 tons per year of any combination of hazardous air pollutants, or such lesser quantity of hazardous air pollutants as determined by the EPA administrator.

MAX or Max.
Maximum

MFR
Major Facility Review. The District's term for the federal operating permit program mandated by Title V of the Federal Clean Air Act and implemented by District Regulation 2, Rule 6.

MIN or Min.
Minimum

MOP
The District's Manual of Procedures.

MSDS
Material Safety Data Sheet

MSW
Municipal solid waste

MTBE
methyl tertiary-butyl ether

MW
Molecular weight

N2 or N_2
Nitrogen

NA
Not Applicable

NAAQS
National Ambient Air Quality Standards

NESHAPS
National Emission Standards for Hazardous Air Pollutants. See in 40 CFR Parts 61 and 63.

NMHC
Non-methane Hydrocarbons (Same as NMOC)

NMOC
Non-methane Organic Compounds (Same as NMHC)

NO2 or NO_2
Nitrogen Dioxide

NOx or NO_x
Oxides of nitrogen.

NSPS
Standards of Performance for New Stationary Sources. Federal standards for emissions from new stationary sources. Mandated by Title I, Section 111 of the Federal Clean Air Act, and implemented by 40 CFR Part 60 and District Regulation 10.

NSR
New Source Review. A federal program for pre-construction review and permitting of new and modified sources of pollutants for which criteria have been established in accordance with Section 108 of the Federal Clean Air Act. Mandated by Title I of the Federal Clean Air Act and implemented by 40 CFR Parts 51 and 52 and District Regulation 2, Rule 2. (Note: There are additional NSR requirements mandated by the California Clean Air Act.)

O2 or O_2
Oxygen

Offset Requirement
A New Source Review requirement to provide federally enforceable emission offsets for the emissions from a new or modified source. Applies to emissions of POC, NOx, PM10, and SO2.

PERP
Portable Equipment Registration Program

Phase II Acid Rain Facility
A facility that generates electricity for sale through fossil-fuel combustion and is not exempted by 40 CFR 72 from Titles IV and V of the Clean Air Act.

POC
Precursor Organic Compounds

PM
Particulate Matter

PM10 or PM_{10}
Particulate matter with aerodynamic equivalent diameter of less than or equal to 10 microns

PM2.5 or $PM_{2.5}$
Particulate matter with aerodynamic equivalent diameter of less than or equal to 2.5 microns

PSD
Prevention of Significant Deterioration. A federal program for permitting new and modified sources of those air pollutants for which the District is classified "attainment" of the National Air Ambient Quality Standards. Mandated by Title I of the Act and implemented by both 40 CFR Part 52 and District Regulation 2, Rule 2.

PTO
Permit to Operate

PV or P/V Valve
Pressure/Vacuum Valve

Regulated Organic Liquid
"Regulated organic liquids" are those liquids which require permits, or which are subject to some regulation, when processed at a liquid-handling operation. For example, for refinery marine terminals, regulated organic liquids are defined as "organic liquids" in Regulation 8, Rule 44.

RICE
Reciprocating Internal Combustion Engine

RMP
Risk Management Plan

RWQCB
Regional Water Quality Control Board

S
Sulfur

SCR
A "selective catalytic reduction" unit is an abatement device that reduces NO_x concentrations in the exhaust stream of a combustion device. SCRs utilize a catalyst, which operates within a specific temperature range, and injected ammonia to promote the conversion of NO_x compounds to nitrogen gas.

Short ton
2000 pounds

SIP
State Implementation Plan. State and District programs and regulations approved by EPA and developed in order to attain the National Air Ambient Quality Standards. Mandated by Title I of the Act.

SO2 or SO_2
Sulfur dioxide

SO3 or SO_3
Sulfur trioxide

SSM
Startup, Shutdown, or Malfunction

SSM Plan
A plan, which states the procedures that will be followed during a startup, shutdown, or malfunction, that is prepared in accordance with the general NESHAP provisions (40 CFR Part 63, Subpart A) and maintained on site at the facility.

TAC
Toxic Air Contaminant (as identified by CARB)

TBACT
Best Available Control Technology for Toxics

THC
Total Hydrocarbons includes all NMHC plus methane (same as TOC).

therm
100,000 British Thermal Units

Title V
Title V of the federal Clean Air Act. Requires a federally enforceable operating permit program for major and certain other facilities.

TOC
Total Organic Compounds includes all NMOC plus methane (same as THC).

TPH
Total Petroleum Hydrocarbons

TRMP
Toxic Risk Management Policy

TRS
Total Reduced Sulfur, which is a measure of the amount of sulfur-containing compounds in a gas stream, typically a fuel gas stream, including, but not limited to, hydrogen sulfide. The TRS content of a fuel gas determines the concentration of SO_2 that will be present in the combusted fuel gas, since sulfur compounds are converted to SO_2 by the combustion process.

TSP
Total Suspended Particulate

TVP
True Vapor Pressure

VMT
Vehicle Miles Traveled

VOC
Volatile Organic Compounds

Symbols:

<	=	less than
>	=	greater than
≤	=	less than or equal to
≥	=	greater than or equal to

Units of Measure:

atm	=	atmospheres
bbl	=	barrel of liquid (42 gallons)
bhp	=	brake-horsepower
btu	=	British Thermal Unit
BTU	=	British Thermal Unit
°C	=	degrees Centigrade
cfm	=	cubic feet per minute
dscf	=	dry standard cubic feet
°F	=	degrees Fahrenheit
ft^3	=	cubic feet
g	=	grams
gal	=	gallon
gpm	=	gallons per minute
gr	=	grains
hp	=	horsepower
hr	=	hour
in	=	inches
kW	=	kilowatts
lb	=	pound
lbmol	=	pound-mole
m^2	=	square meter
m^3	=	cubic meters
Mg	=	mega grams
min	=	minute
mm	=	millimeter
MM	=	million
MM BTU	=	million BTU
M cf	=	one thousand cubic feet
MM cf	=	one million cubic feet
MW	=	megawatts
ppb	=	parts per billion
ppbv	=	parts per billion, by volume
ppm	=	parts per million
ppmv	=	parts per million, by volume
ppmw	=	parts per million, by weight
psia	=	pounds per square inch, absolute
psig	=	pounds per square inch, gauge
scf	=	standard cubic feet
scfm	=	standard cubic feet per minute
sdcf	=	standard dry cubic feet
sdcfm	=	standard dry cubic feet per minute
yd	=	yard
yd^3	=	cubic yards
yr	=	year

APPENDIX C

Engineering Evaluation
Permit Application No. 14265

FINAL ENGINEERING EVALUATION

for

BAAQMD PERMIT APPLICATION # 14265

Proposed Project: 3.8 MW Landfill Gas to Energy Plant
Equipment: Two 2677 bhp Landfill Gas Fired IC Engines

BAAQMD PLANT # 17667 (SITE # B7667)

Applicant: Ameresco Keller Canyon LLC
Location: Keller Canyon Landfill, Pittsburg, CA

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

February 21, 2007

Prepared By:
Carol S. Allen
Senior Air Quality Engineer

TABLE OF CONTENTS

FINAL ENGINEERING EVALUATION

Ameresco Keller Canyon LLC

PLANT # 17667 (SITE # B7667)

APPLICATION # 14265

I. BACKGROUND

This application is for a new landfill gas energy facility that will be located on property owned by Keller Canyon Landfill Company (KCLC, Plant # 4618) but that will be operated by an independent company: Ameresco Keller Canyon LLC (Plant # 17667). The proposed equipment location is between KCLC's existing flare station and leachate tanks, in the northwestern section of KCLC's property.

Initially, Ameresco applied for three 1468 bhp internal combustion engines that would be fired exclusively on landfill gas from Keller Canyon Landfill. On May 24, 2006, Ameresco amended Application # 14265. Ameresco is now applying for two 2677 bhp internal combustion engines (S-1 and S-2 at Plant # 17667). The proposed engines are: GE Jenbacher Model JGS 616 GS-L.L, 4-stroke, 16 cylinders with 97,440 in^3 of total displacement. These engines will be fired exclusively on landfill gas from Keller Canyon Landfill. Each IC engine will produce 1.914 MW of electricity for a total nominal energy output 3.8 MW. The electricity produced by this facility will be sold to the grid. Emissions will vent to the atmosphere through two stacks (35 feet high each) located adjacent to the main engine building.

II. EMISSIONS

Maximum permitted emission levels from each engine are based on either directly stated emission limits or calculated emission limits. All calculated limits were determined using the following parameters: maximum engine operating rates of 24 hours/day and 365 days/year, maximum load of 3677 bhp, maximum heat input rate of 19.733 MM BTU/hour (HHV), landfill gas methane content of 50% by volume, landfill gas heat content of 496.9 BTU/scf of landfill gas, standard temperature of 70 °F, and standard pressure of 1 atm. Pollutant specific emission rate limits are generally based on a BACT standard or a site-specific limit. Pollutant specific emission limits and calculation procedures are discussed in detail below and in the attached spreadsheets.

Criteria Pollutant Emissions

Maximum permitted criteria pollutant (CO, NO_x, POC, SO_2, PM_{10}, and NPOC) emissions from each engine and the total project are summarized in Table 1. The basis for each pollutant specific emission limit is identified in Table 2. Equivalent emission factors and outlet concentrations for each pollutant are described in Table 3. The derivation of the emission factors and emission calculation procedures for each pollutant are discussed in the paragraphs following these tables. Detailed spreadsheets are attached that show all assumptions, constants, and emission calculations.

Table 1. Maximum Permitted Criteria Pollutant Emissions

	Each IC Engine		Total Project
	Pounds/Day	Tons/Year	Tons/Year
CO	297.45	54.285	95.000
NO_x	84.99	15.510	31.020
POC	26.41	4.820	9.640
SO_2	42.59	4.318	8.637
PM_{10}	14.16	2.585	5.170
NPOC	1.32	0.241	0.482

Table 2. Emission Factor Basis for Each Criteria Pollutant

Basis for Emission Factor	Pollutant	Limit	Units
BACT, Mfg Guarantee, Permit Condition Limit	CO	2.1	g/bhp-hr
BACT, Mfg Guarantee, Permit Condition Limit	NO_x	0.6	g/bhp-hr
Regulation 8-34-301.4 NMOC Outlet Conc. Limit	POC	120	ppmv as CH_4 @ 3% O_2
BACT, Permit Condition Limit (daily limit)	SO_2	270	ppmv of TRS (as H_2S) in LFG
BACT, Permit Condition Limit (annual average)	SO_2	150	ppmv of TRS (as H_2S) in LFG
BACT, Mfg Guarantee, Permit Condition Limit	PM_{10}	0.1	g/bhp-hr
BAAQMD Calculation	NPOC	5%	of POC emission rate

Table 3. Equivalent Emission Factors and Outlet Concentration Limits

Pollutant	grams / bhp-hour	pounds / hour	pounds / MM BTU	pounds / M scf LFG	ppmv @ 0% O_2	ppmv @ 3% O_2	ppmv @ 15% O_2	grains/sdcf @ 0% O_2
CO	2.100	12.394	0.62807	0.31212	903	774	257	
NO_x	0.600	3.541	0.17945	0.08918	157	135	45	
POC	0.186	1.100	0.05577	0.02771	140	120	40	
SO_2	0.301	1.775	0.08993	0.04469	57	48	16	
SO_2	0.167	0.986	0.04996	0.02483	31	27	9	
PM_{10}	0.100	0.590	0.02991	0.01486				0.022
NPOC	0.009	0.055	0.00279	0.00139	7	6	2	

Carbon Monoxide Emissions:
For each IC engine, carbon monoxide (CO) emissions are calculated based on a BACT limit of 2.1 grams/bhp-hour, as identified in Part 4 of the permit conditions. The equations used to calculate maximum daily and annual CO emissions from each engine are shown below.

Daily CO: (2.1 g/bhp-hr)*(2677 bhp)*(24 hrs/day)/(453.59 g/lb) =
297.45 lbs/day of CO

Annual CO: (2.1 g/bhp-hr)*(2677 bhp)*(24 hrs/day)*(365 days/yr)/(453.59 g/lb)/
(2000 lbs/ton) =
54.285 tons/yr of CO

For these two engines operating continuously at full capacity, the combined annual CO emissions are 108.57 tons/year. In order to prevent trigger the major facility review requirements of Regulation 2, Rule 6, Ameresco Keller Canyon requested a Synthetic Minor Operating Permit for this facility. In accordance with Regulation 2-6-423.2.1, the District is imposing a maximum CO emission limit of 95 tons/year, as identified in Part 3 of the permit conditions. This facility is expected to be able to comply with this annual CO emission limit because it is unlikely that the engines will operate continuously due to required maintenance events, and the engines are not expected to operate at full capacity during all hours of operation. Part 3a of the permit conditions will allow this facility to demonstrate compliance with the 95 tons/year CO emission limit by limiting the combined operating rate of the two engines to approximately 87.5% of maximum continuous capacity (41,039,310 bhp-hours/year, which is equivalent to 302,510 MM BTU per year). Ameresco Keller Canyon also requested to have the opportunity to show compliance with the annual CO emission limit by using on-site test data, because the site anticipates that actual CO emissions may be significantly less than the 2.1 g/bhp-hour limit. As an alternative to the Part 3a heat input limit, Part 3b will require this site to test each engine for CO on a daily basis and will allow a higher annual heat input rate, if actual CO emissions are found to be lower than the maximum limit. If CO emissions are consistently less than 87.5% of the CO emission limit, the Part 3b will allow this site to reduce the CO testing frequency to once per week.

Nitrogen Oxide Emissions:
For each IC engine, nitrogen oxide (NO_x) emissions are calculated based on a BACT limit of 0.6 grams/bhp-hour, as identified in Part 5 of the permit conditions. The equations used to calculate maximum daily and annual NO_x emissions from each engine and both engines combined are shown below.

Daily NO_x: (0.6 g/bhp-hr)*(2677 bhp)*(24 hrs/day)/(453.59 g/lb) =
84.99 lbs/day of NO_x

Annual NO_x: (0.6 g/bhp-hr)*(2677 bhp)*(24 hrs/day)*(365 days/yr)/(453.59 g/lb)/
(2000 lbs/ton) =
15.510 tons/yr of NO_x

Total NO_x: (15.510 tons/year of NO_x per engine)*(2 engines) =
31.020 tons/year of NO_x

Organic Compound Emissions:
The maximum permitted emission rates of precursor organic compounds (POC) and non-precursor organic compounds (NPOC) are derived from the Regulation 8-34-301.4 non-methane organic compound (NMOC) emission limit. Regulation 8-34-301.4 requires that landfill gas fired energy recovery devices either achieve an NMOC destruction efficiency of 98% by weight or meet an outlet concentration limit of 120 ppmv of NMOC, expressed as methane at 3% oxygen on a dry basis. For Keller Canyon landfill gas,

the inlet NMOC concentration is low enough such that complying with a 98% destruction efficiency limit would result in a lower NMOC emission rate than complying with the 120 ppmv outlet concentration limit. In addition, most landfill gas fired IC engines in the Bay Area have difficulty demonstrating 98% destruction efficiency and typically achieve compliance with Regulation 8-34-301.4 by meeting the NMOC outlet concentration limit. Therefore, as a worst-case assumption, the District will calculate organic emissions for the proposed engines based on the NMOC outlet concentration limit. The NMOC emission factor is calculated below.

(120E-6 ft^3 NMOC/ft^3 flue, 3% O_2)/(387.01 ft^3 NMOC/lbmol NMOC)*(16.043 lbs NMOC/lbmol NMOC)
[(20.95-0)/(20.95-3) ft^3 flue at 3% O_2/ft^3 flue at 0% O_2)(9605.3 ft^3 exhaust at 0% O_2 / MM BTU)
= 5.577E-2 lbs NMOC/MM BTU

As a worst-case assumption, all NMOC emissions are assumed to be precursor organic compounds (POC). Therefore, the POC emission factor is 5.577 E-2 pounds POC per MM BTU. Based on the measured concentrations of non-precursor organic compounds (NPOC) in Keller Canyon landfill gas compared to total NMOC concentrations, the NPOC emission rate is expected to be no more than 5% of the total NMOC emission rate. Therefore, the NPOC emission factor is 2.79E-3 pounds NPOC per MM BTU. Maximum POC and NPOC emissions are calculated below.

Daily POC: (5.577E-2 lbs POC/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day) =
26.41 lbs/day of POC
Annual POC: (5.577E-2 lbs POC/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day)*
(365 days/year)/(2000 lbs/ton) =
4.820 tons/yr of POC
Total POC: (4.820 tons/year of POC per engine)*(2 engines) =
9.640 tons/year of POC

Daily NPOC: (2.79E-3 lbs NPOC/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day) =
1.32 lbs/day of POC
Annual NPOC: (2.69E-3 lbs NPOC/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day)*
(365 days/year)/(2000 lbs/ton) =
0.241 tons/yr of NPOC
Total NPOC: (0.241 tons/year of NPOC per engine)*(2 engines) =
0.482 tons/year of NPOC

Sulfur Dioxide Emissions:
The sulfur dioxide (SO_2) emission factors are derived from the fuel gas sulfur content limits described in Part 8 of the permit conditions: 270 ppmv of TRS (peak) and 150 ppmv of TRS (annual average). These limits were imposed due to BACT requirements for SO_2 emissions from these engines. These emission factor equivalents for these fuel sulfur content limits are derived below.

Peak SO_2 Emission Factor:
(270 ft^3 S/MM ft^3 LFG)/(387.01 ft^3 S/lbmol S)*(1 lbmol SO_2/1 lbmol S)*
(64.059 lbs SO_2/lbmol SO_2)/(496.94 MM BTU/MM ft^3 LFG) =
8.993E-2 lbs SO_2/MM BTU

Annual Average SO_2 Emission Factor:
(150 ft^3 S/MM ft^3 LFG)/(387.01 ft^3 S/lbmol S)*(1 lbmol SO_2/1 lbmol S)*
(64.059 lbs SO_2/lbmol SO_2)/(496.94 MM BTU/MM ft^3 LFG) =
4.996E-2 lbs SO_2/MM BTU

Maximum sulfur dioxide emissions are calculated below based on the peak SO_2 emission factor for daily emissions and the annual average SO_2 emission factor for annual and total project SO_2 emissions.

Daily SO_2: (8.993E-2 lbs SO_2/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day) =
42.59 lbs/day of SO_2
Annual SO_2: (4.996E-2 lbs SO_2/MM BTU)*(19.733 MM BTU/hour)*(24 hours/day)*
(365 days/year)/(2000 lbs/ton) =
4.318 tons/yr of SO_2
Total SO_2: (4.318 tons/year of SO_2 per engine)*(2 engines) =
8.637 tons/year of SO_2

Particulate Emissions:
The particulate (PM_{10}) emission factor is based on the manufacturer's guaranteed emission rate limit of 0.1 grams/bhp-hour. PM_{10} emission calculations are shown below.

Daily PM_{10}: (0.1 g/bhp-hr)*(2677 bhp)*(24 hrs/day)/(453.59 g/lb) =
14.16 lbs/day of PM_{10}
Annual PM_{10}: (0.1 g/bhp-hr)*(2677 bhp)*(24 hrs/day)*(365 days/yr)/(453.59 g/lb)/
(2000 lbs/ton) =
2.585 tons/yr of PM_{10}
Total PM_{10}: (2.585 tons/year of PM_{10} per engine)*(2 engines) =
5.170 tons/year of PM_{10}

Plant Cumulative Emission Increases
Since this application is for a new facility, the current plant cumulative emission increase balance is zero. The total project emissions from Table 1 are equal to the cumulative emission increases for this facility.

Toxic Air Contaminant Emissions
This new facility is subject to Regulation 2, Rule 5. Both acute (pounds/hour) and chronic (pounds/year) emission rates of toxic air contaminants must be calculated and compared to the trigger levels in Table 2-5-1 to determine if a Health Risk Screening Analysis (HRSA) is required for this project. The proposed engines will burn landfill gas collected from Keller Canyon Landfill, which contains numerous toxic organic compounds and several toxic inorganic compounds. The engines will destroy much of these landfill gas contaminants during combustion, but some residual organic and inorganic toxic compounds will remain in the engine exhaust. In addition, the combustion process will produce secondary toxic compound emissions including: formaldehyde due to burning organic compounds, hydrogen chloride due to burning chlorinated compounds, hydrogen bromide due to burning brominated compounds, and hydrogen fluoride due to burning fluorinated compounds. The emission factors for these different types of toxic compounds are discussed below. Detailed emission calculation spreadsheets are attached.

Residual Toxic Organic Compounds:
The MFR Permit for Keller Canyon Landfill Company contains a list of the most significant toxic air contaminants that are present in this site's landfill gas and the maximum expected concentrations for these compounds. This data was used in the Health Risk Screening Analysis (HRSA) for Keller Canyon Landfill Company. Since the proposed engines will burn landfill gas from Keller Canyon Landfill, these inlet toxic organic compound concentration limits will apply to Ameresco Keller Canyon as well.

EPA's Compilation of Air Pollutant Emission Factors (AP-42, fifth edition) Chapter 2.4 MSW Landfills discusses the combustion of landfill gas in IC engines and describes the destruction efficiencies that may be achieved for different types of compounds. From Table 2.4-3, IC engines have typical control efficiencies of 93.0% for halogenated species and 86.1% for non-halogenated species. These control efficiencies will be used for the proposed engines.

The inlet concentration levels for the most significant toxic organic compounds, the appropriate control efficiency, and the resulting abated emission factors are summarized in Table 4 below.

Residual Toxic Inorganic Compounds:
The most significant inorganic contaminant in the landfill gas is hydrogen sulfide. Although landfill gas may contain other inorganic contaminants such as carbon disulfide or mercury, these compounds are found in such low concentration levels that the impacts on health risks have been routinely found to be negligible compared to the health risks resulting from other more prevalent toxic contaminants. Therefore, these compounds were not evaluated for this facility.

For this analysis, the inlet hydrogen sulfide concentration was assumed to be the same as the peak TRS concentration limit for this site: 270 ppmv of TRS expressed as H_2S (from Part 8 of the permit conditions). The AP-42 landfill gas engine destruction efficiency of 86.1% for non-halogenated species was assumed to apply to inlet hydrogen sulfide levels at these engines. This H_2S data is listed in Table 4.

Secondary Acid Gases:
Acid gases (hydrogen chloride, hydrogen bromide, and hydrogen fluoride) are produced by the combustion of halogenated compounds containing chlorine, bromine, or fluorine. Based on site-specific test data and AP-42 default concentration estimates, Keller Canyon landfill gas is expected to contain no more than 40.0 ppmv of chlorine, no more than 20.0 ppmv of bromine, and no more than 5.0 ppmv of fluorine. The combustion process is assumed to convert 100% of these inlet concentration levels into hydrogen chloride, hydrogen bromide, and hydrogen fluoride. The emission factors for these secondary acid gases are identified in Table 4.

Secondary Formaldehyde:
Formaldehyde is another significant secondary pollutant that is created during the combustion process. Recent source tests on three smaller Jenbacher engines that are burning landfill gas from a closed Bay Area landfill found formaldehyde emission rates ranging from 0.10 to 13.03 lbs/MM scf of methane. Initially, the District estimated formaldehyde emission for the proposed engines based on the maximum measured formaldehyde emissions from the other Jenbacher engines (13.03 lbs/MM scf of methane). However, based on the HRSA that was conducted for this project, the formaldehyde emission limit was raised to the maximum allowable rate that would ensure compliance with Regulation 2, Rule 5. This maximum rate is 19 pounds of formaldehyde per million standard cubic feet of methane burned and is cited in Part 9 of the permit conditions. This formaldehyde emission factor is included in Table 4.

Table 4. LFG Concentrations and Emission Factors for Significant Toxic Air Contaminants

Compound	Concentration in LFG ppbv	IC Engine Destruction Efficiency	lbs/MM scf of CH_4 burned	lbs/M scf of LFG burned	lbs/MM BTU of Heat Input
Acrylonitrile	500	86.1%	0.019	9.53E-06	1.918E-05
Benzene	20000	86.1%	1.122	5.61E-04	1.129E-03
Carbon Tetrachloride	100	93.0%	0.006	2.78E-06	5.599E-06
Chloroform	100	93.0%	0.004	2.16E-06	4.345E-06
Ethylene Dibromide	100	93.0%	0.007	3.40E-06	6.838E-06
Ethylene Dichloride	100	93.0%	0.004	1.79E-06	3.602E-06
Hydrogen Sulfide	270000	86.1%	6.609	3.30E-03	6.650E-03
Methylene Chloride	16000	93.0%	0.492	2.46E-04	4.946E-04
Perchloroethylene	3300	93.0%	0.198	9.90E-05	1.992E-04
Trichloroethylene	1500	93.0%	0.071	3.56E-05	7.173E-05
Vinyl Chloride	1700	93.0%	0.038	1.92E-05	3.867E-05
Formaldehyde		0.0%	19.000	9.50E-03	1.912E-02
Hydrogen Bromide	20000	0.0%	8.363	4.18E-03	8.414E-03
Hydrogen Chloride	40000	0.0%	7.537	3.77E-03	7.583E-03
Hydrogen Fluoride	5000	0.0%	0.517	2.58E-04	5.201E-04

The acute and chronic toxic compound emission rates were calculated based on both engines operating continuously for 365 days/year. The toxic compound emission rates are compared to the risk screen trigger levels in Table 5. The acute emission rates from each engine will exceed the risk screen trigger levels for hydrogen sulfide and formaldehyde. In addition the chronic emissions from the whole project (total emissions from two engines) will exceed the risk screen trigger levels for acrylonitrile, benzene, hydrogen sulfide, perchloroethylene, vinyl chloride, formaldehyde, hydrogen bromide, and hydrogen chloride. Therefore an HRSA is required for this project and for each individual engine.

Table 5. TAC Emissions Compared Risk Screen Trigger Levels

Compound	Emissions Per Engine pounds/hour	Acute HRSA Trigger pounds/hour	Emissions From 2 Engines pounds/year	Chronic HRSA Trigger pounds/year
Acrylonitrile	3.78E-04	NA	6.63	0.64
Benzene	2.23E-02	2.90E+00	390.37	6.40
Carbon Tetrachloride	1.10E-04	4.20E+00	1.94	4.30
Chloroform	8.57E-05	3.30E-01	1.50	34.00
Ethylene Dibromide	1.35E-04	NA	2.36	2.60
Ethylene Dichloride	7.11E-05	NA	1.25	8.90
Hydrogen Sulfide	1.31E-01	9.30E-02	2298.94	390.00
Methylene Chloride	9.76E-03	3.10E+01	171.00	180.00

Compound	Emissions Per Engine pounds/hour	Acute HRSA Trigger pounds/hour	Emissions From 2 Engines pounds/year	Chronic HRSA Trigger pounds/year
Perchloroethylene	3.93E-03	4.40E+01	68.86	30.00
Trichloroethylene	1.42E-03	NA	24.80	91.00
Vinyl Chloride	7.63E-04	4.00E+02	13.37	2.40
Formaldehyde	3.77E-01	2.10E-01	6609.12	30.00
Hydrogen Bromide	1.66E-01	NA	2909.01	930.00
Hydrogen Chloride	1.50E-01	4.60E+00	2621.74	350.00
Hydrogen Fluoride	1.03E-02	5.30E-01	179.82	540.00

III. STATEMENT OF COMPLIANCE

Regulation 2, Rule 1 (CEQA and Public Notice Requirements)

In 1999, the District evaluated a proposed landfill gas energy plant associated with the Keller Canyon Landfill pursuant to Permit Application # 19432. This landfill gas energy plant was proposed by Energy Developments Inc. (EDI) and Bio Energy California LLC. EDI's proposed power plant was to consist of three 1877 bhp lean burn IC engines that would burn landfill gas collected from Keller Canyon Landfill (exclusively with no supplemental fuels) and that would have a combined nominal power output of 4 MW. In March 1999, the District was informed by the appropriate local agencies that no other permits would be required and that the District should therefore assume lead agency status for this project. In April 1999, the District evaluated the Appendix H Environmental Information Form and Environmental Assessment that were submitted by the Applicant and concluded that this project met the District's requirements for categorical exemption from CEQA review pursuant to Regulation 2-1-312.11. The Director or Permit Services approved this categorical exemption from CEQA review on April 19, 1999 and issued an Authority to Construct for the three IC engines on May 27, 1999.

In 2001, Contra Costa County determined that a land use permit amendment would be required for EDI's proposed landfill gas power plant. Contra Costa County conducted an initial study and concluded that the proposed project could not have any significant impact on the environment. Although project NO_x emissions exceeded the project significance criteria for NO_x (80 pounds/day and 15 tons/year from Table 3 of District's CEQA Guidelines), Contra Costa County concluded that this impact would not be significant because all NO_x emissions would be fully offset with emission reductions provided from the District's small facility banking account. All other emissions were less than the applicable significance criteria. On June 25, 2002, the Contra Costa County Board of Supervisors considered and adopted the October 2001 Initial Study and Negative Declaration for EDI's landfill gas energy project and approved Land Use Permit (LUP) 012115, an amendment to LUP 2020-89 for the Keller Canyon Landfill Facility, for the construction and operation of a landfill gas power plant at the Keller Canyon Landfill.

EDI never constructed any part of the proposed landfill gas power plant. At the Applicant's request, the District cancelled Authority to Construct # 19432 in February 2003.

In February 2006, Ameresco Keller Canyon LLC submitted Application # 14265 for a similar landfill gas power plant for the Keller Canyon Landfill Facility. Initially, Ameresco proposed to install three 1468

bhp lean burn IC engines that were expected have a nominal power output of 3.2 MW. In May 2006, Ameresco amended this application and requested to install two 2677 bhp lean burn IC engines with a nominal power output of 3.8 MW instead of the three 1468 bhp engines. In the February 2006 application materials, Ameresco indicated (on Form P-101B and in Section 7.0 of the application submittal) that Contra Costa County's Planning Department was the Lead Agency for this proposed landfill gas energy plant. Ameresco stated that CEQA documentation would be provided when it was available.

In January 2007, the District was informed by Joel Sabenorio, a consultant for Contra Costa County, that the county was not currently conducting a new environmental review for the project but was instead conducting a consistency determination to determine if any additional land use permit amendments would be required. He requested a District review of the air quality emissions and requirements to assist with the county's consistency review. The District prepared a Preliminary Engineering Evaluation for this project covering all air quality regulations other than CEQA review. This Preliminary Engineering Evaluation was approved by Brian Bateman, Director of Engineering, on February 5, 2007 and transmitted to Contra Costa County and the Applicant.

The air pollutant emissions and health impacts from toxic air contaminant (TAC) emissions for the two proposed power plant projects at Keller Canyon Landfill are compared in Table C.1. below to the significance thresholds listed in BAAQMD's CEQA Guidelines. Differences in project emissions and health impacts are explained in the footnotes to this table.

Table C.1. Comparison of Air Emissions and Health Impacts to CEQA Significance Criteria

	EDI Power Plant (3 IC Engines)		Ameresco Power Plant (2 IC Engines)		BAAQMD CEQA Significance Criteria	
	Pounds/Day	Tons/Year	Pounds/Day	Tons/Year	Pounds/Day	Tons/Year
CO [(a)]	518.5	94.631	594.9	95.000	none	none
NO_x [(b)]	268.2	48.947	170.0	31.020	80	15
POC [(b)]	54.8	10.007	52.8	9.640	80	15
SO_2 [(c)]	23.5	4.285	85.2	8.637	none	none
PM_{10} [(d)]	47.9	8.742	28.3	5.170	80	15
NPOC [(e)]	0.0	0.000	2.6	0.482	none	none
TAC Impacts [(f)]						
Cancer Risk	1.6 in a million		8.0 in a million		10 in a million	
Chronic HI	0.1		0.47		1.0	
Acute HI	Not Evaluated		0.98		1.0	

(a) Annual CO emissions from each engine project are essentially the same. However, maximum daily carbon monoxide emissions for the Ameresco power plant are 15% higher than the previous project due to a higher CO emission limit for the Ameresco engines. The Ameresco engines will comply with the current BACT level for CO (2.1 g CO/bhp-hr). The CO emission rate proposed for the EDI project (1.74 g/bhp-hr) was less than the

applicable CO BACT level (2.1 g/bhp-hr), but this lower CO emission rate was later determined to be unattainable.

(b) For the Ameresco project, emissions of ozone precursors, NO_x and POC, are less than the NO_x and POC emissions that were allowed for the EDI project. For both projects, the District will fully offset NO_x emissions with emission reduction credits from the small facility banking account. POC offsets are not required for either project.

(c) Sulfur dioxide emissions for the Ameresco project are about double the SO_2 emissions expected for the EDI project. This higher emission rate is due to the higher sulfur levels that have been found in Keller Canyon's landfill gas in recent years. Note that these SO_2 emissions will occur no matter how the gas is burned (in flares or in engines).

(d) Particulate emissions from the Ameresco project are 40% less than the EDI project, based on an improved manufacturer's guaranteed emission rate.

(e) Emissions of non-precursor organic compounds were assumed to be zero for the EDI project but were estimated to be higher than zero for the Ameresco project, because ethane and acetone are now considered to be NPOCs. NPOC emissions are less than the BACT trigger level.

(f) Health impacts for the Ameresco project are about 5 times higher than the impacts that were determined for the EDI project, primarily due to an improved estimate of formaldehyde emissions from the proposed landfill gas fired engines, which was developed recently based on actual source test data for formaldehyde emissions from a similar landfill gas fired engine.

On February 13, 2007, Contra Costa County concluded that Ameresco's proposed landfill gas power plant was substantially equivalent to the previously approved landfill gas power plant. Contra Costa County stated that a land use permit amendment would not be required for Ameresco's landfill gas power plant, and that Ameresco must comply with all land use permit conditions that were approved for the EDI power plant project in June 2002.

Since Contra Costa County has determined that the current project is consistent with the June 2002 Negative Declaration, this Negative Declaration applies to the current project. The proposed project has lower NO_x, POC, and PM_{10} emissions than the EDI project for which Contra Costa County's Negative Declaration was approved. The proposed project will have higher health impacts due to toxic air contaminants than the EDI project; but all health impacts for the Ameresco project are less than the CEQA significance criteria. The proposed project will also have higher CO, SO_2, and NPOC emissions than the EDI project. However, there are no CEQA significance thresholds for project emissions of CO, SO_2, or NPOC. BACT was not trigger for NPOC emissions. The proposed project will comply with BACT for CO and SO_2 emissions. The annual CO emissions will be equivalent to the EDI project. The proposed SO_2 emissions will occur, regardless of how the landfill gas is combusted. Therefore, the District concludes that this project could not result in any significant impacts that were not already addressed by the 2002 Negative Declaration. Ameresco has met the Regulation 2-1-408.1 requirement to have either a certified EIR or an approved Negative Declaration for this project. No further CEQA review is required. In accordance, with Regulation 2-1-408.1, the District will take final action on this application within 30 days of receiving notification from Contra Costa County that the June 2002 Negative Declaration applies to this project (by no later than March 15, 2007).

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

Regulation 2, Rule 2 (NSR – BACT)

As shown in Table 1, each of the proposed IC engines will emit more than 10 pounds per day of CO, NO_x, POC, SO_2, and PM_{10}. Therefore, BACT is required for each of these pollutants that will be emitted from the proposed engines.

BACT is defined in Regulation 2-2-206 and includes: the most effective emission control device that has been utilized for a source, the most stringent emission limit achieved by a particular equipment type, or any control technique that is technologically feasible and cost effective. The District's BACT/TBACT Workbook contains BACT determinations for numerous types of combustion devices. The most recent determination for landfill gas or digester gas fired internal combustion engines ($\geq$250 bhp) is identified as Document # 96.2.1, Revision 3, June 2, 1995. The BACT(2) emission limitations and control techniques discussed in this document have been achieved in practice for landfill gas, digester gas, or multi-fuel fired engines of various sizes. Therefore, BACT for the proposed engines cannot be any less stringent than the BACT(2) emission limits cited in this document. However, the BACT(1) emission limits cited in Document # 96.2.1 have been found to be technologically feasible and cost effective for some waste gas fired engines under certain circumstances. The final BACT determination for the proposed landfill gas fired engines must consider whether the BACT(1) limits cited in Document # 96.2.1 are achievable for this particular application and whether even more stringent emission limitations might be feasible, appropriate, and cost effective for this particular proposed project.

For internal combustion engines, the unabated emission rates of several pollutants (prior to any add-on control devices) are interrelated. For instance, operating the engine in a manner that results in the lowest possible CO emissions will result in higher NO_x emissions than operating the engine in a manner that results in the lowest possible NO_x emissions. Conversely, minimizing NO_x emissions will result in comparatively higher emissions of CO, POC, and other pollutants. Therefore, BACT determinations for internal combustion engines must necessarily employ a balanced approached that considers various possible emission limitation combinations for multiple pollutants as well as the use of add-on control devices to reduce pollutant emissions. The specific types of fuel used in the engines will influence the possible emission limitations. Thus, emission limits that are achievable for one type of fuel, such as digester gas, may not necessarily be achievable when the engine is fired on landfill gas. The site-to-site and seasonal variability of landfill gas must also be taken into account.

The District's BACT determinations for the proposed engines fired on Keller Canyon Landfill Gas are summarized in Table 6 and discussed in detail below for each pollutant. Since the District is non-attainment for ozone, minimizing ozone precursor emissions (NO_x and POC) is the paramount concern. As discussed above, the emission rates of these two ozone precursors follow opposite trends, and the appropriate emission limit for one pollutant must be established in consideration of the potentially achievable emission limit for other pollutant. This type of balanced approach to establishing appropriate emission limits is inherent to each of the following pollutant specific determinations.

Table 6. Proposed Project BACT Limits Compared to Other Reported BACT Standards

Date	Jan. 2007	6/2/1995	12/3/2004	10/6/2006	8/3/2006	1/5/2005	12/16/2004	12/23/2003
	Proposed Project *	BAAQMD ** Doc # 96.2.1	SCAQMD Non-Major	EPA RACT/BACT/LEAR Clearinghouse (Primary Fuel = LFG) NJ-0068 *	NJ-0067 *	RI-0022 *	VT-0019	MI-0371
bhp	2677	≥250	---	2233	2011	2229	2221	1095
	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr	g/bhp-hr
POC	0.2	0.6 / 1.0	0.80	0.16	0.40	0.15	---	---
NO_x	0.6	1.0 / 1.25	0.60	0.60	0.60	0.50	0.50	1.87
CO	2.1	2.1 / 2.65	2.50	2.75	2.70	2.75	2.75	3.02
SO_2	0.3	ns / 0.3	Rule 431.1	0.23	0.34	---	---	---
PM_{10}	0.1	nd / ns	---	0.20	0.17	0.10	---	---

* Draft BACT Determinations
** BAAQMD Determinations are listed as BACT(1) / BACT(2)

BACT for POC:
Although the BAAQMD BACT Determination Document # 96.2.1 states that BACT(1) is an emission limit of 0.6 g POC/bhp-hour, BACT cannot be any less stringent than any current BARCT, NSPS, MACT, or other emission limit applicable to the type of source under evaluation. BAAQMD Regulation 8, Rule 34, Section 301.4 contains a BARCT emission limit for non-methane organic compound (NMOC) emissions from landfill gas fired energy recovery devices, and 40 CFR Part 60, Subpart WWW contains a similar NSPS emission limit for NMOC emissions from enclosed combustors. The applicable BARCT and NSPS emission limitations for landfill gas fired engines are either (a) to emit no more than 120 ppmv of NMOC expressed as methane at 3% oxygen dry basis (which is equivalent to 20 ppmv of NNOC as hexane at 3% O_2, dry basis) or (b) to achieve at least 98% removal of NMOC by weight. For Keller Canyon Landfill Gas, the outlet NMOC concentration limit results in a higher emission rate than the 98% destruction efficiency limit. At the NMOC outlet concentration limit, the proposed engines will emit 0.19 g NMOC/bhp-hour. Assuming all of the NMOC emitted is POC, the BARCT and NSPS emission limits are equivalent to 0.19 g POC/bhp-hour, and this emission rate is about one third of the BACT(1) emission limit cited in Document # 96.2.1. Since BACT cannot be any less stringent than an applicable BARCT requirement, BACT for the proposed engines (which are fired on landfill gas exclusively) can be no greater than 120 ppmvd of NMOC as methane at 3% O_2, or no more than 0.2 g POC/bhp-hour.

From EPA's RACT/BACT/LAER Clearinghouse, several recent BACT determinations for landfill gas fired IC engines (ranging in size from 2011 to 2233 bhp with similar NO_x limitations to the proposed engines) have required VOC emission limits equivalent to approximately 0.2 g/bhp-hour or 20 ppmvd (as hexane) at 3% O_2. All of the g/bhp-hour limits in these EPA determinations noted in Table 6 are equivalent to a VOC outlet concentration limit of 20 ppmvd (as hexane) at 3% O_2. Although EPA did not report verification for any of these determinations, the engines were expected to comply with these

VOC limits based on vendor guarantees. No more stringent POC or VOC emission limitations have been identified in any District, CARB, or EPA clearinghouse than the MSW Landfill NSPS limitations that were discussed above.

In the last five years, the District has issued or proposed to issue authorities to construct (or modify) for more than thirty engines that are or will be subject to the Regulation 8-34-301.4 NMOC limit. Of these proposed, new, or recently modified engines, fifteen engines are currently installed and operating. Source testing within the last year demonstrated that each of these fifteen engines was achieving compliance with the Regulation 8-34-301.4 NMOC emission limit. Numerous other landfill gas fired engines in the Bay Area have been achieving compliance with the Regulation 8-34-301.4 limit since it became effective in July 2002 (five different engine manufacturers with outputs ranging from 1000-4000 bhp). Jenbacher, the engine manufacturer for this project, has also guaranteed that the proposed engines will comply with the Regulation 8-34-301.4 NMOC emission limitations and the equivalent limit of 0.2 g POC/bhp-hour. Therefore, the proposed engines are expected to comply with a POC BACT limit of 0.2 g POC/bhp-hour or the equivalent limits of 120 ppmv of NMOC expressed as methane 3% oxygen, dry basis (Regulation 8-34-301.4) or 20 ppmv of NMOC expressed as hexane at 3% oxygen, dry basis.

As illustrated above, engines burning landfill gas have significantly different POC emission limitations from engines burning digester gas or other waste gases. In addition, these fuels have differing heat contents and contaminants that may impact engine and abatement systems design and operation. Staff recommends that the IC engine BACT determinations be split into fuel specific BACT determinations. For landfill gas fired engines in particular, compliance with the Regulation 8-34-301.4 NMOC emission limit has been achieved in practice for over four years by multiple different lean burn engines. Therefore staff recommends that this limit (equivalent to 0.2 g POC/bhp-hour) be approved as an achieved in practice, or BACT(2), level of control for landfill gas fired engines larger than 250 bhp.

BACT for NO_x:
As shown in Table 6, the NO_x limits in Document # 96.2.1 are out-dated for larger landfill gas fired engines. For landfill gas fires IC engines at non-major facilities, South Coast Air Quality Management District recommends a BACT limit of 0.6 g NO_x/bhp-hour. From EPA's RACT/BACT/LAER Clearinghouse, several landfill gas fired IC engines (ranging in size from 2230 to 2300 bhp with similar POC limitations to the proposed engines) have proposed BACT or LAER limits of 0.5 to 0.6 g NO_x/bhp-hour. However, EPA has not reported compliance verification data for these engines yet.

While it is possible to achieve emission limits lower than 0.5 g NO_x/bhp-hour by using add-on controls such as SCR, catalytic controls require costly landfill gas pretreatment systems to removed siloxanes and other problematic contaminants that can mask or poison the catalyst. Pretreatment and SCR systems have been used on a very limited basis with landfill gas fired IC engines, but these systems are mainly used in large-scale multi-fuel applications or in research situations. These pretreatment/SCR control systems are not cost effective for smaller scale projects, such as the 3.8 MW power plant proposed for this project.

In order to consistently comply with the lowest proposed NO_x limit of 0.5 g/bhp-hour, lean burn landfill gas fired engines may need to be operated in a manner that results in higher POC emissions, which could jeopardize compliance with the Regulation 8-34-301.4 limit. Since all landfill gas fired engines in the Bay Area must comply with Regulation 8-34-301.4, the proposed LAER limit of 0.5 g NO_x/bhp-hour is not recommended for lean burn landfill gas fired engines that will be located in the Bay Area.

A NO_x limit of 0.6 g/bhp-hour has been proposed within the last year as a BACT limit for several other similar sized landfill gas fired IC engines, and this limit does appear to be feasible for the newest generation of landfill gas fired engines ($\geq$1340 bhp). Since Jenbacher has guaranteed compliance with a 0.6 g/bhp-hour NO_x limit for this project and more stringent NOx limits are not feasible, BACT for the proposed engines is deemed to be a limit of 0.6 g NO_x/bhp-hour.

In the Bay Area, there are five landfill gas fired engines (2 Duetz 1877 bhp engines and 3 Jenbacher 1341 bhp engines) currently operating, which have NO_x emission limits of 0.6 g/bhp-hour and POC emission limits equal to the Regulation 8-34-301.4 emission limit. The three Jenbacher engines have been operating for less than a year, but initial source test data is available. The limited available source test data for these five engines demonstrates compliance with both NO_x and POC limits; however, the average measured NO_x emission rate was 0.51 g/bhp-hour (85% of the limit) with a standard deviation of 0.08 g/bhp-hour. Considering this data, a NO_x emission limit (g/bhp-hour) of 0.5 or less has not been achieved and a NO_x emission limit of 0.6 is marginally achievable for landfill gas fired engines greater than 1340 bhp.

In addition to these five engines, the Bay Area has ten landfill gas fired engines that are subject to a limit of 0.8 g NOx/bhp-hour (all are Caterpillar 1138 bhp engines). For the engines subject to a 0.8 g/bhp-hour NO_x limit, the average NO_x emission rate was 0.52 g/bhp-hour with a standard deviation of 0.18 g/bhp-hour.

Other emission limits (such as POC or CO limits) and site-specific landfill gas variables (such heat content and landfill gas contaminants) could impact an engine's ability to meet a 0.6 g/bhp-hour NO_x limit on a long-term basis. Insufficient data is available to declare that a 0.6 g/bhp-hour NO_x limit has been achieved in practice by a wide range of landfill gas fired engine types and sizes. Therefore, the proposed limit of 0.6 g NO_x/bhp-hour constitutes a BACT(1) level of control.

While the engines that are subject to a 0.8 g/bhp-hour NO_x limit have demonstrated compliance with this limit for three years or more, this compliance demonstration is limited to a single engine manufacturer, a single engine size (1138 bhp), and a single fuel source. Additional data needs to be gathered before 0.8 could be deemed achieved in practice for all landfill gas engines in a particular size range. Long-term compliance with an emission limit of 1.0 g NO_x/bhp-hour has been observed in the Bay Area for several different engine types with outputs greater than 1100 bhp. Therefore, staff recommends retaining the current BACT(1) and BACT(2) NO_x limits for landfill gas fired engines smaller than 1100 bhp. For engines greater than 1100 horsepower, staff recommends revising the BACT(2) limit to 1.0 g NO_x/bhp-hour and changing the BACT(1) standard to 0.6 g NO_x/bhp-hour.

BACT for CO:
From Document # 96.2.1, waste gas fired IC engines using lean burn combustion design are subject to a BACT(2) emission limit of 2.65 g CO/bhp-hour and a BACT(1) emission limit of 2.1 g CO/bhp-hour. However, these CO BACT limits were established for engines that are subject to limits of 1.0-1.25 g NO_x/bhp-hour. For landfill gas fired engines that are subject to the proposed NO_x limit of 0.6 g/bhp-hour, SCAQMD recommends a BACT limit of 2.5 g CO/bhp-hour, and EPA's RACT/BACT/LAER Clearinghouse listed BACT limits of 2.7-3.0 g CO/bhp-hour. The District proposed BACT(1) limit of 2.1 g CO/bhp-hour is the most stringent limit cited for lean-burn landfill gas fired engines without add-on controls.

It is possible to achieve lower CO emission rates than 2.1 g/bhp-hour by using a landfill gas pretreatment system and an add-on oxidation catalyst. However as discussed above for NO_x emissions, the high cost of these pretreatment and add-on catalyst systems are prohibitive for most landfill gas projects and there is no data available on the long-term reliability of such systems. Therefore, pretreatment and catalytic systems will not be required to satisfy BACT at this time.

A CO limit of 2.1 g/bhp-hour has been proposed within the last year as a BACT limit for several other similar sized landfill gas fired IC engines, and this limit does appear to be feasible for the newest generation of landfill gas fired engines where landfill gas quality is adequate. Since Jenbacher has guaranteed compliance with a 2.1 g/bhp-hour CO limit for this project and more stringent CO limits are not feasible, BACT for the proposed engines is deemed to be a limit of 2.1 g CO/bhp-hour.

In the Bay Area, two 1877 bhp Duetz engines and three 1341 bhp Jenbacher engines are currently operating in compliance with a NO_x limit of 0.6 g/bhp-hour. The CO limit for the Duetz engines is 2.1 g/bhp-hour, while the CO limit for the smaller Jenbacher engines is 2.5 g bhp-hour. The test data on the Duetz engines was too limited and too scattered to drawn any conclusions. For the Jenbacher engines, only the initial compliance demonstration tests have been completed thus far, but these tests demonstrated that one of the three engines was complying with the lower CO limit of 2.1 g/bhp-hour. In addition, seventeen tests on ten 1138 bhp Caterpillar engines found NO_x emissions of less than 0.6 g/bhp-hour and CO emissions of less than 2.1 g/bhp-hour. Therefore, compliance with both a CO limit of 2.1 g/bhp-hour and a NO_x limit of 0.6 g/bhp-hour is feasible for landfill gas fired lean burn engines larger than 1100 bhp. However, the test data is still insufficient to declare a limit of 2.1 g CO/bhp-hour to be achieved in practice for these engines. Therefore, staff recommends retaining 2.1 g CO/bhp-hour as a BACT(1) limit for landfill gas fired engines (>1100 bhp).

Source test data for the Bay Area engines (1138-1877 bhp) found no instances where CO emissions exceeded 2.5 g/bhp-hour in forty tests with NO_x emissions ranging from 0.21-0.90 g/bhp-hour (average of 0.52 g NO_x/bhp-hour) and landfill gas methane contents ranging from 43.8% to 58.6% (average of 52.4%). Therefore, a CO limit of 2.5 g/bhp-hour constitutes an achieved in practice or BACT(2) level of control for landfill gas fired engines (>1100 bhp).

BACT for SO_2:
The District's current BACT determination identifies a BACT(2) limit of 0.3 g SO_2/bhp-hour, based on an engine burning digester gas. Specific limits for landfill gas applications were not identified. SCAQMD requires compliance with Rule 431.1 for landfill gas fired engines. This rule limits the daily average sulfur content of the landfill gas to 150 ppmv (~0.17 g SO_2/bhp-hour), but this limit was set based on SCAQMD landfill gas data, where none on the landfills reported sulfur contents greater than 150 ppmv. The EPA BACT determinations for SO_2 are less stringent than the SCAQMD limit.

In the Bay Area, all closed landfills and most active landfills have been found to have landfill gas sulfur contents of less than 150 ppmv as H_2S. However, landfill gas sulfur testing conducted at a few active landfills (especially landfills that dispose of sewage sludge or use sewage sludge in cover materials) has found occasional spikes exceeding 150 ppmv. These occasional high sulfur spikes have been found in Keller Canyon Landfill Gas. Therefore, compliance with a landfill gas sulfur limit of 150 ppmv is not possible for this project, without using a landfill gas sulfur removal system.

For this project, a landfill gas sulfur removal system would not be cost effective, because the annual average landfill gas sulfur content is expected to be less than 150 ppmv, and the sulfur spikes have been found on a frequency of less than once per year. Such infrequent spikes do not warrant the added expense of a sulfur treatment system. The HRSA verified that the sulfur spikes do not represent a health hazard to residents or off-site workers. Therefore, the District is proposing that this project meet a peak sulfur content limit in landfill gas of 270 ppmv of total reduced sulfur expressed as H_2S, which is equivalent to the BACT(2) digester gas limit of 0.3 g SO_2/bhp-hour. The District is also proposing that this project have an annual average landfill gas sulfur content of less than 150 ppmv of TRS, which is equivalent to the SCAQMD BACT standard.

These proposed limits constitute a BACT(1) level of control of all landfill gas fired engines in the Bay Area. The only landfill gas sulfur content limit that has been demonstrated to have been achieved in practice the Bay Area is the peak sulfur content limit of 1300 ppmv of TRS, expressed as H_2S, which currently applies to the Bay Area's Title V landfills and ensures compliance with Regulation 9-2-302. To date, compliance with this limit has required no landfill gas pretreatment, but some sites may need to reduce sewage sludge acceptance in order to ensure continued compliance with this limit.

BACT for PM_{10}:
Landfill gas is typically filtered and dewatered prior to combustion to prevent damage to burner or engine parts. The District and SCAQMD BACT determinations require landfill gas filtering but do not specify a particulate emission limit. Three recent EPA BACT determinations limited PM_{10} emissions to 0.1-0.2 g/bhp-hour. For this project, the engine manufacturer guaranteed that the engines would comply with a limit of 0.1 g PM_{10}/bhp-hour (the most stringent BACT limit proposed to date). This emission limit constitutes a BACT(1) level of control for landfill gas engines. No Bay Area data is available for PM_{10} emissions from lean burn landfill gas fired engines. Therefore, a BACT(2) emission limit will not be specified.

Regulation 2, Rule 2 (NSR – Offsets)
Regulation 2-2-302 requires offsets for NO_x and POC emission increases, if the facility wide NO_x or POC emissions will exceed 10 tons per year. As shown in Table 1, the total permitted emissions for this facility will be 31.020 tons/year of NO_x and 9.640 tons/year of POC. Since POC emissions will not exceed 10 tons/year, offsets are not required for the 9.64 tons/year of POC emission increases. Facility wide NO_x emissions will exceed 10 tons/year, and offsets are required for the 31.020 tons/year of NO_x emission increases. Since facility wide emissions are less than 35 tons/year, NO_x offsets must be supplied at a ratio of 1.0 to 1.0. This facility qualifies to use the small facility banking account (SFBA) for the required NO_x offsets, because facility wide NO_x emissions will be less than 35 tons/year of NO_x, and the applicant does not hold any banked emission reduction credits. Therefore, the District will provide 31.020 tons/year of NO_x offsets from the SFBA for this project.

Regulation 2-2-303 requires PM_{10} and SO_2 offsets for major facilities that have more than 100 tons/year of PM_{10} or SO_2 emissions. Since neither PM_{10} nor SO_2 emissions from this facility will exceed 100 tons/year, offsets are not required for these pollutants.

Regulation 2, Rule 2 (NSR – PSD)
PSD review is required for facilities that emit more than 250 tons/year of a regulated air pollutant, or than emit more than 100 tons/year if the facility is one of 28 source categories that are subject to the lower PSD threshold of 100 tons/year. Landfill gas fired IC engines are not in one of the 28 special PSD

source categories; therefore, the PSD threshold for this site is 250 tons/year. Since this facility will emit less than 250 tons/year of each pollutant, PSD does not apply.

Regulation 2, Rule 5 (NSR – Toxic Air Contaminants)

Since the project emissions will exceed risk screen trigger levels (see Table 7), a Health Risk Screening Analysis (HRSA) is required for this project pursuant to Regulation 2-5-401. The District conducted an HRSA for this project in accordance with the BAAQMD HRSA Guidelines. The results of this HRSA are summarized below in Tables 7 and 8. A detailed HRSA report is attached.

Table 7. HRSA Results: Total Project Risk

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
Residential Receptor	5.7	0.29	0.14
Worker Receptor	8.0	0.47	0.98

Table 8. HRSA Results: Source Risks

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
S-1 IC Engine			
Residential Receptor	2.8	0.14	No Applicable
Worker Receptor	4.2	0.25	Standard
S-2 IC Engine			
Residential Receptor	2.9	0.14	No Applicable
Worker Receptor	4.5	0.27	Standard

TBACT:

Regulation 2-5-301 requires best available control technology for toxic air contaminants (TBACT) for each source that has a source risk of more than 1.0 in a million cancer risk or more than 0.2 chronic hazard index. As shown in Table 8, each engine has source risks that exceed these TBACT thresholds. Therefore, each engine must satisfy TBACT requirements. In order to determine appropriate TBACT requirements, the major risk contributors need to be identified. From the detailed HRSA report, the top three contributors to cancer risk are: formaldehyde (73%), benzene (20%), and acrylonitrile (3%). All of these compounds are POCs. The top three contributors to chronic hazard index are: formaldehyde (76%), hydrogen chloride (10%), and hydrogen sulfide (9%).

The District's BACT/TBACT Guideline for IC Engines - Landfill or Digester Gas Fired; Greater than 250 hp (Document # 96.2.1) describes previously approved BACT and TBACT requirements for the type of engine that is proposed in this project. This document states that TBACT constitutes compliance with the emission limits and control technologies that are specified as BACT for POC emissions. Since formaldehyde, which is a POC, is the primary contributor to both cancer risk and chronic hazard index for this project, TBACT for the proposed engines will use the same technology as BACT for POC emissions. Source test data for the ALZA landfill gas fired IC engines confirms that there is a general correlation between CO and POC emissions and formaldehyde emissions. Therefore, minimizing CO and POC emissions from these engines will also minimize formaldehyde emissions and health risks.

For POC emissions, the District's BACT(1) determination for landfill gas fired engines limits the POC emission rate to 0.6 g/bhp-hr, which can be achieved using lean burn technology. The proposed lean burn engines for this project will comply with the outlet NMOC concentration specified in Regulation 8-34-301.4, which is equivalent to about 0.2 g/bhp-hour. This proposed emission rate is about one third of the current BACT(1) determination for POC emissions. Therefore, the engines - as proposed - are minimizing POC and formaldehyde emissions and will comply with the current BACT(1) determination for TBACT by using lean burn technology.

The District also considered the technological feasibility of further reducing formaldehyde emissions from these landfill gas fired IC engines. Oxidation catalysts are commonly used to reduce formaldehyde emissions from natural gas fired IC engines. However, the use of oxidation catalysts has not been proven to be technologically feasible for landfill gas fired IC engines, because contaminants in the landfill gas (such as siloxanes and sulfides) can damage the catalyst. Consequently, any use of an oxidation catalyst in a landfill gas combustion operation will necessitate the use of a gas pretreatment system to remove the catalyst-poisoning contaminants. Siloxane removal systems are a fairly recent development, and limited operational data is available. A large range of site-specific variables and the dynamic nature of collected landfill gas increase the difficulty of designing and operating siloxane removal systems. No data is available about the formaldehyde emission reductions that could be achieved by landfill gas pretreatment systems and oxidation catalysts. The long-term reliability of these systems is also uncertain. Therefore, it is not appropriate to require these additional control measures as TBACT at this time.

In summary, the proposed project will comply with TBACT by using lean burn engines and minimizing the formaldehyde emissions from the engines. Demonstrating on-going compliance with the NMOC emission limit in Regulation 8-34-301.4, which is required by Regulation 8-34-509, will also verify that formaldehyde emissions are minimized.

Project Risks:
Regulation 2-5-302 limits project risks to 10.0 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. Total project risks for the two proposed IC engines are identified in Table 7 and are all less than the Regulation 2-5-302 project risk limits. Therefore, the engines –as proposed – will comply with Regulation 2-5-302. Formaldehyde emissions are the biggest contributor to each type of health risk. The formaldehyde emission limit in Part 9 of the permit conditions will ensure that formaldehyde emissions do not exceed the rates evaluated in the HRSA. Source testing will verify compliance with this formaldehyde emission limit.

Regulation 2, Rule 6 (Synthetic Minor Operating Permit)
As discussed in the Emissions Section of this report, the two proposed engines have a combined potential to emit of 108.57 tons per year of CO. However, this facility requested to limit the emissions from the engines to less than 100 tons per year of CO in order to avoid Major Facility Review. In other words, this site has requested to be deemed a synthetic minor facility. Consequently, this facility is subject to the requirements of Regulations 2-6-310, 2-6-420 through 2-6-423, 2-6-602, and Regulation 3, Schedule P (Sections 1 and 2).

This initial permit application constitutes an application for a synthetic minor operating permit in addition to the application for an authority to construct. [The facility was billed for the synthetic minor permit fees for this application on January 17, 2007. This note will be deleted upon receipt of payment for these additional fees.] As required by Regulation 2-6-423.2.1, the District is proposing a federally

enforceable permit condition (see Part 3) that will limit facility-wide emissions to 95 tons/year of CO. The monitoring and record keeping requirements in Parts 3a and 3b are sufficient to demonstrate compliance with the 95 tons/year CO emission limit and satisfy the requirements of Regulation 2-6-423.2.3. In accordance with Regulation 2-6-423.4, the APCO will forward this proposed synthetic minor operating permit to EPA.

BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)

Properly operating landfill gas fired IC engines will have no visible particulate emissions. Therefore, the proposed engines are expected to comply with the Regulation 6-301 Ringelmann 1.0 limitation and the Regulation 6-302 20% opacity limitation. The exhaust point from each proposed engine is also subject to the Regulation 6-310 particulate weight limitation of 0.15 grains/dscf. At the manufacturer's guaranteed emission rate of 0.1 grams/bhp-hour, the grain loading in the exhaust will be 0.022 grains/dscf for at an outlet oxygen concentration of 0% by volume. At a typical oxygen concentration of 13% by volume, the grain loading will be less than 0.009 grains/dscf (less than 6% of the limit). Since the proposed PM_{10} emission rate is far below the Regulation 6-310 limit and non-compliance is highly unlikely, additional monitoring to verify compliance with this limit is not justifiable. Therefore, the District is not proposing to include a PM_{10} emission limit in the permit conditions and is not proposing any source testing for PM_{10} emissions.

BAAQMD Regulation 8, Rule 34 (Solid Waste Disposal Sites)

Landfill gas combustion operations are subject to Regulation 8, Rule 34. The proposed IC engines (S-1 and S-2) are energy recovery devices that are subject to Regulations 8-34-301.2, 8-34-301.4, 8-34-412, 8-34-413, 8-34-501.2, 8-34-501.4, 8-34-501.6, 8-34-501.10, 8-34-501.11, 8-34-501.12, 8-34-503, 8-34-504, 8-34-508, and 8-34-509.

Regulation 8-34-301.2 limits the leaks from any component of a landfill gas emission control system to 1000 ppmv expressed as methane. A properly operated landfill gas fired IC engine is not expected to result in any component leaks in excess of this limit. Regulations 8-34-503 and 504 require quarterly testing of all control system components that contain landfill gas using a portable gas analyzer. Regulations 8-34-501.4, 501.6, and 501.12 require the site to maintain records of these test results for at least five years. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.2. The facility plans to use a consulting firm to comply with the necessary testing and record keeping provisions.

Regulation 8-34-301.4 requires each energy recovery device to achieve 98% by weight destruction efficiency for NMOC or to emit less than 120 ppmv of NMOC, expressed as methane at 3% oxygen, dry basis. This requirement is echoed in Part 6 of the proposed permit conditions. Regulations 8-34-412 and 413 and Part 10 of the proposed permit conditions will require this site to conduct annual source tests to demonstrate compliance with the NMOC emission limit. In addition, Regulation 8-34-509 requires this site to establish a key emission control system operating parameter and monitoring schedule for each engine that will demonstrate compliance with Regulation 8-34-301.4 on an on-going basis. Parts 7 and 11 of the proposed permit conditions describe how the key parameter, operating limits, and monitoring schedule will be determined. Regulation 8-34-501.4 and 8-34-501.11 require this site to maintain records of the key parameter monitoring data and all other test data necessary to demonstrate compliance with this rule. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.4. The facility plans to use independent source testing and consulting firms to comply with these requirements.

In order to determine actual landfill gas consumption rates for energy recovery devices and the operating times for all landfill gas control system devices, Regulation 8-34-508 requires continuous monitoring of the landfill gas flow rates to the engines, and Regulation 8-34-501.2 requires records of all emission control system downtime. These monitoring and record keeping requirements will also demonstrate compliance with the heat input limits in Parts 2 and 3 of the proposed conditions. The proposed engines will be equipped with the necessary flow rate monitoring and recording devices.

BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide)

Regulation 9-1-301 limits ground level sulfur dioxide concentrations (outside of areas that are physically secured against public access) to 0.5 ppmv averaged over 3 minutes, 0.25 averaged over 60 minutes, and 0.05 ppmv averaged over 24 hours. From the HRSA, the maximum hourly ground level concentration that results from a 1 g/s emission rate (split evenly between the two engines) is 508.5 $\mu g/m^3$. The location of this maximum impact point is on the property of Keller Canyon Landfill Company in an area with no public access. The maximum 1-hour concentration occurring outside of the landfill property line is 71.5 $\mu g/m^3$. The maximum SO_2 emission rate from the two engines will be 0.447 g/s for a peak landfill gas sulfur content of 270 ppmv (see Part 8a of the permit conditions). Therefore, the maximum hourly ground level SO_2 impacts are 227 $\mu g/m^3$ for KCLC workers and 32 $\mu g/m^3$ for public access areas. These maximum expected 1-hour ground level impacts are equal to about 0.085 ppmv of SO_2 and 0.012 ppmv of SO_2, respectively. Standard sampling time conversion factors were used to determine 3-minute average SO_2 impacts and 24-hour average SO_2 impacts based on these modeled 1-hour impacts. The project impacts are added to the Bay Area's maximum background SO_2 concentrations for comparison to the limit. As shown in Table 9, the maximum expected SO_2 concentrations for the adjacent KCLC workers will not exceed the Regulation 9-1-301 limits. The total SO_2 concentrations in general public access areas are well below the Regulation 9-1-301 limits.

Table 9. Estimated Ground Level SO_2 Concentrations Compared to 9-1-301 Limits

Project Impact Location	Averaging Period	Project Impacts (ppmv SO_2)	Max. Bay Area Background Conc. (ppmv SO_2)	Total Concentration (ppmv SO_2)	Concentration Limits (ppmv SO_2)
On KCLC Property	3-minute	0.142	0.32	0.46	0.50
	1-hour	0.085	0.104	0.19	0.25
	24-hour	0.034	0.016	0.05	0.05
Public Access Areas	3-minute	0.020	0.32	0.34	0.50
	1-hour	0.012	0.104	0.12	0.25
	24-hour	0.005	0.016	0.02	0.05

Regulation 9-1-302 limits SO_2 concentration in any exhaust point to 300 ppmv (dry basis). At the proposed peak landfill gas sulfur content of 270 ppmv, the maximum possible concentration in the exhaust will be 57 ppmv of SO_2 at 0% oxygen. Therefore, the proposed landfill gas sulfur concentration limit of 270 ppmv will ensure compliance with Regulation 9-1-302. The landfill gas sulfur content monitoring requirements proposed in permit condition Part 8 are adequate for demonstrating compliance with the proposed peak landfill gas sulfur content limit and these Regulation 9, Rule 1 sulfur dioxide limitations.

BAAQMD Regulation 9, Rule 2 (Hydrogen Sulfide)

Regulation 9-2-301 limits the off-site ground level hydrogen sulfide concentration to 0.06 ppmv averaged over any 3 consecutive minutes and 0.03 ppmv averaged over any 60 consecutive minutes. Maximum 1-hour hydrogen sulfide (H_2S) ground level concentrations were evaluated using the same air dispersion modeling assumptions that were used for the HRSA and using the maximum hourly H_2S emission rates from the engines and also from the adjacent landfill and flares. Maximum hourly H_2S concentrations resulting from this engine project alone will be 16.8 $\mu g/m^3$ (0.012 ppmv) at a location within the KCLC property boundary. For this same location, the 3-minute average concentration is 0.020 ppmv H_2S. On-site landfill and flare emissions are not subject to Regulation 9-2-301 for KCLC workers. Therefore, the landfill and flares were not included in the determination of maximum H_2S concentrations that may occur near the engines but within the KCLC property boundary. However, for locations outside of the KCLC property boundary, the landfill and flare emissions contribute significantly to a local background H_2S concentration. Therefore, the emissions from the landfill and flares were evaluated in addition to the engine project emissions to determine the maximum potential local H_2S concentration that occur after installation of the proposed engines. For areas outside of the KCLC property boundary that are accessible to the general public, the maximum hourly H_2S concentration resulting from the landfill, flares, and engines will be 0.018 ppmv. For this maximum off-site impact location, the 3-minute average concentration will be 0.030 ppmv H_2S. As shown in Table 10, neither the on-site H_2S concentrations resulting from the engines alone nor the off-site H_2S concentrations resulting from the proposed engines and the existing landfill and flares will exceed the Regulation 9-2-301 limits. Therefore, this project will comply with Regulation 9-2-301.

Table 10. Estimated Ground Level H_2S Concentrations Compared to 9-2-301 Limits

Impact Location	Averaging Period	Project Impacts (ppmv H_2S)	Concentration Limits (ppmv H_2S)
On KCLC Property	3-minute	0.020	0.06
	1-hour	0.012	0.03
Public Access Areas	3-minute	0.030	0.06
	1-hour	0.018	0.03

BAAQMD Regulation 9, Rule 8 (NO_x and CO from Stationary IC Engines)

Regulation 9, Rule 8 applies to stationary internal combustion engines rated at 50 bhp or more. Sections 301 and 302 limit nitrogen oxides (NO_x) and carbon monoxide (CO) emissions from gas fired IC engines. Sections 330 and 331 apply to emergency standby engines only. The proposed engines are subject to Regulation 9-8-302 only, which applies to waste gas fired engines. Regulation 9-8-302.1 limits the outlet NO_x concentration to 140 ppmv, corrected to 15% oxygen, dry basis, for lean burn waste gas fired engines. Regulation 9-8-302.3 limits the outlet CO concentration to 2000 ppmv, corrected to 15% oxygen, dry basis, for any waste gas fired engines. At the proposed BACT limits for NO_x and CO, the outlet concentrations for the proposed engines will be: 45 ppmv of NOx at 15% O_2 and 257 ppmv of CO at 15% O_2. Therefore, the proposed engines will comply with Regulation 9, Rule 8. The initial source test required pursuant to Part 10 of the permit conditions will satisfy the initial compliance demonstration requirements of Regulation 9-8-501.

Federal Requirements (NSPS and NESHAPs for MSW Landfills)

The proposed engines will be burning treated landfill gas delivered from the Keller Canyon Landfill. Keller Canyon Landfill is subject to the NSPS for MSW Landfills (40 CFR Part 60, Subpart WWW),

which requires KCLC to collect and control landfill gas from Keller Canyon Landfill. In accordance with 40 CFR Part 60.752(b)(2)(iii), KCLC may satisfy the requirements of this NSPS by: (A) routing the collected gas to an open flare, (B) routing the collected gas to a control system that meets the specified NMOC limits, or (C) routing the collected gas to a treatment system that processes this gas for subsequent sale or use. Treating the landfill gas to remove excess water and particulates and delivering the gas to Ameresco Keller Canyon LLC satisfies the requirements of 40 CFR Part 60.752(b)(2)(iii)(C) for KCLC. No additional NSPS or NESHAPs requirements apply to the two proposed engines that will be owned by Ameresco Keller Canyon, LLC.

IV. PERMIT CONDITIONS

The District is proposing to impose the following permit conditions on the two landfill gas fired IC engines in order to ensure that these engines will comply with all of applicable requirements identified in Section C of this report.

Condition # 23400

FOR S-1 AND S-2 LFG-FIRED INTERNAL COMBUSTION ENGINES AND GENSETS:

1. The S-1 and S-2 Internal Combustion (IC) Engines shall be fired exclusively on landfill gas collected from the Keller Canyon Landfill. (Basis: Cumulative Increase)

2. The heat input to each IC Engine (S-1 and S-2) shall not exceed 172,861 MM BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for each IC engine operating continuously. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the heat input to each engine for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The landfill gas flow rate to each engine shall be monitored and recorded continuously in accordance with Regulation 8-34-508. The landfill gas methane content supplied to either engine shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to any engine operation and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. Total carbon monoxide (CO) emissions from the engines (S-1 and S-2 combined) shall not exceed 95 tons of CO during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with this annual CO emission limit by EITHER: (a) complying with the Part 3a annual combined heat input limit and the Part 4 CO emission rate limit; or (b) complying with the annual CO emission limit above and the Part 3b CO emission calculation procedures. If the Permit Holder elects to comply with Part 3a in lieu of Part 3b, any excess of the Part 3a annual combined landfill gas throughput limit OR the Part 4 CO emission rate limit shall be deemed a violation of a Regulation 2-6-423.2.1 synthetic minor permit emission limit and shall be subject to enforcement action pursuant to Regulation 2-6-311. If the Permit Holder elects to comply with Part 3b in lieu of Part 3a, any excess of the annual CO emission limit determined in accordance with Part 3b shall be deemed a violation of a Regulation 2-6-423.2.1 synthetic minor

permit emission limit and shall be subject to enforcement action pursuant to Regulation 2-6-311. (Basis: Regulations 2-6-423.2.1, 423.2.3, and Cumulative Increase)

a. Unless the Permit Holder demonstrates compliance with the Part 3 annual CO emission limit in accordance with Part 3b below, the heat input to S-1 and S-2 combined shall not exceed 302,510 MM BTU (HHV) during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the calculated heat input to S-1 and S-2 combined for each calendar month and for each rolling 12-month period.

b. During any time that the heat input to S-1 and S-2 combined exceeds the limit in Part 3a or the CO emission rate exceeds the limit in Part 4, the Permit Holder shall demonstrate compliance with the Part 3 annual CO emission limit using the carbon monoxide and oxygen monitoring, record keeping, and emission calculation procedures described below. The Permit Holder shall obtain APCO approval in writing for the use of any monitors, calibration procedures, or calculation methods that are relevant to this requirement.

   i. On a daily basis, the Permit Holder shall use portable monitors to measure the CO and O_2 concentrations in the exhaust from each IC engine. This CO and O_2 monitoring is required on any normal working day (Monday through Friday, excluding Saturday, Sunday, and Holidays) during which the engine operates for 3 or more consecutive hours between the hours of 6:00 AM and 6:00 PM. After collecting 120 daily monitoring events (for each engine), this monitoring frequency may be reduced to a weekly basis, provided that either the maximum measured CO concentration in the exhaust from each engine was not more than 225 ppmv of CO, corrected to 15% O_2, dry basis, or each measured CO concentration is within plus or minus 10% of the average measured CO concentration for the 120 days period. Weekly CO monitoring is required for any calendar week (Sunday 12:00 AM through Saturday 11:59 PM) during which the engine operates for 3 or more consecutive hours on a normal working day as defined above.

   ii. For each day that CO and O_2 measurements are taken, the Permit Holder shall record, in the data acquisition system or other District approved log, the date and time that the measurements were taken, the measured CO concentration in ppmv, dry basis, and the measured O_2 concentration in percent by volume, dry basis. The Permit Holder shall calculate and record the corrected CO concentration (corrected to 15% O_2, dry basis) in the stack gas from each engine for each operating day. For any days that the engine operates but CO and O_2 measurements were not required, the corrected CO concentration for that day shall use the corrected CO concentration determined for the previous day.

   iii. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the theoretical stack gas flow rate for each day of engine operation using landfill gas flow rates and landfill gas methane concentrations measured pursuant to Part 2.

   iv. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the daily CO emission rate from each engine using the corrected CO concentration determined pursuant to Part 3b(ii) and the theoretical stack gas flow rate determined pursuant to Part 3b(iii).

v. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the total CO emissions from each engine and from S-1 and S-2 combined for each calendar month and for each consecutive 12-month period.

vi. The total CO emission from S-1 and S-2 combined shall be compared to the Part 3 annual CO emission limit above for each consecutive 12-month period.

4. Carbon Monoxide (CO) emissions from each IC Engine (S-1 and S-2) shall not exceed 2.1 grams of CO per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a carbon monoxide concentration in the engine exhaust of no more than 257 ppmv of CO, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 257 ppmv of CO shall not be deemed a violation of this part, if the Permit Holder can demonstrate that CO emissions did not exceed 2.1 g/bhp-hour during the test period. (Basis: Regulation 2-6-423.2.1, BACT, and Cumulative Increase)

5. Nitrogen Oxide (NO_x) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.6 grams of NO_x (calculated as NO_2) per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a nitrogen oxide concentration in the engine exhaust of no more than 45 ppmv of NO_x, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 45 ppmv of NO_x shall not be deemed a violation of this part, if the Permit Holder can demonstrate that NO_x emissions did not exceed 0.6 g/bhp-hour during the test period. (Basis: BACT and Offsets)

6. Each IC Engine (S-1 and S-2) shall comply with either the destruction efficiency requirements or the non-methane organic compound (NMOC) outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulations 2-5-302 and 8-34-301.4, BACT, TBACT, and Offsets)

7. In order to demonstrate on-going compliance with Part 6 and Regulation 8-34-509, the Permit Holder shall maintain the [insert description of key emission control system operating parameter] within [insert minimum and/or maximum operating ranges for key parameter]. [Add monitoring method and frequency after key parameter is established.] The Permit Holder shall determine the key parameter that will be monitored and shall establish the operating ranges for this key parameter during the initial compliance demonstration test. To facilitate the evaluation of potential key parameters (engine cylinder temperature, stack oxygen concentration, and lambda – λ – a comparison of the actual versus ideal air-to-fuel ratio), each engine shall be equipped with devices that will continuously monitor engine cylinder temperature and stack gas oxygen concentration during the initial compliance demonstration test. The Permit Holder shall obtain District approval for all source test and monitoring procedures that will be used to evaluate potential key operating parameters prior to conducting the initial compliance demonstration test. (Basis: Regulations 8-34-501.11 and 8-34-509)

8. Sulfur Dioxide (SO_2) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.3 grams of SO_2 per brake-horsepower-hour. In addition, the emissions from S-1 and S-2 combined shall not exceed 8.64 tons during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with these SO_2 emission limits by complying with the landfill gas concentration limits, monitoring and record keeping requirements identified Parts 8a and 8b below. (Basis: BACT and Cumulative Increase)

a. The concentration of total reduced sulfur (TRS) compounds in the landfill gas sent to the engines shall not exceed 270 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement. Compliance with this landfill gas concentration limit shall be demonstrated using either a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS or a District approved portable analysis method that reports only the H_2S concentration. If the portable analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the measured or calculated TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = measured TRS / measured % CH_4 * 50).

b. The annual weighted average concentration of TRS in the landfill gas sent to the engines shall not exceed 150 ppmv of TRS, expressed as H_2S and corrected to a landfill gas methane concentration of 50% by volume. Compliance with this annual average concentration limit shall be determined using the following procedures.

   i. On a daily basis, the Permit Holder shall use a District approved portable hydrogen sulfide monitor (or other District approved method) to determine the concentration of H_2S in the landfill gas that is sent to S-1 or S-2. This H_2S monitoring is required on any normal working day (Monday through Friday, excluding Saturday, Sunday, and Holidays) during which the engine operates for 3 or more consecutive hours between the hours of 6:00 AM and 6:00 PM. After collecting 120 daily monitoring events, this monitoring frequency may be reduced to a weekly basis, provided that the maximum measured H_2S concentration was not more than 200 ppmv of H_2S. Weekly H_2S monitoring is required for any calendar week (Sunday 12:00 AM through Saturday 11:59 PM) during which the engine operates for 3 or more consecutive hours on a normal working day as defined above.

   ii. For each day (or week) that an H_2S measurement is taken, the Permit Holder shall record, in the data acquisition system or other District approved log, the date and time that the H_2S measurement was taken and the measured H_2S concentration in ppmv. The TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (calculated TRS = 1.2 * measured H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = calculated TRS / measured % CH_4 * 50). For any day (or week) that an engine operates but an H_2S measurement is not required, the recorded TRS concentration for that day (or week) shall be equal to the corrected TRS concentration that was determined for the previous day (or week).

   iii. The Permit Holder shall use a data acquisition system to calculate and record the weighted average TRS concentration for each calendar month based on the daily TRS concentration data recorded pursuant to Part 8b(ii) - or weekly TRS concentration data if the testing frequency has been reduced to weekly in accordance with Part 8b(i) - and the continuous landfill gas flow rate data recorded pursuant to Part 2. The monthly weighted average TRS concentration is equal to the sum of the daily landfill gas flow rate to both engines times the

TRS concentration for each day of the month divided by the total landfill gas flow rate for that month.

iv. The Permit Holder shall use a data acquisition system to calculate and record the annual weighted average TRS concentration for each rolling 12-month period using the monthly average TRS concentration determined pursuant to Part 8b(iii) and the monthly landfill gas flow rate data recorded pursuant to Part 2.

v. The annual weighted average TRS concentration determined pursuant to Part 8b(iv) shall be compared to the Part 8b limit above for each consecutive 12-month period.

*9. Formaldehyde emissions from each IC Engine (S-1 and S-2) shall not exceed 19 pounds per million standard cubic feet of methane burned. (Basis: Regulation 2-5-302)

10. In order to demonstrate compliance with Parts 4, 5, 6, 8, and 9 above and Regulations 8-34-301.4, 9-1-302, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within 60 days of initial start-up of each engine and annually thereafter. This source test shall be conducted while the engine is operating at or near the maximum operating rate and shall determine all items identified in Parts 10a-k below. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report for the initial compliance demonstration test shall be submitted to the Source Test Section and the Engineering Division within 60 days of the test date. Subsequent annual source test reports shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 60 days of the test date. (Basis: BACT, TBACT, Offsets, Cumulative Increase, and Regulations 2-5-302, 2-6-423.2.1, 8-34-301.4, 8-34-412, 9-1-302, 9-8-302.1, and 9-8-302.3)

a. Operating rate for each engine during the test period (bhp);
b. Total flow rate of all gaseous fuel to each engine (dry basis, sdcfm);
c. Concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), total non-methane organic compounds (NMOC), hydrogen sulfide (H_2S), and total reduced sulfur compounds (TRS) in the gaseous fuel burned in the engines (percent by volume or ppmv);
d. High heating value for the landfill gas (BTU/scf);
e. Heat input rate to each engine averaged over the test period (BTU/hour);
f. Exhaust gas flow rate from each engine based on EPA Method 19 (dry basis, sdcfm);
g. Concentrations (dry basis) of NO_x, CO, CH_4, NMOC, SO_2, and O_2 in the exhaust gas from each engine (ppmv or percent by volume);
h. NO_x and CO concentrations corrected to 15% O_2 in the exhaust gas from each engine (ppmv);
i. NO_x and CO emission rates from each engine (grams/bhp-hour);
j. NMOC concentrations corrected to 3% O_2 in the exhaust gas from each engine (ppmv);
k. NMOC destruction efficiency achieved by each engine (weight percent);
l. Formaldehyde emission rate from each engine (pounds/hour and pounds/million scf CH_4 burned);
m. [Insert testing requirement for a key emission control system operating parameter once this parameter has been established.]

11. In order to demonstrate compliance with Part 7 above and Regulation 8-34-509, the Permit Holder shall conduct a sufficient number of additional initial compliance demonstrate tests on each engine to determine an appropriate key emission control system operating parameter and the minimum, typical, and maximum operating ranges for that parameter. These tests shall demonstrate a correlation between the proposed key parameter and the engine's NMOC emission rate over all expected operating ranges for the engine. For each engine operating level that is being evaluated, the compliance test shall determine either the NMOC concentration in the engine exhaust (ppmv corrected to 3% O_2) or NMOC destruction efficiency (weight percent) and at least one of the following: average temperature of all engine cylinders during the test period (degrees F); stack gas oxygen concentration during the test period as measured by the continuous stack gas oxygen monitor (percent by volume); or a comparison (λ) of the actual air-to-fuel ratio versus the ideal air-to-fuel ratio. Calculation of the λ parameter requires measurement of the stack gas oxygen concentration using a continuous stack gas oxygen monitor, measurement of the landfill gas flow rate using a continuous landfill gas flow rate monitor, and measurement of the landfill gas methane content using a continuous methane sensor. If any of these additional initial compliance demonstration tests that are not conducted concurrently with the Part 10 test, the Permit Holder shall follow the source test notification and reporting procedures that are described in Part 10 above. An additional report shall be prepared that describes the results of all these additional initial compliance demonstration tests, that discusses the correlations found between the NMOC emission rate and the proposed parameters, and that identifies the proposed key parameter and the proposed operating limits. This additional report shall be submitted to the Engineering Division by no later than 150 days after the initial start-up date for the engine. (Basis: Regulations 8-34-501.11 and 8-34-509)

V. RECOMMENDATION

The District recommends issuance of an Authority to Construct for the following equipment, subject to the permit conditions identified above.

S-1 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 97,440 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

S-2 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 97,440 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

By: Carol S. Allen _____ Date
Senior Air Quality Engineer

APPENDIX D

Final Determination of Compliance
Permit Application No. 16830

FINAL DETERMINATION

OF COMPLIANCE

for

BAAQMD PERMIT APPLICATION # 16830

Proposed Project:
Landfill Gas Treatment System and Waste Gas Flare and
Condition Changes for Two Landfill Gas Fired IC Engines

BAAQMD PLANT # 17667 (SITE # B7667)

Applicant: Ameresco Keller Canyon LLC
Location: Keller Canyon Landfill, Pittsburg, CA

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

June 17, 2008

Prepared By:

Carol S. Allen

Senior Air Quality Engineer

TABLE OF CONTENTS

FINAL DETERMINATION OF COMPLIANCE

Ameresco Keller Canyon LLC

PLANT # 17667 (SITE # B7667)

APPLICATION # 16830

I. BACKGROUND

This application is for a modification of a proposed landfill gas to energy facility that will be located on property owned by Keller Canyon Landfill Company (KCLC, Plant # 4618) but that will be operated by an independent company: Ameresco Keller Canyon LLC (Plant # 17667). The proposed equipment location is between KCLC's flare station and leachate tanks, in the northwestern section of KCLC's property.

Pursuant to Application # 14265, the District issued Ameresco Keller Canyon LLC (or "Ameresco") an Authority to Construct for two 2677 bhp internal combustion engines that will be fired exclusively on landfill gas collected from Keller Canyon Landfill. This equipment has not completed construction yet. In order to prevent triggering Title V, Ameresco voluntarily accepted a facility-wide emission limit for CO of 95.0 tons/year. Although Ameresco expected to comply with this CO emission limit by reducing the annual landfill gas throughput to the engines to approximately 85% of maximum capacity, the maximum permitted emission levels for all pollutants except CO were based on each of the two proposed engines operating continuously at full capacity.

Upon further consultation with the engine manufacturer, Ameresco has determined that a siloxane removal system will be necessary to prolong the life of the engines, to reduce engine maintenance costs, and to increase the compliance margin for the BACT CO emission limit. Ameresco submitted Application # 16830 in order to permit the proposed siloxane removal system and its associated waste gas flare. Due to the expected CO emissions from the flare, Ameresco will no longer be able to comply with the facility-wide CO emission limit. Consequently, Ameresco has submitted a Title V permit application for this facility.

The siloxane removal system includes additional filters and condensers and a temperature swing adsorption (TSA) gas cleaning module. The TSA module includes four pairs of carbon adsorbers (a total of 8 carbon canisters), which are collectively identified as the S-3 Temperature Swing Adsorption (TSA) Gas Cleaning System. During operation of S-3, two carbon canister pairs will operate in the adsorption mode (with no air emissions), while the other two carbon canister pairs undergo desorption. During the desorption cycle, the carbon canisters will be heated and flushed with treated "clean" landfill gas to remove VOC and organic toxic air contaminants from the carbon canisters. This flush gas will be blended with "carrier gas" (filtered landfill gas that has not been processed by the siloxane removal steps), and then vented to a small (8.25 MM BTU/hour) enclosed flare (A-1). Ameresco has requested to operate this flare continuously using as fuel: (a) the waste flush gas alone, (b) the flush gas/carrier gas blend, or (c) the carrier gas alone.

In addition to adding the siloxane removal system and flare, Ameresco amended their original application submittal to request modifications and condition changes for the two landfill gas fired IC Engines (S-1 and S-2) that are still under construction. The requested change of conditions at the engines will: delete the 95 tons/yr CO emission limit, increase the annual CO emission limit for the engines up to full capacity at continuous operation, and eliminate the onerous monitoring and record keeping requirements that were imposed in order to ensure compliance with the 95 tons/year CO limit. The use of the siloxane removal system will produce a "clean" landfill gas fuel for the engines that will result in lower toxic and VOC emissions from S-1 and S-2.

II. EMISSIONS

As discussed in the Background Section, this application involves modifications to the landfill gas fired IC Engines (S-1 and S-2) as well as the addition of new equipment: S-3 TSA Gas Cleaning System abated by A-1 TSA Waste Gas Flare. The new TSA system will produce a cleaner landfill gas fuel that will result in lower toxic air contaminant (TAC) emission rates from the engines, but the permit condition changes at the engines will result in a higher maximum permitted annual CO emission rate from the engines. Since all emissions from S-3 will be controlled by the A-1 Flare, the stack from this flare will be the only new emission point. This flare will have residual emissions of VOC and TACs that remain after combustion of the waste flush gas and carrier landfill gas, and it will have secondary criteria pollutant and TAC emissions. The new and revised emission limits for each source and for this total facility are discussed in detail below for each type of pollutant.

Criteria Pollutant Emissions

The criteria pollutant emission changes for the engines, the flare, and the total facility are each discussed below.

S-1 and S-2 IC Engines:

Pursuant to Application # 14265, each of the proposed 2677 bhp engines was permitted to operate for 24 hours per day and 365 days per year. All maximum daily and maximum annual criteria pollutant emission limits for these engines were based on these operating rates, except for carbon monoxide (CO). In order to qualify for a synthetic minor operating permit, Ameresco voluntarily accepted an annual CO emission limit of 95 tons/year, which is 87.5% of the maximum possible CO emission rate for the two engines combined.

For this application, each IC engine will be permitted to operate at maximum capacity with no additional restrictions on CO emissions. CO emissions are calculated based on the BACT limit of 2.1 grams/bhp-hour. The equation used to calculate maximum annual CO emissions these two engines is:

Annual CO: (2.1 g/bhp-hr)*(2677 bhp)*(24 hrs/day)*(365 days/yr)/(453.59 g/lb)/
(2000 lbs/ton)*(2 engines) = 108.569 tons/yr of CO

The CO emission increase for this modification of the engines is:
(108.569 tons/year CO) – (95.000 tons/year CO) = 13.569 tons/year of CO emission increase

For this application, the engines will be burning a cleaner landfill gas fuel that is expected to result in lower POC and NPOC emission rates from the engines. However, Ameresco has not requested to modify these POC and NPOC emission rate limits or any of the bases that were used to calculate these emission limits. Therefore, the maximum permitted POC and NPOC emission limits for these engines will remain unchanged from Application # 14265.

For clarity, the revised maximum permitted criteria pollutant (CO, NO_x, POC, SO_2, PM_{10}, and NPOC) emissions from each engine and the two engines combined are summarized in Table B.1. The basis for each pollutant specific emission limit is identified in Table B.2. Equivalent emission factors and outlet concentrations for each pollutant are described in Table B.3. The derivation of the emission factors and emission calculation procedures for each pollutant are discussed in detail in Application # 14265 with the change noted above for the maximum annual CO emission rate from these engines.

Table B.1. Revised Maximum Permitted Criteria Pollutant Emissions (S-1 and S-2)

	Each IC Engine		Total for Two Engines
	Pounds/Day	Tons/Year	Tons/Year
CO	297.45	54.285	108.569
NO_x	84.99	15.510	31.020
POC	26.41	4.820	9.640
SO_2	42.59	4.318	8.637
PM_{10}	14.16	2.585	5.170
NPOC	1.32	0.241	0.482

Table B.2. Emission Factor Basis for Each Criteria Pollutant (S-1 and S-2)

Basis for Emission Factor	Pollutant	Limit	Units
BACT, Mfg Guarantee, Permit Condition Limit	CO	2.1	g/bhp-hr
BACT, Mfg Guarantee, Permit Condition Limit	NO_x	0.6	g/bhp-hr
Regulation 8-34-301.4 NMOC Outlet Conc. Limit	POC	120	ppmv as CH_4 @ 3% O_2
BACT, Permit Condition Limit (daily limit)	SO_2	270	ppmv of TRS (as H_2S) in LFG
BACT, Permit Condition Limit (annual average)	SO_2	150	ppmv of TRS (as H_2S) in LFG
BACT, Mfg Guarantee, Permit Condition Limit	PM_{10}	0.1	g/bhp-hr
BAAQMD Calculation	NPOC	5%	of POC emission rate

Table B.3. Equivalent Emission Factors and Outlet Concentration Limits (S-1 and S-2)

Pollutant	grams / bhp-hour	pounds / hour	pounds / MM BTU	pounds / M scf LFG	ppmv @ 0% O_2	ppmv @ 3% O_2	ppmv @ 15% O_2	grains/sdcf @ 0% O_2
CO	2.100	12.394	0.62807	0.31212	903	774	257	
NO_x	0.600	3.541	0.17945	0.08918	157	135	45	
POC	0.186	1.100	0.05577	0.02771	140	120	40	
SO_2	0.301	1.775	0.08993	0.04469	57	48	16	
SO_2	0.167	0.986	0.04996	0.02483	31	27	9	
PM_{10}	0.100	0.590	0.02991	0.01486				0.022
NPOC	0.009	0.055	0.00279	0.00139	7	6	2	

S-3 TSA Gas Cleaning System and A-1 TSA Waste Gas Flare:

Landfill gas collected from the Keller Canyon Landfill contains an average of 3000 ppmv of NMOC (expressed as C_1 at 50% methane) with a typical range of 1000-5000 ppmv of NMOC. Currently, this collected gas is abated by Keller Canyon Landfill's two enclosed flares, which achieve either 98% by weight control of these NMOC's or emit no more than 30 ppmv of NMOC (expressed as C_1 at 3% excess oxygen) from the outlet of each flare.

Ameresco is proposing to process this collected Keller Canyon Landfill gas using the S-3 TSA Gas Cleaning System which includes filters, condensers, chillers, carbon adsorption, and a carbon desorption process that will be abated by the A-1 Waste Gas Flare.

At S-3, landfill gas that has passed through filters, condensers, and chillers will be vented through a series of two carbon canisters (an additional pairs of carbon canisters will be operated in parallel, if necessary). During this adsorption cycle, the carbon canisters will adsorb organic siloxanes, organic toxic air contaminants, and much of the other non-methane/non-ethane organic compounds that are present in the landfill gas. The resulting "clean" landfill gas will provide fuel for Ameresco's S-1 and S-2 IC Engines.

When the carbon canisters have reached full capacity, the inlet gas will begin venting to the other set(s) of canisters, and the full canisters will be switched to a desorption cycle. During this desorption cycle, the canisters are heated and flushed with a small slipstream of the clean landfill gas. The resulting waste flush gas is landfill gas that contains higher concentrations of siloxanes and the other organic contaminants than the gas that came directly from the landfill gas collection system. The concentrations of the organic constituents are expected to be about two times the concentration in raw collected landfill gas. Since Keller Canyon's landfill gas is expected to contains up to 5000 ppmv of NMOC (expressed as C1 at 50% methane), the waste flush gas is expected to have no more than 10,000 ppmv of NMOC expressed as C_1 at 50% CH_4.

The criteria pollutant emission rate limits for the A-1 Waste Gas Flare are summarized in Table B.4. The basis for each pollutant limit is described in Table B.5. Equivalent emission factors and outlet concentration limits for A-1 are summarized in Table B.6. A detailed explanation of

the basis for each pollutant limit follows Tables 4-6. Spreadsheets containing all calculations and assumptions are attached.

Table B.4. Revised Maximum Permitted Criteria Pollutant Emissions (S-3 and A-1)

	Uncontrolled From S-3		Abated and Secondary From A-1	
	Pounds/Day	Tons/Year	Pounds/Day	Tons/Year
CO			39.60	7.227
NO_x			11.88	2.168
POC	165.16	30.142	3.30	0.603
SO_2			17.81	1.805
PM_{10}			6.64	1.212
NPOC	8.26	1.507	0.17	0.030

Table B.5. Emission Factor Basis for Each Criteria Pollutant (From A-1)

Basis for Emission Factor	**Pollutant**	**Limit**	**Units**
RACT, Mfg Guarantee, Permit Condition Limit	CO	0.20	pounds/MM BTU
RACT, Mfg Guarantee, Permit Condition Limit	NO_x	0.06	pounds/MM BTU
Max Expected Inlet NMOC and Regulation 8-34-301.3 NMOC Destruction Efficiency Limit	POC	10,000 and 98%	ppmv of NMOC in A-1 inlet gas and by weight destruction of NMOC
Same as Engine BACT, Permit Condition Limit (daily limit)	SO_2	270	ppmv of TRS (as H_2S) in A-1 inlet gas
Same as Engine BACT, Permit Condition Limit (annual avg.)	SO_2	150	ppmv of TRS (as H_2S) in A-1 inlet gas
RACT, Mfg Guarantee	PM_{10}	0.001	pounds/hour per scfm of gas burned
BAAQMD Calculation	NPOC	5%	by weight of POC emission rate

Table B.6. Equivalent Emission Factors and Outlet Concentration Limits (From A-1)

Pollutant	pounds / hour	pounds / MM BTU	pounds / M scf	ppmv @ 0% O_2	ppmv @ 3% O_2	ppmv @ 15% O_2	grains/sdcf @ 0% O_2
CO	1.650	0.20000	0.09939	288	246	81	
NO_x	0.495	0.06000	0.02982	53	45	15	
POC	0.138	0.01668	0.00829	42	36	12	
Daily SO_2	0.742	0.08993	0.04469	57	48	16	
Annual SO_2	0.412	0.04996	0.02483	31	27	9	
PM_{10}	0.277	0.03354	0.01667				0.0244
NPOC	0.007	0.00083	0.00041	2	2	1	

Residual Organic Emissions from A-1:

The waste flush gas will be abated by the A-1 TSA Waste Gas Flare, which can burn up to 8.25 MM BTU/hour or 276.69 scfm of waste gas at 50% methane. If necessary, this waste gas will be blended with a carrier gas (filtered Keller Canyon landfill gas) to ensure the flare has a sufficient inlet heat rate for the flare to run properly. However, worst case emissions will occur when the flare is burning waste flush gas alone. The A-1 Flare will meet the requirements of Regulation 8-34-301.3 by achieving either a minimum of 98% by weight destruction of the NMOC in the waste flush gas or by emitting no more than 30 ppmv of NMOC expressed as C_1 at 3% excess O_2 from the outlet of the flare. Maximum permitted emissions for S-3 abated A-1 will be based on the higher of the two allowable flare NMOC limits.

If the A-1 Flare is operating at maximum capacity on waste flush gas with the maximum expected NMOC content, the 98% by weight NMOC destruction efficiency limit is equal to an emission rate of 0.138 pounds/hour of NMOC, as calculated below.
(8.25 E6 BTU/hour)/(496.943 BTU/scf flush gas)*(10,000 scf NMOC/1E6 scf flush gas)/
(387.006 scf NMOC/lbmol NMOC)*(16.04 lbs NMOC/lbmol NMOC)*
(1.00-0.98 lbs NMOC emitted/lb NMOC) = 0.1376 pounds/hour of NMOC emitted

If the A-1 Flare is operating at maximum capacity on waste flush gas, the 30 ppmv NMOC outlet concentration limit is equal to an emission rate of 0.115 pounds/hour of NMOC, as calculated below.
(8.25 MM BTU/hour)*(9605 sdcf flue gas at 0% O_2/MM BTU)*
[(29.95-0)/(20.95-3) scf flue gas at 3% O_2/scf flue gas at 0% O_2]*
(30 scf NMOC/1E6 scf flue gas at 3% O2)/(387.006 scf NMOC/lbmol NMOC)*
(16.04 lbs NMOC/lbmol NMOC) = 0.1150 pounds/hour of NMOC emitted

The maximum permitted emission rate for precursor organic compounds (POC) is the higher of the two possible NMOC emission rate limits that were determined above. Due to the high inlet NMOC concentration in the waste flush gas, the 8-34-301.3 requirement to achieve 98% NMOC destruction efficiency results in the higher residual NMOC emission rate than the NMOC outlet concentration limit. Therefore, the maximum permitted POC emission rate from the A-1 Flare is 0.1376 pounds/hour. For continuous operation (24 hours/day and 365 days/year), the maximum permitted POC emission rates are: 3.30 pounds/day and 0.603 tons/year.

Based on analytical data for Keller Canyon Landfill gas, the concentration of non-precursor organic compounds (NPOC) in the collected landfill gas is no more than 5% of the total NMOC concentration. This relationship is expected to be valid for the waste flush gas as well. Therefore, maximum permitted NPOC emission rates are: 0.0069 pounds/hour, 0.17 pounds/day, and 0.030 tons/year.

Secondary Criteria Pollutant Emissions from A-1:

Secondary emission rates for CO, NO_x, and PM_{10} are based on vendor specifications. The manufacturer guaranteed that the A-1 TSA Waste Gas Flare would emit no more than: (a) 0.20 pounds of CO per MM BTU, (b) 0.06 pounds of NO_x per MM BTU, and (c) 0.001 pounds/hour of PM_{10} per scfm of landfill gas burned, which is equivalent to a maximum outlet grain loading

of 0.0244 grains/sdcf of exhaust. The maximum hourly emission rate for each of these pollutants is calculated below:

CO: (0.20 lbs CO/MM BTU)*(8.25 MM BTU/hour) = 1.6500 pounds/hour of CO
NO_x: (0.06 lbs NO_x/MM BTU)*(8.25 MM BTU/hour) = 0.4950 pounds/hour of NO_x
PM_{10}: (0.001 lbs/hour / scfm of gas)*(276.69 scfm of gas) = 0.2767 pounds/hour of PM_{10}

Maximum daily and maximum annual emissions of CO, NO_x, and PM_{10} are based on continuous operation of the flare (24 hours/day and 365 days/year) at the maximum hourly emission rates determined above.

The landfill gas fuel used in Ameresco's S-1 and S-2 IC Engines has two BACT related sulfur content limits. The peak limit of 270 ppmv of TRS in the gas was derived from the District's BACT(2) standard for digester gas fired IC engines, which is 0.3 grams of SO_2/bhp-hour. For landfill gas containing 50% methane, an inlet concentration limit of 270 ppmv of TRS will ensure that sulfur dioxide emissions from the engine outlet will not exceed 0.3 g/bhp-hr. This limit applies to any individual test of the gas. The second limit is an annual average limit of 150 ppmv of TRS in the fuel gas to S-1 and S-2. Typically, the District imposes a single BACT limit of 150 ppmv of TRS in the fuel (applicable to any single test of the gas as well as to annual averages) for landfill gas fired combustion equipment. In Application # 14265, the District determined that this limit was not a feasible limit for S-1 and S-2, because Keller Canyon Landfill has occasionally measured TRS concentration spikes that have exceed 150 ppmv of TRS. However, these spikes are infrequent, and the average sulfur content has remained well below 150 ppmv of TRS. Therefore, the District imposed a two-tiered BACT standard for SO_2 emissions from Ameresco's engines.

The gas filters, chillers, and adsorbers that constitute the gas treatment system for this project are expected to have little impact on the sulfur compounds in the landfill gas, which consist mainly of hydrogen sulfide. As a result, the District expects the gas entering the flare will have essentially the same total reduced sulfur content as the gas entering the engines, and the two-tiered BACT sulfur content limits that apply to the engines will also be applicable for the A-1 Flare. Maximum daily SO_2 emissions are based on the peak sulfur content limit, while maximum annual SO_2 emissions are based on the annual average limit. Calculations are presented below:

(270 scf TRS/1E6 scf LFG gas)/(387.006 scf TRS/1 lbmol S)*(1 lbmol SO_2/1 lbmol S)*
(64.06 lbs SO_2/lbmol)*(276.69 scf gas/min)*(60 min/hour) = 0.7419 lbs/hour of SO_2 (peak)

Maximum Daily: (0.7419 lbs/hour SO_2)*(24 hours/day) = 17.81 lbs/day of SO_2

(150 scf TRS/1E6 scf LFG gas)/(387.006 scf TRS/1 lbmol S)*(1 lbmol SO_2/1 lbmol S)*
(64.06 lbs SO_2/lbmol)*(276.69 scf gas/min)*(60 min/hour) = 0.4122 lbs/hour of SO_2 (average)

Maximum Annual: (0.4122 lbs/hour SO_2)*(24 hours/day)*(365 days/year)/(2000 lbs/ton)
= 1.805 tons/year of SO_2

Facility Wide Emissions and Plant Cumulative Emission Increases

Maximum permitted emissions for each source and for the entire proposed project are summarized in Table B.7. Since this site has no other permitted equipment these total project emissions are also the total facility emissions.

The cumulative emission increase inventory for each application and the remaining balances for the total facility are summarized in Table B.8.

Table B.7. Maximum Permitted Criteria Pollutant Emissions For Total Site # B7667

	S-1 LFG Engine Tons/Year	S-2 LFG Engine Tons/Year	S-3 and A-1 Desorption & Flare Tons/Year	Total Project and Total Facility Tons/Year
CO	54.285	54.285	7.227	115.796
NO_x	15.510	15.510	2.168	33.188
POC	4.820	4.820	0.603	10.243
SO_2	4.318	4.318	1.805	10.442
PM_{10}	2.585	2.585	1.212	6.382
NPOC	0.241	0.241	0.030	0.512

Table B.8. Plant Cumulative Emission Increase Inventory for Site # B7667

	Application # 14265			Application # 16830			Total Site Inventory
Tons/Year	Increases	Offsets	Balance	Increases	Offsets	Balance	Balances
CO	95.000		95.000	20.796		20.796	115.796
NO_x	31.020	31.020	0.000	2.168	2.168	0.000	0.000
POC *	9.640	9.640	0.000	0.603	0.603	0.000	0.000
SO_2	8.637		8.637	1.805		1.805	10.442
PM_{10}	5.170		5.170	1.212		1.212	6.382
NPOC	0.482		0.482	0.030		0.030	0.512

* POC Offsets were not initially required for Application # 14265, because site-wide POC emissions were less than 10 tons/year. With Application # 16830, POC emissions will exceed 10 tons/year, and all previous POC emission increases must be offset. Since this site will emit less than 35 tons/year of POC, POC offsets will be supplied on behalf of the applicant from the District's small facility banking account.

Toxic Air Contaminant Emissions

This project is subject to Regulation 2, Rule 5. Since the equipment in this application is related to the landfill gas engines that were permitted pursuant to Application 14265, these two applications are considered to be a single project. This project includes the two landfill gas fired engines (S-1 and S-2) that were permitted pursuant to Application 14265, plus the S-3 TSA Gas Cleaning System, and the A-1 TSA Waste Gas Flare. All emissions from S-3 will be vented to A-1. The emission points are P-1 and P-2 (from each engine) and P-3 from the A-1 Flare.

The engines and the flare will burn gases that contain numerous toxic organic compounds and several toxic inorganic compounds. The engines and flare will destroy much of these toxic air contaminants (TACs) during combustion, but some residual organic and inorganic toxic compounds will remain in the emission points. In addition, the combustion process will produce secondary toxic compound emissions including: formaldehyde due to burning organic compounds, hydrogen chloride due to burning chlorinated compounds, hydrogen bromide due to burning brominated compounds, and hydrogen fluoride due to burning fluorinated compounds. Toxic emissions from the engines and from the flare are discussed in more detail below. Detailed calculations are available in the attached spreadsheets.

From Engines:
For this application, the proposed use of the TSA gas control module is expected to produce a "clean" landfill gas that contains much lower concentrations of VOC and toxic air contaminants than the VOC and TAC concentrations that are currently present in the filtered landfill gas from Keller Canyon Landfill (this filtered landfill gas was the engine fuel evaluated pursuant to Application # 14265). Since the TSA gas control module is a new process and each site's landfill gas composition is unique, the equipment manufacturer will not provide any guarantees about the VOC or toxic air contaminant removal efficiencies that the TSA gas control module will achieve. Based on the consultant's gas concentration projections for the flush gas, the District estimates that the TSA gas control module will remove at least 50% of each TAC from the filtered landfill gas. Formaldehyde emissions are expected to follow a similar trend, and formaldehyde emissions from the engines are estimated to be half of the current formaldehyde emission limit. Since the TSA gas control module is not expected to remove any sulfur compounds from the landfill gas, the hydrogen sulfide concentrations are based on the current limits for these engines. The engines are expected to achieve at least 85% by weight destruction efficiency for each individual TAC present in the inlet gas (95% minimum destruction efficiency for hydrogen sulfide.) The maximum expected TAC concentrations in the clean landfill gas and the revised residual and secondary emissions estimates for each engine are summarized in Table B.9.

From Flare:
The carbon desorption process uses heat and clean landfill gas to remove the adsorbed compounds from the carbon. The resulting waste flush gas will contain higher concentrations of VOCs and TACs. Based on data provided by the consultant, the District estimates that the TAC concentrations in the waste flush gas will be approximately twice as high as the untreated Keller Canyon landfill gas. Secondary organic TAC emissions are expected to follow a similar trend. Hydrogen sulfide concentrations in the flush gas are expected to be the same as the current concentration limits for the engines. The waste flush gas will be burned in the A-1 Flare, which will achieve higher destruction efficiencies for each individual TACs than the destruction rates expected for an IC engine. Since the carrier gas and flush/carrier gas blends that may be burned in this flare will contain lower TAC concentrations than the waste flush gas, combustion of the waste flush gas at the maximum flare capacity represents the worst-case scenario. The flare is expected to achieve at least 90% by weight destruction efficiency for each individual TAC present in the inlet gas (98% minimum destruction efficiency for hydrogen sulfide.) The maximum expected TAC concentrations in the waste flush gas and the residual and secondary TAC emission rate estimates for the A-1 Flare and the total project are summarized in Table B.10.

Table B.9. Revised TAC Emission Estimates for S-1 and S-2 Engines Burning Clean Landfill Gas

Significant TACs in Clean LFG	Molecular Weight g/mol	Estimated Concentration, ppbv	Destruct Eff.	Emission Factor lbs/M scf	Emissions Per Engine lbs/hour	Emissions Per Engine lbs/year	Total for 2 Engines lbs/year
Acrylonitrile	53.06	250	85%	5.142E-6	2.042E-04	1.79	3.58
Benzene	78.11	10000	85%	3.028E-4	1.202E-02	105.31	210.63
Carbon Tetrachloride	153.82	100	85%	5.962E-6	2.367E-04	2.07	4.15
Chloroform	119.38	100	85%	4.627E-6	1.837E-04	1.61	3.22
Ethylene Dibromide	187.86	100	85%	7.281E-6	2.891E-04	2.53	5.07
Ethylene Dichloride	98.96	250	85%	9.589E-6	3.808E-04	3.34	6.67
Hydrogen Sulfide (max. hourly)	34.08	270000	95%	1.189E-3	4.720E-02	NA	NA
Hydrogen Sulfide (annual avg.)	34.08	150000	95%	6.604E-4	NA	229.71	459.42
Methylene Chloride	84.93	10000	85%	3.292E-4	1.307E-02	114.51	229.02
Perchloroethylene	165.83	2000	85%	1.286E-4	5.105E-03	44.72	89.43
Trichloroethylene	131.39	1000	85%	5.093E-5	2.022E-03	17.71	35.43
Vinyl Chloride	62.50	1000	85%	2.422E-5	9.619E-04	8.43	16.85
Secondary TACs	MW	Ion Concen.		lbs/M scf		lbs/year	lbs/year
Formaldehyde	30.03			5.000E-3	1.985E-01	1739.24	3478.49
HCl	36.46	20000	0%	1.884E-3	7.482E-02	655.44	1310.87
HBr	80.91	10000	0%	2.091E-3	8.302E-02	727.25	1454.50
HF	20.01	2500	0%	1.292E-4	5.132E-03	44.96	89.91

Table B.10. TAC Emission Estimates for A-1 Flare Burning Waste Flush Gas and for the Total Project

Significant TACs in Flush Gas	Molecular Weight g/mol	Estimated Concentration, ppbv	Destruct Eff.	Emission Factor lbs/M scf	Flare Emissions lbs/hour	Flare Emissions lbs/year	Total Project lbs/year
Acrylonitrile	53.06	1000	90%	1.371E-5	2.276E-04	1.99	5.57
Benzene	78.11	40000	90%	8.074E-4	1.340E-02	117.41	328.04
Carbon Tetrachloride	153.82	500	90%	1.987E-5	3.299E-04	2.89	7.04
Chloroform	119.38	500	90%	1.542E-5	2.560E-04	2.24	5.46
Ethylene Dibromide	187.86	500	90%	2.427E-5	4.029E-04	3.53	8.60
Ethylene Dichloride	98.96	1000	90%	2.557E-5	4.245E-04	3.72	10.39
Hydrogen Sulfide (max. hourly)	34.08	270000	98%	4.755E-4	7.893E-03	NA	NA
Hydrogen Sulfide (annual avg.)	34.08	150000	98%	2.641E-4	NA	38.41	497.84
Methylene Chloride	84.93	40000	90%	8.778E-4	1.457E-02	127.66	356.68
Perchloroethylene	165.83	8000	90%	3.428E-4	5.691E-03	49.85	139.29
Trichloroethylene	131.39	4000	90%	1.358E-4	2.254E-03	19.75	55.18
Vinyl Chloride	62.50	4000	90%	6.460E-5	1.072E-03	9.39	26.25
Secondary TACs	MW	Ion Concen.		lbs/M scf		lbs/year	lbs/year
Formaldehyde	30.03			4.000E-4	6.641E-03	58.17	3536.66
HCl	36.46	80000	0%	7.537E-3	1.251E-01	1096.10	2406.97
HBr	80.91	40000	0%	8.363E-3	1.388E-01	1216.20	2670.71
HF	20.01	10000	0%	5.170E-4	8.582E-03	75.18	165.09

In Table B.11, the current project emissions (emissions from the engines burning clean landfill gas plus the gas treatment system emissions) are compared to the previous project emissions (due to the two engines burning filtered landfill gas) and are also compared to the risk screen trigger levels. For this application, the maximum hourly project emissions of hydrogen sulfide and formaldehyde will exceed the acute trigger levels from Table 2-5-1. For annual emissions, the emission rates for acrylonitrile, benzene, carbon tetrachloride, ethylene dibromide, ethylene dichloride, hydrogen sulfide, methylene chloride, perchloroethylene, vinyl chloride, hydrogen bromide and hydrogen fluoride will each exceed their chronic risk screen trigger level. Therefore, a new Health Risk Screening Analysis is required for this project.

Table B.11. Current and Proposed TAC Emissions for the Total Project Compared to Risk Screen Trigger Levels

Compound	App. # 14265 Project lbs/hr	App. # 16830 Project lbs/hr	Acute HRSA Trigger lbs/hr	App. # 14265 Project lbs/yr	App. # 16830 Project lbs/yr	Chronic HRSA Trigger lbs/yr
Acrylonitrile	7.56 E-4	6.36 E-4	NA	6.63	5.57	0.64
Benzene	4.46 E-2	3.74 E-2	2.90 E+0	390.37	328.04	6.40
Carbon Tetrachloride	2.20 E-4	8.57 E-4	4.20 E+0	1.94	7.04	4.30
Chloroform	1.71 E-4	6.23 E-4	3.30 E-1	1.50	5.46	34.00
Ethylene Dibromide	2.70 E-4	9.81 E-4	NA	2.36	8.60	2.60
Ethylene Dichloride	1.42 E-4	1.19 E-3	NA	1.25	10.39	8.90
Hydrogen Sulfide	2.62 E-1	1.02 E-1	9.30 E-2	2298.94	497.84	390.00
Methylene Chloride	1.95 E-2	4.07E-2	3.10 E+1	171.00	356.68	180.00
Perchloroethylene	7.86 E-3	1.59E-2	4.40 E+1	68.86	139.29	30.00
Trichloroethylene	2.84 E-3	5.12 E-3	NA	24.80	55.18	91.00
Vinyl Chloride	1.53 E-3	3.00 E-3	4.00 E+2	13.37	26.25	2.40
Formaldehyde	7.54 E-1	3.97 E-1	2.10 E-1	6609.12	3536.66	30.00
Hydrogen Bromide	3.32 E-1	3.05 E-1	NA	2621.74	2670.71	930.00
Hydrogen Chloride	3.00 E-1	2.75 E-1	4.60 E+0	2909.01	2406.97	350.00
Hydrogen Fluoride	2.06 E-2	1.88 E-2	5.30 E-1	179.82	165.09	540.00

III. STATEMENT OF COMPLIANCE

Regulation 2, Rule 1 (CEQA and Public Notice Requirements)

In 1999, the District evaluated a proposed landfill gas energy plant associated with the Keller Canyon Landfill pursuant to Permit Application # 19432. This landfill gas energy plant was proposed by Energy Developments Inc. (EDI) and Bio Energy California LLC. EDI's proposed power plant was to consist of three 1877 bhp lean burn IC engines that would burn landfill gas collected from Keller Canyon Landfill (exclusively with no supplemental fuels) and that would have a combined nominal power output of 4 MW. In March 1999, the District was informed by the appropriate local agencies that no other permits would be required and that the District should therefore assume lead agency status for this project. In April 1999, the District evaluated

the Appendix H Environmental Information Form and Environmental Assessment that were submitted by the Applicant and concluded that this project met the District's requirements for categorical exemption from CEQA review pursuant to Regulation 2-1-312.11. The Director or Permit Services approved this categorical exemption from CEQA review on April 19, 1999 and issued an Authority to Construct for the three IC engines on May 27, 1999.

In 2001, Contra Costa County determined that a land use permit amendment would be required for EDI's proposed landfill gas power plant. Contra Costa County conducted an initial study and concluded that the proposed project could not have any significant impact on the environment. Although project NO_x emissions exceeded the project significance criteria for NO_x (80 pounds/day and 15 tons/year from Table 3 of District's CEQA Guidelines), Contra Costa County concluded that this impact would not be significant because all NO_x emissions would be fully offset with emission reductions provided from the District's small facility banking account. All other emissions were less than the applicable significance criteria. On June 25, 2002, the Contra Costa County Board of Supervisors considered and adopted the October 2001 Initial Study and Negative Declaration for EDI's landfill gas energy project and approved Land Use Permit (LUP) 012115, an amendment to LUP 2020-89 for the Keller Canyon Landfill Facility, for the construction and operation of a landfill gas power plant at the Keller Canyon Landfill.

EDI never constructed any part of the proposed landfill gas power plant. At the Applicant's request, the District cancelled Authority to Construct # 19432 in February 2003.

In February 2006, Ameresco Keller Canyon LLC submitted Application # 14265 for a similar landfill gas power plant for the Keller Canyon Landfill Facility. Initially, Ameresco proposed to install three 1468 bhp lean burn IC engines that were expected have a nominal power output of 3.2 MW. In May 2006, Ameresco amended this application and requested to install two 2677 bhp lean burn IC engines with a nominal power output of 3.8 MW instead of the three 1468 bhp engines. In the February 2006 application materials, Ameresco indicated (on Form P-101B and in Section 7.0 of the application submittal) that Contra Costa County's Planning Department was the Lead Agency for this proposed landfill gas energy plant. Ameresco stated that CEQA documentation would be provided when it was available.

In January 2007, the District was informed by Joel Sabenorio, a consultant for Contra Costa County, that the county was not currently conducting a new environmental review for the project but was instead conducting a consistency determination to determine if any additional land use permit amendments would be required. He requested a District review of the air quality emissions and requirements to assist with the county's consistency review. The District prepared a Preliminary Engineering Evaluation for this project covering all air quality regulations other than CEQA review. This Preliminary Engineering Evaluation was approved by Brian Bateman, Director of Engineering, on February 5, 2007 and transmitted to Contra Costa County and the Applicant. On February 13, 2007, Contra Costa County concluded that Ameresco's proposed landfill gas power plant was substantially equivalent to the previously approved landfill gas power plant. Contra Costa County stated that a land use permit amendment would not be required for Ameresco's landfill gas power plant, and that Ameresco must comply with all land use permit conditions that were approved for the EDI power plant project in June 2002.

The District concluded that Ameresco had satisfied the requirements of Regulation 2-1-408.1 and that no further CEQA review was required. The District issued the Authority to Construct for the two 2677 bhp IC Engines on February 28, 2007.

Application #16830 will modify the currently permitted landfill gas to energy project by adding a landfill gas treatment system and a waste gas flare and by increasing the CO emission limit at the two engines from 95 tons/year to the maximum capacity level of 109 tons/year. The total criteria pollutant emission increases for this application are: 20.8 tons/year of CO, 2.2 tons/year of NO_x, 0.6 tons/year of POC, 1.8 tons/year of SO_2, and 1.2 tons/year of PM_{10}. As with the previous application, all NO_x emissions for this project including the additional NO_x emissions from this modification will be fully offset by emission reduction credits from the District's small facility banking account. In addition, the POC emissions from the site will now trigger the POC offset requirement. Therefore, all POC emissions for both the previous project and this current modification will be fully offset with emission reduction credits from the District's small facility banking account. Although this modification will result in some net increases in CO, SO_2, and PM_{10} emissions, the use of the gas treatment system will produce a cleaner fuel for the engines, and the use of this clean fuel will reduce the overall health impacts from this project. The cancer risk for this project will be reduced by 20%, the chronic hazard index will be reduced by 38%, and the acute hazard index will be reduced by 54% from the currently approved project.

The potential need for a gas treatment system was discussed in the December 12, 2006 Project Overview and Description (Section 10.6) that the Applicant prepared for Contra Costa County and BAAQMD Application # 14265. Thus, this current project was included in the February 2007 update to the 2001 Negative Declaration that Contra Costa County approved for a landfill gas to energy facility at this location. Since the December 2006 Project Overview and Description did not contain a specific discussion about the air emissions from the gas treatment system, the District will compare the currently proposed project and the emission increases associated with this modification to the BAAQMD CEQA Significance Criteria to determine if this modification constitutes a significant change to the project and specifically to the air quality impacts from this project, which were – in part – the basis on which the 2001 Negative Declaration was prepared. In Tables C.1 and C.2, the air pollutant emissions and health impacts for the original EDI landfill gas to energy project, the Ameresco landfill gas to energy project approved pursuant to Application # 14265, and the revised Ameresco project for Application # 16830 are compared to the appropriate CEQA significance thresholds.

Table C.1 Comparison of Maximum Daily Emissions to Related Projects and to CEQA Significance Criteria

Application #	19432	14265	16830			
Plant Owner	EDI	Ameresco	Ameresco			
Project Description	4 MW Power Produced By 3 Engines Burning LFG	3.8 MW Power Produced By 2 Engines Burning LFG	3.8 MW, Same 2 Engines Burning Clean LFG, Plus GTS, & Flare	Proposed Project vs. EDI Project	Proposed Project vs. App. #14265 Project	BAAQMD CEQA Significance Criteria
Pounds/Day CO	519	595	635	+ 116	+ 40	none
Pounds/Day NO_x	268	170	182	- 86	+ 12	80
Pounds/Day POC	55	53	56	+ 1	+ 3	80
Pounds/Day SO_2	24	85	103	+ 79	+ 18	none
Pounds/Day PM_{10}	48	28	35	- 13	+ 7	80

Table C.2 Comparison of Maximum Annual Emissions and Health Impacts to Related Projects and CEQA Significance Criteria

Application #	19432	14265	16830			
Plant Owner	EDI	Ameresco	Ameresco			
Project Description	4 MW Power Produced By 3 Engines Burning LFG	3.8 MW Power Produced By 2 Engines Burning LFG	3.8 MW, Same 2 Engines Burning Clean LFG, Plus GTS, & Flare	Proposed Project vs. EDI Project	Proposed Project vs. App. #14265 Project	BAAQMD CEQA Significance Criteria
Tons/Year CO	94.6	95.0	115.8	+ 21.2	+ 20.8	none
Tons/Year NO_x	48.9	31.0	33.2	- 15.7	+ 2.2	15
Tons/Year POC	10.0	9.6	10.2	+ 0.2	+ 0.6	15
Tons/Year SO_2	4.3	8.6	10.4	+ 6.2	+ 1.8	none
Tons/Year PM_{10}	8.7	5.2	6.4	- 2.4	+ 1.2	15
Cancer Risk	1.6 in a million	8.0 in a million	6.4 in a million	+ 4.8 in a million	- 1.2 in a million	10 in a million
Chronic HI	0.1	0.47	0.29	+ 0.19	- 0.18	1
Acute HI	Not Evaluated	0.98	0.45		- 0.53	1

For the original EDI project, maximum daily and maximum annual NO_x emissions exceeded the CEQA significance thresholds of 80 pounds/day and 15 tons/year. Since all NO_x emissions were offset with NO_x emission reduction credits, this NO_x emission increase was mitigated to a less than significant level. POC and PM_{10} emissions and the health impacts resulting from the project's toxic air contaminant emissions were each below the CEQA significance thresholds. There were no significance criteria for CO or SO_2 emissions. On this basis, Contra Costa County concluded that the landfill gas to energy facility (after incorporation of the required NO_x offsets) would have a less than significant air quality impact.

For both the currently approved Ameresco project and the proposed revised Ameresco project, NO_x is the only pollutant for which the project emissions will exceed a CEQA significance criteria. As with the EDI project, all NO_x emission increases for the proposed Ameresco project will be fully offset by NO_x emission reduction credits provided by the District. Furthermore, the total NO_x emissions proposed for the revised Ameresco project are 32% lower than the NO_x emission rate approved for the EDI project. While the revised Ameresco project will have a 0.2 ton/year POC increase compared to the EDI project, the total project emissions (10.2 tons/year of POC) remain less than the 15 tons/year significance criteria for POC, and the 10.2 tons/year of POC emissions for this energy facility will be offset with POC emission reduction credits provided by the District. PM_{10} emissions from the revised Ameresco project are both lower than the significance criteria and lower than the PM_{10} emissions from the EDI project. Health impacts from the revised Ameresco project are also less than the significance criteria. Although health impacts from the revised Ameresco project are higher than the health impacts determined for the EDI project, these health impacts are lower than the currently approved project. SO_2 and CO emissions from the revised Ameresco project are both higher than the emissions from the EDI project, but there are no significance criteria for these pollutants. The SO_2 emissions will occur at the same rate, regardless of whether the collected landfill gas is burned in Keller Canyon Landfill's flares, Ameresco's engines, or Ameresco's waste gas flare. The CO emission increases are due to the higher CO emission rate that is emitted from the combustion of landfill gas in IC engines compared to the CO emission rate produced by burning landfill gas in an enclosed flare. The gas treatment system that is the subject of this current application will produce a cleaner burning landfill gas and should mitigate these CO emission increases to the maximum extent possible revision.

While this current application will result in criteria pollutant emission increases compared to the currently approved project, these emission increases are either being offset by emission reductions elsewhere (for example, NO_x and POC emission reduction credits will be supplied by the District and SO_2 and PM_{10} emissions will simply shift from the Keller Canyon Landfill facility to the Ameresco site) or are being mitigated to the maximum extent possible as a result of this proposed modification (health impacts for the revised project are lower than the approved project and actual CO emissions for the revised project may be lower than the currently approved project due to the use of clean LFG fuel in the engines). Since the gas treatment process was previously addressed in CEQA documentation and there is no possibility that this application will result in any significant unmitigated adverse air quality impacts, the District concludes that this project modification is consistent with the previously approved Negative Declaration for a similar project at the same location. The Regulation 2-1-408.1 requirement to have either a certified EIR or an approved Negative Declaration for this project is satisfied by the 2001 Negative Declaration for the similar landfill gas to energy facility that was proposed by EDI but never constructed. No additional CEQA review is required.

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

Regulation 2, Rule 2 (NSR – BACT for S-1 and S-1 Engines)

As shown in Table B.1, each of the proposed IC engines will emit more than 10 pounds per day of CO, NO_x, POC, SO_2, and PM_{10}. Therefore, BACT is required for each of these pollutants. The BACT requirements for these engines were described in detail in the Engineering Evaluation for Application # 14265. This current application will increase the annual CO emission limit so that the engines will be allowed to operate at continuously at full capacity. However, this application will not alter any BACT determinations, BACT related limits, or other requirements for these engines that were imposed to ensure compliance with each of the applicable pollutant specific BACT requirements. Therefore, no additional BACT review is triggered for the S-1 and S-2 IC Engines.

Regulation 2, Rule 2 (NSR – BACT for S-3 TSA Gas Cleaning System)

As shown in Table B.4, uncontrolled POC emissions from the S-3 TSA Gas Cleaning System will exceed 10 pounds/day of POC emissions. Therefore, BACT is required for POC emissions from S-3. Ameresco has proposed to control these POC emissions by venting all of the gases from S-3 to an enclosed flare (A-1) that will achieve at least 98% by weight reduction of these POC emissions and that will emit less than 10.0 pounds/day of residual POC emissions.

The District does not have any specific BACT determinations for landfill gas treatment systems; however, the BACT determinations for Landfill Gas Gathering Systems (Document #101.1) and Digester Gas or Landfill Gas Enclosed Flares (Document #80.1) involve similar gas flow rates and compositions and similar emission control methods. From Document #101.1, a BACT(2) achieved-in-practice level of control is to vent collected landfill gas to an enclosed flare or an IC engine. From Document # 80.1, the enclosed flare should be designed to have a minimum retention time of 0.6 seconds with the temperature maintained at a minimum of 1400 °F. The flare should also be equipped with automatic combustion air controls, automatic gas shutoff valves, and automatic restart systems.

The flare manufacturer, John Zink Company, provided specifications for the proposed A-1 Flare. This flare is designed to operate at a maximum heat input rate of 8.25 MM BTU/hour with landfill gas flow rates of 100-275 scfm. At the maximum flow rate, the flare is designed to achieve a minimum retention time of 0.7 seconds with operating temperatures ranging from 1400-1800 °F. At a set temperature of 1600 °F, the A-1 Flare will achieve 98% by weight destruction of non-methane organic compounds. The A-1 Flare will be equipped with automatic shutoff valves, automatic air damper louver controls, and automatic restart features. The A-1 is expected to achieve Therefore, the proposed A-1 Flare satisfies all of the BACT(2) design criteria described in Document #80.1. Since the residual POC emissions from the flare will be less than 10 pounds/day, it is not necessary for this proposed control system to achieve a higher POC control efficiency than 98% by weight. Thus, venting emissions from S-3 to the properly operating A-1 Flare constitutes BACT for the control of POC emissions from S-3.

Proposed Condition # 23962, Parts 1, 3, 4, 10, and 11 will ensure compliance with the BACT requirements identified above. These monitoring requirements include annual source testing to verify the NMOC destruction efficiency achieved by the flare and to establish the appropriate minimum combustion zone temperature, continuous combustion zone temperature records, and continuous gas flow rate records.

Regulation 2, Rule 2 (NSR – RACT for Secondary Emissions from A-1 Flare)
The A-1 TSA Waste Gas Flare will have secondary combustion emissions due to burning waste flush gas from S-3 and/or landfill gas delivered from Keller Canyon Landfill. Pursuant to Regulation 2-2-110, secondary emissions from abatement devices that are required to meet BACT or BARCT requirements for another pollutant are exempt from the Regulation 2-2-301 BACT requirements but must achieve a RACT level of control for these secondary pollutants instead. As shown in Table B.4, the secondary CO, NO_x, and SO_2 emissions from A-1 will each exceed 10 pounds/day. Therefore, A-1 is required to achieve a RACT level of control for the CO, NO_x, and SO_2 emissions.

CO:
From Document # 80.1, the BACT(2) requirement for secondary CO emissions from an enclosed landfill gas flare is the use of good combustion practices. Compliance with this BACT(2) requirement constitutes a RACT level of control for secondary CO emissions. For many other landfill gas flares, the District has determined that meeting a maximum CO emission limit of 0.2 pounds of CO per MM BTU is indicative of good combustion practice and is a reasonable and achievable CO emission limit for an enclosed landfill gas flare. Based on specifications provided by John Zink Company, the proposed flare is expected to comply with a maximum emission limit of 0.20 lbs CO/MM BTU. Proposed Condition #23962, Parts 6 and 11 will demonstrate compliance with this RACT limit based on annual source testing of the flare.

NO_x:
From Document # 80.1, the BACT(2) requirement for secondary NO_x emissions from an enclosed landfill gas flare is having a NO_x emission limit of 0.06 pounds of NO_x per MM BTU. Based on specifications provided by John Zink Company, the proposed flare is expected to comply with a maximum emission limit of 0.06 pounds of NO_x lbs/MM BTU. Proposed Condition #23962, Parts 5 and 11 will demonstrate compliance with this RACT limit based on annual source testing of the flare.

SO_2:
Document #80.1 has no BACT(2) controls for reducing SO_2 emissions. The BACT(1) level of control for SO_2 emissions includes the use of a scrubber or other approved gas pretreatment systems to remove sulfur compounds from the gas. As discussed in Application # 14265, using a gas pretreatment system to

remove the sulfur compounds (which are mainly hydrogen sulfide) from the gas was not found to be a cost effective method of control for SO_2 emissions from the landfill gas fired engines. Instead, BACT was deemed to be compliance with a short term limit of 270 ppmv of TRS in the gas (equivalent to a maximum SO_2 emission rate from the engines of 0.3 g/bhp-hr) and compliance with an annual average limit of 150 ppmv of TRS in the gas. The gas burned by the A-1 Flare is expected to comply with these same sulfur content limits. These limits constitute a RACT level of control for secondary SO_2 emissions from A-1.

Proposed Condition #23962, Parts 7 and either Part 11 or Part 12 will demonstrate compliance with these RACT limits for secondary sulfur dioxide emission limits. The annual test for either SO_2 emissions from the flare or for TRS content in the flare inlet gas will verify that that the TRS concentrations in the flare inlet gas are no higher than the TRS levels found in the gas burned in the engines. The fuel sulfur content monitoring in Condition #23400, Part 7 will verify compliance with the annual sulfur dioxide emission limit assumptions.

Regulation 2, Rule 2 (NSR – Offsets)

Regulation 2-2-302 requires offsets for NO_x and POC emission increases, if the facility-wide NO_x or POC emissions will exceed 10 tons per year. As shown in Table B.7, the total permitted emissions for this facility will be 33.2 tons/year of NO_x and 10.2 tons/year of POC. Since facility-wide NO_x and POC emissions will each exceed 10 tons/year, offsets are required for the total emissions increases of 33.188 tons/year NO_x and 10.243 tons/year of POC. Since facility wide emissions are less than 35 tons/year NO_x and less than 35 tons/year POC, the emission reduction credits should be supplied at a ratio of 1.0 to 1.0. This facility qualifies to use the small facility banking account (SFBA), because facility wide emissions will be less than 35 tons/year each of NO_x and POC and because the applicant does not hold any banked emission reduction credits. Therefore, the District will provide all of the required NO_x and POC emission reduction credits for this project from the SFBA. The District previously supplied 31.020 tons/year of NO_x emission reduction credits for this project per Application # 14265. The District will provide an additional 2.168 tons/year of NO_x credits for this project per Application # 16830. No POC credits have been supplied to date for this project, because facility-wide POC emissions under Application # 14265 were less than 10 tons/year. Now that POC emissions exceed 10 tons/year, emission reduction credits must be supplied for all previous POC emission increases. The District will retroactively provide 9.640 tons/year of POC emission reduction credits for Application # 14265 and 0.603 tons/year of POC emission reduction credits for Application # 16830. The heat input limits and records in proposed Condition #23962, Part 2 combined with the NMOC and NO_x standards in Parts 3 and 5 will verify that Ameresco has not exceeded the annual emission rates for which emission reduction credits have been provided.

Regulation 2-2-303 requires PM_{10} and SO_2 offsets for major facilities that have more than 100 tons/year of PM_{10} or SO_2 emissions. Since neither PM_{10} nor SO_2 emissions from this facility will exceed 100 tons/year, offsets are not required for either of these pollutants.

Regulation 2, Rule 2 (NSR – PSD)

PSD review is required for facilities that emit more than 250 tons/year of a regulated air pollutant, or than emit more than 100 tons/year if the facility is one of 28 source categories that are subject to the lower PSD threshold of 100 tons/year. Landfill gas fired IC engines, gas treatment systems, and flares are not in one of the 28 special PSD source categories. Therefore, the PSD threshold for this site is 250 tons/year. Since this facility will emit less than 250 tons/year of each pollutant, PSD does not apply.

Regulation 2, Rule 2 (Publication and Public Comment)

This application is for a modification of a synthetic minor permit that will result in total facility-wide emissions of more than 100 tons/year of CO. Therefore, this facility is a new major facility for CO emissions. Regulation 2-2-405 requires the District to notify EPA, ARB, adjacent Districts, and the general public of BAAQMD's preliminary decision on this project and to invite written public comment on this project for a 30-day period following publication of BAAQMD's preliminary decision.

The public notice and preliminary engineering evaluation were sent to EPA, ARB, and adjacent Districts and posted on the District's web site on May 2, 2008. Public comments were accepted through June 12, 2008, but the District did not receive any comments on this proposed project. The public comment requirements of Regulation 2-2-405 have been satisfied. The District has determined that the proposed project will comply with all applicable requirements and that no revisions to the proposed permit conditions are necessary. Therefore, the District will take the final action to approve the authority to construct for this project.

Regulation 2, Rule 5 (NSR – Toxic Air Contaminants)

Since toxic air contaminant (TAC) emissions for this project will exceed risk screen trigger levels (see Table B.11), a Health Risk Screening Analysis (HRSA) is required for this project pursuant to Regulation 2-5-401. The District conducted an HRSA for this project in accordance with the BAAQMD HRSA Guidelines. The results of this HRSA are summarized below in Tables C.3 and C.4. A detailed HRSA report is attached.

Table C.3. HRSA Results: Total Project Risk

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
Residential Receptor	3.8	0.16	0.45
Worker Receptor	6.4	0.29	

Table C.4. HRSA Results: Source Risks

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
S-1 IC Engine			
Residential Receptor	1.6	0.07	No Applicable Standard
Worker Receptor	2.3	0.12	
S-2 IC Engine			
Residential Receptor	1.6	0.07	No Applicable Standard
Worker Receptor	2.5	0.13	
A-1 Flare			
Residential Receptor	0.6	0.02	No Applicable Standard
Worker Receptor	5.6	0.22	

TBACT:
Regulation 2-5-301 requires best available control technology for toxic air contaminants (TBACT) for each source that has a source risk of more than 1.0 in a million cancer risk or more than 0.2 chronic hazard index. As shown in Table C.5, each engine and the flare have source risks that exceed one or more of these TBACT thresholds. Therefore, S-1, S-2, and A-1 must each satisfy TBACT requirements. In order to determine appropriate TBACT requirements, the major risk contributors need to be identified. From the detailed HRSA report, the top contributors to cancer risk are: formaldehyde and benzene for the engines and benzene and vinyl chloride from the flare. All of these compounds are POCs. The primary contributors to chronic hazard index are formaldehyde and acid gas emissions from the flare. Formaldehyde is a POC while the acid gases are formed as a result on halogenated contaminants in the inlet gas.

The District's BACT/TBACT Guideline for IC Engines - Landfill or Digester Gas Fired; Greater than 250 hp (Document # 96.2.1) describes previously approved BACT and TBACT requirements for the type of engine that is proposed in this project. This document states that TBACT constitutes compliance with the emission limits and control technologies that are specified as BACT for POC emissions. Since the primary contributors to the cancer risk resulting from the engines in this project are POCs, TBACT for the proposed engines will be the use of the same technology as BACT for POC emissions. Source test data for similar engines located at another Bay Area facility confirm that there is a general correlation between CO and POC emissions and formaldehyde emissions. Therefore, minimizing CO and POC emissions from these engines will also minimize formaldehyde emissions and health risks.

Under Application # 14265, the District concluded that that the proposed engines would comply with TBACT requirements by using lean burn technology and complying with the outlet NMOC concentration specified in Regulation 8-34-301.4, which is equivalent to about 0.2 g/bhp-hour. This emission rate limit is about one third of the current BACT(1) determination for POC emissions. As a result of Application # 16830, these engines will now be burning clean landfill gas produced by the landfill gas treatment system instead of the filtered landfill gas that was approved pursuant to Application # 14265. Use of this clean landfill gas fuel is expected to further reduce CO and POC emissions (even though the site has not asked to reduce these limits) and to reduce formaldehyde emissions. A revised formaldehyde emission limit is proposed in the permit conditions (see Condition # 23400, Part 9) to recognize the emission reductions expected for this clean landfill gas fuel.

The District's BACT/TBACT Guideline for Enclosed Landfill Gas Flares (Document #80.1) describes previously approved BACT and TBACT requirements for enclosed landfill gas flares. Compliance with the POC BACT criteria, specifically the minimum retention time and minimum operating temperature requirements, constitutes TBACT for enclosed flares. As discussed previously, the A-1 Flare is designed to have a retention time of 0.7 seconds and has an operating temperature range of 1400-1800 °F. These design criteria satisfy the TBACT requirements for A-1. Proposed Condition #23962, Part 4 requires a minimum operating temperature of no less than 1400 °F and will ensure compliance with these TBACT requirements.

Project Risks:
Regulation 2-5-302 limits project risks to 10.0 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. The revised total project risks are identified in Table C.3 and these

revised project risks are all less than the Regulation 2-5-302 project risk limits. Therefore, this project – as proposed – will comply with Regulation 2-5-302.

This application to add a gas treatment system and flare for this project shifts most of the control of the TACs that are present in the collected landfill gas from the engines to the proposed flare. The flare has higher TAC control efficiencies for the individual compounds present in the landfill gas compared to the TAC control efficiencies expected for the IC engines. The flare is also expected to produce less secondary formaldehyde emissions compared to the engines. Therefore, this modification will result in lower overall project risks compared to the currently approved project. The limits on formaldehyde emission rates from the engines (Condition #23400, Part 8) and from the flare (Condition #23962, Part 8), the TAC concentration limits in Condition #23962, Part 9, and the testing requirements in Condition #23400, Part 9l and Condition #23962, Parts 11i will verify that the project has not exceeded the emission rates that this HRSA was based on. Any exceedance of these TAC limits will require a new HRSA to verify that the increases will still comply with the project risk limits.

Regulation 2, Rule 6 (Major Facility Review)

The permit condition changes proposed for this application will eliminate the facility-wide synthetic minor emission limit of 95 tons/year of CO that was established pursuant to Application # 14265. Ameresco Keller Canyon submitted an application for an initial Title V permit for this facility on March 17, 2008 (Application # 17615). This Title V application satisfies the Regulation 2-6-404 requirements for submittal of a timely application for major facility review. All Title V permitting requirements will be discussed in detail in the Statement of Basis for Application # 17615.

BAAQMD Regulation 6 (Particulate Matter and Visible Emissions)

Properly operating landfill gas fired IC engines and landfill gas flares will have no visible particulate emissions. Therefore, the proposed engines and the A-1 Flare are expected to comply with the Regulation 6-301 Ringelmann 1.0 limitation and the Regulation 6-302 20% opacity limitation. Each stack is also subject to the Regulation 6-310 particulate weight limitation of 0.15 grains/dscf. At the engine manufacturer's guaranteed emission rate of 0.1 grams/bhp-hour, the grain loading in the exhaust will be 0.022 grains/dscf for at an outlet oxygen concentration of 0% by volume. At a typical oxygen concentration of 13% by volume, the grain loading will be less than 0.01 grains/dscf (less than 10% of the limit). At the flare manufacturer's guaranteed emission rate of 0.001 lbs/hr per scfm of gas, the grain loading in the exhaust will be 0.024 grains/dscf for at an outlet oxygen concentration of 0% by volume. At a typical oxygen concentration of 13% by volume, the grain loading will be less than 0.01 grains/dscf (less than 10% of the limit). Since the proposed PM_{10} emission rates are far below the Regulation 6-310 limit and non-compliance is highly unlikely, additional monitoring to verify compliance with this limit is not justifiable. Therefore, the District is not proposing to include a PM_{10} emission limit in the permit conditions for the engines or the flare and is not proposing any source testing for PM_{10} emissions.

BAAQMD Regulation 8, Rule 34 (Solid Waste Disposal Sites)

Landfill gas combustion operations are subject to Regulation 8, Rule 34. The proposed IC engines (S-1 and S-2) are energy recovery devices that are subject to Regulations 8-34-301.2, 8-34-301.4, 8-34-412, 8-34-413, 8-34-501.2, 8-34-501.4, 8-34-501.6, 8-34-501.10, 8-34-501.11, 8-34-501.12, 8-34-503, 8-34-504, 8-34-508, and 8-34-509. The A-1 TSA Waste Gas Flare is

subject to Regulations 8-34-301.2, 8-34-301.3, 8-34-412, 8-34-413, 8-34-501.2, 8-34-501.3, 8-34-501.4, 8-34-501.6, 8-34-501.10, 8-34-501.12, 8-34-503, 8-34-504, 8-34-507, and 8-34-508.

Regulation 8-34-301.2 limits the leaks from any component of a landfill gas emission control system to 1000 ppmv expressed as methane. A properly operated landfill gas fired engines and flares are not expected to result in any component leaks in excess of this limit. Regulations 8-34-503 and 504 require quarterly testing of all control system components that contain landfill gas using a portable gas analyzer. Regulations 8-34-501.4, 501.6, and 501.12 require the site to maintain records of these test results for at least five years. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.2. The facility plans to use a consulting firm to comply with the necessary testing and record keeping provisions.

Regulation 8-34-301.3 requires each enclosed flare to achieve 98% by weight destruction efficiency for NMOC or to emit less than 30 ppmv of NMOC, expressed as methane at 3% oxygen, dry basis. This requirement is echoed in Condition #23962, Part 3 of the proposed permit conditions for the gas treatment system and flare, because this NMOC emission limit is also a BACT requirement for S-3. Regulations 8-34-412 and 413 and Condition #23962, Part 11 will require this site to conduct annual source tests on the flare to demonstrate compliance with the NMOC emission limit. In addition, Regulation 8-34-507 requires a continuous temperature monitor and recorder for this flare. In Condition #23962, Part 4, the temperature limit will initially be set to no less than 1400 F to ensure compliance with BACT and TBACT requirements. Regulation 8-34-501.3 and Condition #23962, Part 4 require this site to maintain continuous records of flare combustion zone temperature. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.3. The facility plans to use independent source testing and consulting firms to comply with these requirements.

Regulation 8-34-301.4 requires each energy recovery device to achieve 98% by weight destruction efficiency for NMOC or to emit less than 120 ppmv of NMOC, expressed as methane at 3% oxygen, dry basis. This requirement is echoed in Condition #23400, Part 5 of the proposed permit conditions. Regulations 8-34-412 and 413 and Condition # 23400, Part 9 of the proposed permit conditions will require this site to conduct annual source tests to demonstrate compliance with the NMOC emission limit. In addition, Regulation 8-34-509 requires this site to establish a key emission control system operating parameter and monitoring schedule for each engine that will demonstrate compliance with Regulation 8-34-301.4 on an on-going basis. Condition #23400, Parts 6 and 10 describe how the key parameter, operating limits, and monitoring schedule will be determined. Regulation 8-34-501.4 and 8-34-501.11 require this site to maintain records of the key parameter monitoring data and all other test data necessary to demonstrate compliance with this rule. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.4. The facility plans to use independent source testing and consulting firms to comply with these requirements.

In order to determine actual landfill gas consumption rates for energy recovery devices and the operating times for all landfill gas control system devices, Regulation 8-34-508 requires continuous monitoring of the landfill gas flow rates to the engines, and Regulation 8-34-501.2 requires records of all emission control system downtime. These monitoring and record keeping requirements will also demonstrate compliance with the heat input limits in Conditions #23400 and #23962. The TSA gas treatment system flare and the engines will be equipped with the necessary flow rate monitoring and recording devices.

BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide)

Regulation 9-1-301 limits ground level sulfur dioxide concentrations (outside of areas that are physically secured against public access) to 0.5 ppmv averaged over 3 minutes, 0.25 averaged over 60 minutes, and 0.05 ppmv averaged over 24 hours. The sulfur dioxide emissions due to both the two existing Keller Canyon Landfill flares and the proposed Ameresco engines and flare were evaluated using the same procedures that were used for the HRSA, except that only off-site receptors were evaluated, because the Keller Canyon Landfill Company's (KCLC's) property is secured against public access. The maximum hourly ground level concentration occurring outside of KCLC's property line is 93.54 $\mu g/m^3$. This maximum expected 1-hour ground level impact is equal to about 0.035 ppmv of SO_2. Standard sampling time conversion factors were used to determine 3-minute average SO_2 impacts and 24-hour average SO_2 impacts based on this modeled 1-hour impact. The project impacts are added to the Bay Area's maximum background SO_2 concentrations for comparison to the limit. As shown in Table C.5, the maximum expected off-site SO_2 concentrations will not exceed the Regulation 9-1-301 limits, and the combined impacts from these two facilities are less than one third of the standard. Impacts from the Ameresco facility alone are less than 40% of these combined impacts and less than 10% of the Regulation 9-1-301 standards. Since the ground level SO_2 concentration impacts from the Ameresco project are far below the standard, it is neither necessary nor justifiable to require expensive ground level SO_2 monitoring for this facility. The fuel sulfur content monitoring proposed in Condition #23400, Part 7 and this modeling analysis will adequately demonstrate compliance with the Regulation 9-1-301 limits.

Table C.5. Off-Site Ground Level SO_2 Concentrations Compared to 9-1-301 Limits

Averaging Period	Ameresco Project Impacts (ppmv SO_2)	Combined Ameresco & KCLC Impacts (ppmv SO_2)	Max. Bay Area Background Concentration (ppmv SO_2)	Total Off-Site Concentration (ppmv SO_2)	Concentration Limits (ppmv SO_2)
3-minute	0.022	0.059	0.320	0.38	0.50
1-hour	0.013	0.035	0.104	0.14	0.25
24-hour	0.005	0.014	0.016	0.03	0.05

Regulation 9-1-302 limits SO_2 concentration in any exhaust point to 300 ppmv (dry basis). At the proposed peak landfill gas sulfur content of 270 ppmv for each source, the maximum possible concentration in the exhaust will be 57 ppmv of SO_2 at 0% oxygen. Therefore, the proposed landfill gas sulfur concentration limit of 270 ppmv will ensure compliance with Regulation 9-1-302. The landfill gas sulfur content monitoring requirements proposed in Condition #23400, Part 7 and Condition #23962, Part 7 are adequate for demonstrating compliance with the proposed peak landfill gas sulfur content limits and this Regulation 9-1-302 sulfur dioxide limit.

BAAQMD Regulation 9, Rule 2 (Hydrogen Sulfide)

Regulation 9-2-301 limits the off-site ground level hydrogen sulfide (H_2S) concentration to 0.06 ppmv averaged over any 3 consecutive minutes and 0.03 ppmv averaged over any 60 consecutive minutes. Maximum 1-hour ground level H_2S concentrations were evaluated using the same air dispersion modeling assumptions that were used for the HRSA and using the maximum hourly H_2S emission rates from Ameresco's proposed engines and flare plus from KCLC's landfill and flares. For areas outside of the KCLC property boundary that are accessible to the general

public, the maximum hourly off-site ground level concentration resulting from both facilities combined, was determined to be 0.018 ppmv H_2S and the 3-minute average concentration was determined to be 0.030 ppmv H_2S. As shown in Table C.6, these concentrations are less than the Regulation 9-2-301 limits.

The modeling analysis indicates that the fugitive H_2S emission from the KCLC landfill is the dominating contributor to the off-site ground level concentrations discussed above. In fact, the H_2S emissions from the Ameresco equipment had no impact on the maximum H_2S concentrations listed in Table C.6. The maximum off-site ground level concentrations resulting from the proposed Ameresco equipment alone are less than 2% of the 9-2-301 standards. Since the Ameresco project impacts are far below the hydrogen sulfide standards, and this project will have a negligible impact on off-site concentrations compared to the neighboring landfill, monitoring to demonstrate compliance with this standard is not warranted.

Table C.6. Off-Site Ground Level H_2S Concentrations Compared to 9-2-301 Limits

Averaging Period	Ameresco Project Impacts (ppmv H_2S)	Combined Ameresco & KCLC Impacts (ppmv H_2S)	Concentration Limits (ppmv H_2S)
3-minute	0.0010	0.030	0.06
1-hour	0.0006	0.018	0.03

BAAQMD Regulation 9, Rule 8 (NO_x and CO from Stationary IC Engines)

Regulation 9, Rule 8 applies to stationary internal combustion engines rated at 50 bhp or more. Sections 301 and 302 limit nitrogen oxides (NO_x) and carbon monoxide (CO) emissions from gas fired IC engines. Sections 330 and 331 apply to emergency standby engines only. The proposed engines are subject to Regulation 9-8-302 only, which applies to waste gas fired engines. Regulation 9-8-302.1 currently limits the outlet NO_x concentration to 140 ppmv, corrected to 15% oxygen, dry basis, for lean burn waste gas fired engines. Effective January 1, 2012, this limit will be reduced to 70 ppmv NO_x, corrected to 15% O_2, dry basis. Regulation 9-8-302.3 limits the outlet CO concentration to 2000 ppmv, corrected to 15% oxygen, dry basis, for any waste gas fired engines. At the proposed BACT limits for NO_x and CO, the outlet concentrations for the proposed engines will be: 45 ppmv of NO_x at 15% O_2 and 257 ppmv of CO at 15% O_2. Therefore, the proposed engines will comply with both the current and future requirements Regulation 9, Rule 8. The initial source test required pursuant to Condition # 23400, Part 9 will satisfy the initial compliance demonstration requirements of Regulation 9-8-501.

Federal Requirements (NSPS and NESHAPs for MSW Landfills)

Keller Canyon Landfill is subject to the NSPS for MSW Landfills (40 CFR Part 60, Subpart WWW), which requires KCLC to collect and control landfill gas from Keller Canyon Landfill. In accordance with 40 CFR Part 60.752(b)(2)(iii), KCLC may satisfy the requirements of this NSPS by: (A) routing the collected gas to an open flare, (B) routing the collected gas to a control system that meets the specified NMOC limits, or (C) routing the collected gas to a treatment system that processes this gas for subsequent sale or use. Treating the landfill gas to remove excess water and particulates and delivering the gas to Ameresco Keller Canyon LLC satisfies the requirements of 40 CFR Part 60.752(b)(2)(iii)(C) for KCLC.

No additional NSPS or NESHAPs requirements apply to the down stream off-site user of landfill gas from a facility that is subject to 40 CFR Part 60.752(b)(2)(iii)(C). Therefore, Ameresco's

engines and flare are not subject to 40 Part 60, Subpart WWW or to 40 CFR Part 63, Subpart AAAA.

IV. PERMIT CONDITIONS

The District is proposing to make the revisions identified below in Condition # 23400 for the engines and to add Condition # 23962 for the S-3 TSA Gas Cleaning Systems and the A-1 TSA Waste Gas Flare in order to ensure that this equipment will comply with all applicable requirements identified in Section C of this report.

Condition # 23400

FOR S-1 AND S-2 LFG-FIRED INTERNAL COMBUSTION ENGINES AND GENSETS:

1. The S-1 and S-2 Internal Combustion (IC) Engines shall be fired exclusively on landfill gas collected from the Keller Canyon Landfill. (Basis: Cumulative Increase)

2. The heat input to each IC Engine (S-1 and S-2) shall not exceed 172,861 MM BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for each IC engine operating continuously. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the heat input to each engine for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The landfill gas flow rate to each engine shall be monitored and recorded continuously in accordance with Regulation 8-34-508. The landfill gas methane content supplied to either engine shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to any engine operation and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

~~3. Total carbon monoxide (CO) emissions from the engines (S-1 and S-2 combined) shall not exceed 95 tons of CO during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with this annual CO emission limit by EITHER: (a) complying with the Part 3a annual combined heat input limit and the Part 4 CO emission rate limit; or (b) complying with the annual CO emission limit above and the Part 3b CO emission calculation procedures. If the Permit Holder elects to comply with Part 3a in lieu of Part 3b, any excess of the Part 3a annual combined landfill gas throughput limit OR the Part 4 CO emission rate limit shall be deemed a violation of a Regulation 2-6-423.2.1 synthetic minor permit emission limit and shall be subject to enforcement action pursuant to Regulation 2-6-311. If the Permit Holder elects to comply with Part 3b in lieu of Part 3a, any excess of the annual CO emission limit determined in accordance with Part 3b shall be deemed a violation of a Regulation 2-6-423.2.1 synthetic minor permit emission limit and shall be subject to enforcement action pursuant to Regulation 2-6-311. (Basis: Regulations 2-6-423.2.1, 423.2.3, and Cumulative Increase)~~

~~a. Unless the Permit Holder demonstrates compliance with the Part 3 annual CO emission limit in accordance with Part 3b below, the heat input to S-1 and S-2 combined shall not exceed 302,510 MM BTU (HHV) during any consecutive 12-~~

month period. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the calculated heat input to S-1 and S-2 combined for each calendar month and for each rolling 12-month period.

b. During any time that the heat input to S-1 and S-2 combined exceeds the limit in Part 3a or the CO emission rate exceeds the limit in Part 4, the Permit Holder shall demonstrate compliance with the Part 3 annual CO emission limit using the carbon monoxide and oxygen monitoring, record keeping, and emission calculation procedures described below. The Permit Holder shall obtain APCO approval in writing for the use of any monitors, calibration procedures, or calculation methods that are relevant to this requirement.

i. On a daily basis, the Permit Holder shall use portable monitors to measure the CO and O_2 concentrations in the exhaust from each IC engine. This CO and O_2 monitoring is required on any normal working day (Monday through Friday, excluding Saturday, Sunday, and Holidays) during which the engine operates for 3 or more consecutive hours between the hours of 6:00 AM and 6:00 PM. After collecting 120 daily monitoring events (for each engine), this monitoring frequency may be reduced to a weekly basis, provided that either the maximum measured CO concentration in the exhaust from each engine was not more than 225 ppmv of CO, corrected to 15% O_2, dry basis, or each measured CO concentration is within plus or minus 10% of the average measured CO concentration for the 120 days period. Weekly CO monitoring is required for any calendar week (Sunday 12:00 AM through Saturday 11:59 PM) during which the engine operates for 3 or more consecutive hours on a normal working day as defined above.

ii. For each day that CO and O_2 measurements are taken, the Permit Holder shall record, in the data acquisition system or other District approved log, the date and time that the measurements were taken, the measured CO concentration in ppmv, dry basis, and the measured O_2 concentration in percent by volume, dry basis. The Permit Holder shall calculate and record the corrected CO concentration (corrected to 15% O_2, dry basis) in the stack gas from each engine for each operating day. For any days that the engine operates but CO and O_2 measurements were not required, the corrected CO concentration for that day shall use the corrected CO concentration determined for the previous day.

iii. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the theoretical stack gas flow rate for each day of engine operation using landfill gas flow rates and landfill gas methane concentrations measured pursuant to Part 2.

iv. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the daily CO emission rate from each engine using the corrected CO concentration determined pursuant to Part 3b(ii) and the theoretical stack gas flow rate determined pursuant to Part 3b(iii).

v. The Permit Holder shall use a data acquisition system or electronic spreadsheet to calculate the total CO emissions from each engine and from S-1 and S-2 combined for each calendar month and for each consecutive 12-month period.

~~vi. The total CO emission from S-1 and S-2 combined shall be compared to the Part 3 annual CO emission limit above for each consecutive 12-month period.~~

43. Carbon Monoxide (CO) emissions from each IC Engine (S-1 and S-2) shall not exceed 2.1 grams of CO per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a carbon monoxide concentration in the engine exhaust of no more than 257 ppmv of CO, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 257 ppmv of CO shall not be deemed a violation of this part, if the Permit Holder can demonstrate that CO emissions did not exceed 2.1 g/bhp-hour during the test period. (Basis: Regulation 2-6-423.2.1, BACT, and Cumulative Increase)

54. Nitrogen Oxide (NO_x) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.6 grams of NO_x (calculated as NO_2) per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a nitrogen oxide concentration in the engine exhaust of no more than 45 ppmv of NO_x, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 45 ppmv of NO_x shall not be deemed a violation of this part, if the Permit Holder can demonstrate that NO_x emissions did not exceed 0.6 g/bhp-hour during the test period. (Basis: BACT and Offsets)

65. Each IC Engine (S-1 and S-2) shall comply with either the destruction efficiency requirements or the non-methane organic compound (NMOC) outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulations 2-5-302 and 8-34-301.4, BACT, TBACT, and Offsets)

76. In order to demonstrate on-going compliance with Part 67 and Regulation 8-34-509, the Permit Holder shall maintain the [insert description of key emission control system operating parameter] within [insert minimum and/or maximum operating ranges for key parameter]. [Add monitoring method and frequency after key parameter is established.] The Permit Holder shall determine the key parameter that will be monitored and shall establish the operating ranges for this key parameter during the initial compliance demonstration test. To facilitate the evaluation of potential key parameters (engine cylinder temperature, stack oxygen concentration, and lambda – λ – a comparison of the actual versus ideal air-to-fuel ratio), each engine shall be equipped with devices that will continuously monitor engine cylinder temperature and stack gas oxygen concentration during the initial compliance demonstration test. The Permit Holder shall obtain District approval for all source test and monitoring procedures that will be used to evaluate potential key operating parameters prior to conducting the initial compliance demonstration test. (Basis: Regulations 8-34-501.11 and 8-34-509)

87. Sulfur Dioxide (SO_2) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.3 grams of SO_2 per brake-horsepower-hour. In addition, the emissions from S-1 and S-2 combined shall not exceed 8.64 tons during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with these SO_2 emission limits by complying with the landfill gas concentration limits, monitoring and record keeping requirements identified Parts 87a and 87b below. (Basis: BACT and Cumulative Increase)

a. The concentration of total reduced sulfur (TRS) compounds in the landfill gas sent to the engines shall not exceed 270 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement. Compliance with this landfill gas concentration limit shall be demonstrated using either a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS or a District approved portable analysis method that reports only the H_2S concentration. If the portable analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the measured or calculated TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = measured TRS / measured % CH_4 * 50).

b. The annual weighted average concentration of TRS in the landfill gas sent to the engines shall not exceed 150 ppmv of TRS, expressed as H_2S and corrected to a landfill gas methane concentration of 50% by volume. Compliance with this annual average concentration limit shall be determined using the following procedures.

i. On a daily basis, the Permit Holder shall use a District approved portable hydrogen sulfide monitor (or other District approved method) to determine the concentration of H_2S in the landfill gas that is sent to S-1 or S-2. This H_2S monitoring is required on any normal working day (Monday through Friday, excluding Saturday, Sunday, and Holidays) during which the engine operates for 3 or more consecutive hours between the hours of 6:00 AM and 6:00 PM. After collecting 120 daily monitoring events, this monitoring frequency may be reduced to a weekly basis, provided that the maximum measured H_2S concentration was not more than 200 ppmv of H_2S. Weekly H_2S monitoring is required for any calendar week (Sunday 12:00 AM through Saturday 11:59 PM) during which the engine operates for 3 or more consecutive hours on a normal working day as defined above.

ii. For each day (or week) that an H_2S measurement is taken, the Permit Holder shall record, in the data acquisition system or other District approved log, the date and time that the H_2S measurement was taken and the measured H_2S concentration in ppmv. The TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (calculated TRS = 1.2 * measured H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = calculated TRS / measured % CH_4 * 50). For any day (or week) that an engine operates but an H_2S measurement is not required, the recorded TRS concentration for that day (or week) shall be equal to the corrected TRS concentration that was determined for the previous day (or week).

iii. The Permit Holder shall use a data acquisition system to calculate and record the weighted average TRS concentration for each calendar month based on the daily TRS concentration data recorded pursuant to Part ~~8~~7b(ii) - or weekly TRS concentration data if the testing frequency has been reduced to weekly in accordance with Part ~~8~~7b(i) - and the

continuous landfill gas flow rate data recorded pursuant to Part 2. The monthly weighted average TRS concentration is equal to the sum of the daily landfill gas flow rate to both engines times the TRS concentration for each day of the month divided by the total landfill gas flow rate for that month.

iv. The Permit Holder shall use a data acquisition system to calculate and record the annual weighted average TRS concentration for each rolling 12-month period using the monthly average TRS concentration determined pursuant to Part ~~8~~7b(iii) and the monthly landfill gas flow rate data recorded pursuant to Part 2.

v. The annual weighted average TRS concentration determined pursuant to Part ~~8~~7b(iv) shall be compared to the Part ~~8~~7b limit above for each consecutive 12-month period.

*~~9~~8. Formaldehyde emissions from each IC Engine (S-1 and S-2) shall not exceed ~~19~~10. pounds per million standard cubic feet of methane burned. (Basis: Regulation 2-5-302)

~~10~~9. In order to demonstrate compliance with Parts ~~4~~3, ~~5~~4, ~~6~~5, ~~8~~7, and ~~9~~8 above and Regulations 8-34-301.4, 9-1-302, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within 60 days of initial start-up of each engine and annually thereafter. This source test shall be conducted while the engine is operating at or near the maximum operating rate and shall determine all items identified in Parts ~~10~~9a-k below. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report for the initial compliance demonstration test shall be submitted to the Source Test Section and the Engineering Division within 60 days of the test date. Subsequent annual source test reports shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 60 days of the test date. (Basis: BACT, TBACT, Offsets, Cumulative Increase, and Regulations 2-5-302, 2-6-423.2.1, 8-34-301.4, 8-34-412, 9-1-302, 9-8-302.1, and 9-8-302.3)

a. Operating rate for each engine during the test period (bhp);
b. Total flow rate of all gaseous fuel to each engine (dry basis, sdcfm);
c. Concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), total non-methane organic compounds (NMOC), hydrogen sulfide (H_2S), and total reduced sulfur compounds (TRS) in the gaseous fuel burned in the engines (percent by volume or ppmv);
d. High heating value for the landfill gas (BTU/scf);
e. Heat input rate to each engine averaged over the test period (BTU/hour);
f. Exhaust gas flow rate from each engine based on EPA Method 19 (dry basis, sdcfm);
g. Concentrations (dry basis) of NO_x, CO, CH_4, NMOC, SO_2, and O_2 in the exhaust gas from each engine (ppmv or percent by volume);
h. NO_x and CO concentrations corrected to 15% O_2 in the exhaust gas from each engine (ppmv);
i. NO_x and CO emission rates from each engine (grams/bhp-hour);
j. NMOC concentrations corrected to 3% O_2 in the exhaust gas from each engine (ppmv);

k. NMOC destruction efficiency achieved by each engine (weight percent);
l. Formaldehyde emission rate from each engine (pounds/hour and pounds/million scf CH_4 burned);
m. [Insert testing requirement for a key emission control system operating parameter once this parameter has been established.]

~~11~~10. In order to demonstrate compliance with Part ~~7~~6 above and Regulation 8-34-509, the Permit Holder shall conduct a sufficient number of additional initial compliance demonstrate tests on each engine to determine an appropriate key emission control system operating parameter and the minimum, typical, and maximum operating ranges for that parameter. These tests shall demonstrate a correlation between the proposed key parameter and the engine's NMOC emission rate over all expected operating ranges for the engine. For each engine operating level that is being evaluated, the compliance test shall determine either the NMOC concentration in the engine exhaust (ppmv corrected to 3% O_2) or NMOC destruction efficiency (weight percent) and at least one of the following: average temperature of all engine cylinders during the test period (degrees F); stack gas oxygen concentration during the test period as measured by the continuous stack gas oxygen monitor (percent by volume); or a comparison (λ) of the actual air-to-fuel ratio versus the ideal air-to-fuel ratio. Calculation of the λ parameter requires measurement of the stack gas oxygen concentration using a continuous stack gas oxygen monitor, measurement of the landfill gas flow rate using a continuous landfill gas flow rate monitor, and measurement of the landfill gas methane content using a continuous methane sensor. If any of these additional initial compliance demonstration tests that are not conducted concurrently with the Part ~~10~~9 test, the Permit Holder shall follow the source test notification and reporting procedures that are described in Part ~~10~~9 above. An additional report shall be prepared that describes the results of all these additional initial compliance demonstration tests, that discusses the correlations found between the NMOC emission rate and the proposed parameters, and that identifies the proposed key parameter and the proposed operating limits. This additional report shall be submitted to the Engineering Division by no later than 150 days after the initial start-up date for the engine. (Basis: Regulations 8-34-501.11 and 8-34-509)

Condition # 23962

FOR S-3 TSA GAS CLEANING SYSTEM AND A-1 TSA WASTE GAS FLARE:

1. All waste flush gas generated by the carbon desorption cycle at S-3 shall be vented to the A-1 TSA Waste Gas Flare. Landfill gas delivered from Keller Canyon Landfill may be burned in A-1 or blended with the flush gas prior to combustion in A-1, if the use of this supplemental landfill gas is necessary to ensure proper operation of A-1. The A-1 flare shall be operated continuously during any time that gas is being vented to this flare. (Basis: BACT)

2. The heat input rate to the A-1 Flare shall not exceed 72,270 million BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for the flare operating continuously. In order to demonstrate compliance with this part, the A-1 flare shall be equipped with a continuous gas flow meter and recorder, and the owner/operator shall maintain records of the heat input to A-1 for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated

using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The methane content in the inlet gas shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to initial operation of A-1 and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. The A-1 Flare shall either achieve 98% by weight destruction of the total non-methane organic compounds (NMOC) in the inlet gas or shall emit no more than 30 ppmv of NMOC, expressed as methane and corrected to 3% oxygen, in the exhaust gas from A-1. (Basis: BACT)

4. In order to ensure compliance with Part 3 and to ensure adequate destruction of the toxic air contaminants present in the inlet gas, the owner/operator shall maintain the combustion zone temperature of the A-1 Flare at a minimum temperature of 1400 degrees F, averaged over any 3-hour period. If a source test demonstrates compliance with all applicable requirements at a different temperature, the APCO may revise these minimum temperature requirements in accordance with the procedures identified in Regulation 2-6-414 or 2-6-415 and the following criteria. The minimum combustion zone temperature for the flare shall be equal to the average combustion zone temperature determined during the most recent complying source test minus 50 degrees F, provided that the minimum combustion zone temperature is not less than 1400 degrees F. To demonstrate compliance with this part, the A-1 flare shall be equipped with a temperature monitor with readout display and continuous recorder. One or more thermocouples shall be placed in the primary combustion zone of the flare and these thermocouples shall accurately indicate the combustion zone temperature at all times. (Basis: BACT and TBACT)

5. Nitrogen oxide (NOx) emissions from the A-1 flare shall not exceed 0.06 pounds of NOx, expressed as NO2, per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 15 ppmv of NO_x, expressed as NO_2 at 15% oxygen on a dry basis. (Basis: RACT)

6. Carbon monoxide (CO) emissions from the A-1 flare shall not exceed 0.20 pounds of CO per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 81 ppmv of CO at 15% oxygen on a dry basis. (Basis: RACT)

7. Sulfur dioxide (SO2) emissions from the A-1 flare shall not exceed 0.09 pounds of SO2 per million BTU of heat input, based on any single test or measurement. Compliance with this emission limit shall be demonstrated using one of the procedures identified in subparts a-c below. (RACT)
   a. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and calculate the SO2 emissions in units of pounds per MM BTU of heat input using District approved test methods and calculation procedures; or
   b. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and have an outlet sulfur

dioxide concentration that does not exceed 16 ppmv of SO2 at 15% oxygen on a dry basis; or

c. Collect a sample of the inlet gas to A-1 during the compliance demonstration test required by Part 11, analyze this sample for total reduced sulfur compounds (TRS) using a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS, and have a TRS concentration in the inlet gas that does not exceed 270 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume.

*8. Formaldehyde emissions from the flare (A-1) shall not exceed 0.8 pounds per million standard cubic feet of methane burned. (Basis: Regulation 2-5-302)

*9. If the concentration of a toxic air contaminants (TACs) in the inlet gas to the A-1 flare exceeds any of the levels listed below, the owner/operator shall submit a permit application to the District, within 30 days receiving the analysis results, that requests a modification of these limits and verifies that project health impacts have not exceeded the limits specified in Regulation 2-5-302. (Basis: Regulation 2-5-302)

Compound	Concentration (ppbv, dry basis)
Acrylonitrile	1,000
Benzene	40,000
Carbon Tetrachloride	500
Chloroform	500
Ethylene Dibromide	500
Ethylene Dichloride	1,000
Methylene Chloride	40,000
Perchloroethylene	8,000
Trichloroethylene	4,000
Vinyl Chloride	4,000

10. The A-1 flare shall be equipped with both local and remote alarms, automatic combustion air control, automatic gas shutoff valves, and automatic start/restart system. (Basis: BACT)

11. In order to demonstrate compliance with Parts 3 through 6, 7a, 7b, and 8 above, the owner/operator shall conduct a compliance demonstration source test at the A-1 TSA Waste Gas Flare within 60 days of initial start-up of A-1 and within 12 months of the previous test date for each subsequent year. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report shall be submitted to the Source Test Section within 60 days of the test date. Each annual source test shall measure or determine the criteria in subparts a-i below. (Basis: RACT, BACT, TBACT, Regulation 2-5-302 and 9-1-302)

a. inlet gas flow rate to the flare (scfm, dry basis);

b. concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), and total non-methane organic compounds (NMOC) in the inlet gas to the flare;

c. inlet heat input rate to the flare in units of MM BTU (HHV) per hour;

d. stack gas flow rate from the flare (scfm, dry basis);
e. concentrations (dry basis) of NMOC, NO_x, CO, SO_2, and O_2, in the flare stack gas;
f. NMOC destruction efficiency achieved by the flare (by weight);
g. average combustion zone temperature in the flare during the test period;
h. NO_x, CO, and SO_2 emission rates from the flare in units of pounds per MM BTU,
i. formaldehyde emissions from the flare in units of pounds/hour and pound/MM scf CH_4 burned.

12. In order to demonstrate compliance with Parts 7c and 9, the owner/operator shall conduct a characterization of the flare inlet gas concurrent with the annual source test required by Part 11 above. In addition to the compounds listed in Part 11b, the flare inlet gas shall be analyzed for, as a minimum, the organic compounds listed below. If the owner/operator is electing to demonstrate compliance with Part 7 using the methods in Part 7c instead of Parts 7a or 7b, the permit holder shall analyze the flare inlet gas for, as a minimum, the sulfur compounds listed below, and the owner/operator does not need to conduct the SO2 analysis or calculations in Parts 11e and 11h. All concentrations shall be reported on a dry basis. The test report shall be submitted to the Source Test Section within 60 days of the test date. (Basis: Regulations 2-5-501 and Cumulative Increase)

Organic Compounds
Acrylonitrile
Benzene
Carbon Tetrachloride
Chloroform
Ethylene Dibromide
Ethylene Dichloride
Methylene Chloride
Perchloroethylene
Trichloroethylene
Vinyl Chloride

Sulfur Compounds
Carbon Disulfide
Carbonyl Sulfide
Dimethyl Sulfide
Ethyl Mercaptan
Hydrogen Sulfide
Methyl Mercaptan

V. RECOMMENDATION

The District recommends issuance of a Change of Permit Conditions for the following equipment, subject to the revised permit condition #23400 identified above.

S-1 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

S-2 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

The District recommends issuance of an Authority to Construct for the following equipment, subject to the permit condition #23962 identified above.

S-3 **Temperature Swing Adsorption Gas Cleaning System**; GE Jenbacher, M4 TSA System, 4 X 2 with 2580 lbs of carbon per vessel; abated by **A-1 TSA Waste Gas Flare**; John Zink Company, ZTOF Enclosed Flare, 8.25 MM BTU/hr, fired on TSA waste flush gas, landfill gas, or a blend of these gases, 275 scfm.

Prepared By:	Date:
Carol S. Allen Senior Air Quality Engineer	June 17, 2008

APPENDIX A

Health Risk Screening Analysis for Application # 16830

INTEROFFICE MEMORANDUM

March 21, 2008

To: Scott Lutz **Via:** Daphne Chong

From: Carol Allen

Subject: Health Risk Screening Analysis
Application # 16830
Ameresco Keller Canyon LLC, Plant # 17667

Summary

This Health Risk Screening Analysis (HRSA) evaluates a proposed modification to the currently permitted operating scenario for Ameresco's Keller Canyon landfill gas to energy facility that is still under construction. The project includes all proposed sources and abatement devices at this facility (two landfill gas fired IC engines, a carbon desorption process, and a waste gas flare). The project modification produces a cleaner fuel for the two engines, but it requires a new carbon desorption process and a new waste gas flare. Overall, the proposed modifications to this facility will result in lower health impacts compared to the currently permitted operating scenario. Maximum project impacts for the proposed operating scenario are: 6.4 in a million cancer risk, 0.3 chronic HI, and 0.5 acute HI. In accordance with Regulation 2, Rule 5 requirements, these health impact levels are acceptable, provided the engines and the flare each comply with TBACT requirements.

Background

This application is for a modification of a proposed landfill gas to energy facility that will be located on property owned by Keller Canyon Landfill Company (KCLC, Plant # 4618) but that will be operated by an independent company: Ameresco Keller Canyon LLC (Plant # 17667). The proposed equipment location is between KCLC's flare station and leachate tanks, in the northwestern section of KCLC's property. Keller Canyon Landfill employees are considered to be off-site worker receptors for the Ameresco facility; and likewise, Ameresco employees are off-site worker receptors for the Keller Canyon Landfill facility.

Pursuant to Application # 14265, the District issued Ameresco KCL an Authority to Construct for two 2677 bhp internal combustion engines that will be fired exclusively on landfill gas collected from Keller Canyon Landfill. This equipment has not completed construction yet. In order to prevent triggering Title V, Ameresco voluntarily accepted a facility-wide emission limit for CO of 95.0 tons/year. Although Ameresco expected to comply with this CO emission limit by reducing the annual landfill gas throughput to the engines to approximately 85% of maximum capacity, the HRSA for Application # 14265 was evaluated based on each of the two proposed LFG engines operating continuously at full capacity. The proposed project resulted in a maximum increased cancer risk of 8.0 in a million, a maximum chronic HI of 0.47, and a maximum acute HI of 0.98 for Keller Canyon Landfill worker receptors.

Upon further consultation with the engine manufacturer, Ameresco has determined that a siloxane removal system will be necessary to prolong the life of the engines, to reduce engine maintenance costs,

and to increase the compliance margin for the BACT CO emission limit. Ameresco submitted Application # 16830 in order to permit the proposed siloxane removal system components and to modify the engine emission limits. The engines will now be burning "clean" landfill gas with significantly lower VOC and toxic air contaminant concentrations. However, the site will no longer be able to comply with the facility-wide CO emission limit due to the need for an enclosed flare, which will abate waste gas from the siloxane removal system. Consequently, Ameresco has submitted a Title V permit application for this facility.

The siloxane removal system includes additional filters and condensers and a temperature swing adsorption (TSA) gas control module. The TSA module includes four pairs of carbon adsorbers (a total of 8 carbon canisters). During operation, two carbon canister pairs will operate in the adsorption mode, while the other two carbon canister pairs undergo desorption. During the desorption cycle, the carbon canisters will be heated and flushed with treated "clean" landfill gas. This flush gas will be blended with "carrier gas", which is filtered landfill gas that has not been processed by the siloxane removal steps, and then vented to a small (8.25 MM BTU/hour) enclosed flare (A-1). Ameresco has requested to operate this flare continuously with the waste flush gas alone, with the flush gas/carrier gas blend, or with the carrier gas alone. The waste flush gas is expected to have the highest concentrations of toxic air contaminants.

This HRSA will evaluate the health impacts resulting from the proposed enclosed waste gas flare (A-1) as well as the revised project impacts due to the two proposed engines burning "clean" landfill gas instead of filtered landfill gas.

Emissions

The proposed use of a TSA gas control module is expected to produce a "clean" landfill gas that contains much lower concentrations of VOC and toxic air contaminants than the VOC and TAC concentrations currently present in the filtered landfill gas from Keller Canyon Landfill. Since the TSA gas control module is a new process and each site's landfill gas composition is unique, the equipment manufacturer will not provide any guarantees about the VOC or toxic air contaminant removal efficiencies that the TSA gas control module will achieve. Based on the consultant's gas concentration projections for the flush gas, the District estimates that the TSA gas control module will remove at least 50% of each TAC from the filtered landfill gas. Formaldehyde emissions are expected to follow a similar trend, and formaldehyde emissions estimated to be half of the current formaldehyde emission limit. Since the TSA gas control module is not expected to remove any sulfur compounds from the landfill gas, the hydrogen sulfide concentrations are based on the current limits for these engines. The maximum expected TAC concentrations in the clean landfill gas and the revised residual and secondary emissions estimates for each engine are summarized in Table 1.

Table 1. Revised TAC Emission Estimates for S-1 and S-2 Engines Burning Clean Landfill Gas

Significant TACs in Clean LFG	Molecular Weight g/mol	Estimated Concentra-tion, ppbv	Destruct Eff.	Emission Factor lbs/Mscf	Emissions Per Engine lbs/year	Total for 2 Engines lbs/year
Acrylonitrile	53.06	250	85%	5.142E-6	1.79	3.58
Benzene	78.11	10000	85%	3.028E-4	105.31	210.63
Carbon Tetrachloride	153.82	100	85%	5.962E-6	2.07	4.15
Chloroform	119.38	100	85%	4.627E-6	1.61	3.22
Ethylene Dibromide	187.86	100	85%	7.281E-6	2.53	5.07
Ethylene Dichloride	98.96	250	85%	9.589E-6	3.34	6.67
Hydrogen Sulfide (max. hourly)	34.08	270000	95%	1.189E-3	413.48	826.96
Hydrogen Sulfide (annual avg.)	34.08	150000	95%	6.604E-4	229.71	459.42
Methylene Chloride	84.93	10000	85%	3.292E-4	114.51	229.02
Perchloroethylene	165.83	2000	85%	1.286E-4	44.72	89.43
Trichloroethylene	131.39	1000	85%	5.093E-5	17.71	35.43
Vinyl Chloride	62.50	1000	85%	2.422E-5	8.43	16.85
Secondary TACs	MW	Ion Concen.		lbs/Mscf	lbs/year	lbs/year
Formaldehyde	30.03			5.000E-3	1739.24	3478.49
HCl	36.46	20000	0%	1.884E-3	655.44	1310.87
HBr	80.91	10000	0%	2.091E-3	727.25	1454.50
HF	20.01	2500	0%	1.292E-4	44.96	89.91

The carbon desorption process uses heat and clean landfill gas to remove the adsorbed compounds from the carbon. The resulting waste flush gas will contain higher concentrations of VOCs and TACs. Based

on data provided by the consultant, the District estimates that the TAC concentrations in the waste flush gas will be approximately twice as high as the untreated Keller Canyon landfill gas. Secondary organic TAC emissions are expected to follow a similar trend. Hydrogen sulfide concentrations in the flush gas are expected to be the same as the current concentration limits for the engines. The waste flush gas will be burned in the A-1 Flare, which will achieve a higher destruction efficiency for each individual TAC than the destruction rate expected for an IC engine. Since the carrier gas and flush/carrier gas blends that may be burned in this flare will contain lower TAC concentrations than the waste flush gas, combustion of the waste flush gas at the maximum flare capacity represents the worst-case scenario. The maximum expected TAC concentrations in the waste flush gas and the residual and secondary TAC emission rate estimates for the A-1 Flare and the total project are summarized in Table 2.

Table 2. TAC Emission Estimates for A-1 Flare Burning Waste Flush Gas and for the Project

Significant TACs in Flush Gas	Molecular Weight g/mol	Estimated Concentra-tion, ppbv	Destruct Eff.	Emission Factor lbs/Mscf	Flare Emissions lbs/year	Total Project lbs/year
Acrylonitrile	53.06	1000	90%	1.371E-5	1.99	5.57
Benzene	78.11	40000	90%	8.074E-4	117.41	328.04
Carbon Tetrachloride	153.82	500	90%	1.987E-5	2.89	7.04
Chloroform	119.38	500	90%	1.542E-5	2.24	5.46
Ethylene Dibromide	187.86	500	90%	2.427E-5	3.53	8.60
Ethylene Dichloride	98.96	1000	90%	2.557E-5	3.72	10.39
Hydrogen Sulfide (max. hourly)	34.08	270000	98%	4.755E-4	69.15	896.10
Hydrogen Sulfide (annual avg.)	34.08	150000	98%	2.641E-4	38.41	497.84
Methylene Chloride	84.93	40000	90%	8.778E-4	127.66	356.68
Perchloroethylene	165.83	8000	90%	3.428E-4	49.85	139.29
Trichloroethylene	131.39	4000	90%	1.358E-4	19.75	55.18
Vinyl Chloride	62.50	4000	90%	6.460E-5	9.39	26.25
Secondary TACs	MW	Ion Concen.		lbs/Mscf	lbs/year	lbs/year
Formaldehyde	30.03			4.000E-4	58.17	3536.66
HCl	36.46	80000	0%	7.537E-3	1096.10	2406.97
HBr	80.91	40000	0%	8.363E-3	1216.20	2670.71
HF	20.01	10000	0%	5.170E-4	75.18	165.09

Additional details about TAC emission calculation procedures and assumptions are provided in the attached spreadsheets.

Modeling Procedures

The ISCST3 air dispersion model was used for this analysis. Since there were no appropriate real meteorological data sets, the Screen3 data set was used to determine the maximum 1-hour average ground level concentrations that would result from this project's emissions. The applicant provided the exhaust gas flow rate data for the engines (S-1 and S-2) and the flare (A-1), stack information (P-1, P-2, and P-3), and building parameters. Terrain data from the Clayton and Honker's Bay quadrangles were used to determine elevations for all receptors, buildings, tanks, and sources.

Instead of entering the emission rate for each compound at each emission point, the District used pre-processed input factors that are a function of the individual compound emission rates in Tables 1 and 2, the health effects values for these compounds, exposure adjustment factors, receptor breathing rates, and other conversion factors that are necessary for the health impact calculations. Input factors for the emission points from each engine and from the flare were determine for each of the following scenarios: acute non-cancer, resident chronic non-cancer, worker chronic non-cancer, resident cancer risk, and worker cancer risk.

These input factors were calculated based on the sum of the weighted average emission rates for each compound at each emission point, where the weighted average emission rate for each compound was determined using the average grams/second emission rate for that compound $(ER, g/s)_i$ from each of the three emission points and a health effect value for that compound:

Acute REL Weighted Emission Rate = $\Sigma\ (ER, g/s)_i / (\text{acute REL})_i$
Chronic REL Weighted Emission Rate = $\Sigma\ (ER, g/s)_i / (\text{chronic REL})_i$
Cancer Risk Weighted Emission Rate = $\Sigma\ (ER, g/s)_i * (\text{cancer potency factor})_i$

The acute non-cancer input factors required no additional adjustments.
Acute Non-Cancer Input Factor = Acute REL Weighted Emission Rate

The chronic REL weighted average emission rates were multiplied by 0.1 to convert the 1-hour average concentration produced by the air dispersion model into an annual average concentration, and by the appropriate residential or worker exposure adjustment factors.

Resident Chronic Non-Cancer Input Factor = Chronic REL Wtd. ER * 0.1 * (24/24)*(350/365)
Worker Chronic Non-Cancer Input Factor = Chronic REL Wtd. ER * 0.1 * (8/24)*(245/365)

Similar procedures were used to calculate cancer risk weighted input factors for each emission point, except that resident and worker breathing rates and additional conversion factors were used to convert the cancer potency factor weighted emission rate into a cancer risk adjusted input factor.

Resident Cancer Risk Input Factor:
= Cancer Risk Wtd. ER * 0.1 * (24/24)*(350/365)*(70/70) * (302)*(1E-6) * (1E6 risk per million)
Worker Cancer Risk Input Factor:
= Cancer Risk Wtd. ER * 0.1 * (8/24)*(245/365)*(40/70) * (447)*(1E-6) * (1E6 risk per million)

All input factors are summarized in Table 3. Additional details about the calculation procedures for these pre-processed input factors are provided in the attached spreadsheets.

Table 3. Pre-Processed Input Factors for ISCST3 Air Dispersion Model

	P-1	P-2	P-3
Acute Non-Cancer	4.164E-4	4.164E-4	4.630E-5
Resident Chronic Non-Cancer	9.880E-4	9.880E-4	2.897E-4
Worker Chronic Non-Cancer	2.305E-4	2.305E-4	6.760E-5
Resident Cancer Risk	2.241E-2	2.241E-2	8.644E-3
Worker Cancer Risk	4.422E-3	4.422E-3	1.706E-3

Separate ISCST3 model runs were conducted for the resident and worker scenarios using the appropriate receptor grids for each run. Each model was run using RURAL dispersion coefficients and Screen3 meteorological data.

The nearest residential areas to this facility are located to the north and west of the proposed engine and flare locations, outside of Keller Canyon Landfill Company's property line. Receptors were placed in various intervals (ranging from 20 meters to 150 meters apart) in all known residential areas outside of Keller Canyon Landfill Company.

The nearest worker receptors to the Ameresco facility are the employees of Keller Canyon Landfill Company. Worker receptors were located at 2-meter to 10-meter intervals on KCLC property outside of the proposed Ameresco property line.

Detailed modeling results are available electronically.

Results

The proposed project for this application includes the S-1 and S-2 IC Engines burning clean landfill gas plus the A-1 Flare burning waste gases from the TSA gas control module. Overall, the proposed modifications to this facility (installation of a TSA gas control module and flare with lower TAC emission rates from the proposed engines) will result in lower health impacts compared to the currently permitted scenario (two engines operating at full capacity without the TSA gas control module). The maximum project impacts for the proposed operating scenario are: 6.4 in a million cancer risk, 0.29 chronic HI, and 0.45 acute HI; the maximum project impacts for the currently permitted operating scenario are: 8.0 in a million cancer risk, 0.47 chronic HI, and 0.98 acute HI.

The maximum impact points for this project were determined to occur for worker receptors on Keller Canyon Landfill Company property. The maximum impact point for residential receptors was located about 900 meters west northwest of the project area. The maximum project impacts are summarized in Table 4. The maximum source impacts are summarized in Table 5. Aerial photos showing the points of maximum impact are attached.

Table 4. HRSA Results: Total Project Risk

	Acute Hazard Index	Chronic Hazard Index	Cancer Risk (per million)
Residential Receptor	0.45	0.16	3.8
Worker Receptor		0.29	6.4

Table 5. HRSA Results: Source Risks

	Acute Hazard Index	Chronic Hazard Index	Cancer Risk (per million)
S-1 IC Engine			
Residential Receptor	No Applicable Standard	0.07	1.6
Worker Receptor		0.12	2.3
S-2 IC Engine			
Residential Receptor	No Applicable Standard	0.07	1.6
Worker Receptor		0.13	2.5
A-1 Flare			
Residential Receptor	No Applicable Standard	0.02	0.6
Worker Receptor		0.22	5.6

This project is subject to Regulation 2, Rule 5, NSR of Toxic Air Contaminants. BAAQMD Regulation 2-5-301 requires TBACT for a source if the source risk exceeds either 1.0 in a million cancer risk or 0.2 chronic hazard index. As illustrated in Table 5, the engines and the flare each trigger TBACT, because the source risk for each device is greater than 1.0 in a million cancer risk. The source risk for the flare is also greater than 0.2 chronic HI. The primary contributors to the cancer risk impacts are formaldehyde and benzene emissions from the engines and benzene and vinyl chloride emissions from the flare. The primary contributors to the chronic HI for this project are acid gas and formaldehyde emissions from the flare. Compliance with TBACT requirements is discussed in the Permit Evaluation Report for Application # 16830.

The proposed project will comply with BAAQMD Regulation 2-5-302.1 by having a cancer risk of less than 10.0 in a million, provided that S-1, S-2, and A-1 each meet TBACT requirements. Likewise, the proposed project will comply with BAAQMD Regulation 2-5-302.2 by having a chronic HI of less than 1.0, provided the A-1 Flare constitutes TBACT. The proposed project will comply with BAAQMD Regulation 2-5-302.3 by having an acute HI of less than 1.0.

Prepared by: Date:

Carol S. Allen March 21, 2008

APPENDIX E

Permit to Operate Issuance Report
Permit Application No. 14265 and 16830

PERMIT to OPERATE ISSUANCE REPORT

for

BAAQMD PERMIT APPLICATION # 14265

BAAQMD PERMIT APPLICATION # 16830

Proposed Project:
Two Landfill Gas Fired IC Engines, Equipped with One Landfill Gas Treatment System and One Waste Gas Flare

BAAQMD PLANT # 17667 (SITE # B7667)

Applicant: Ameresco Keller Canyon LLC
Location: Keller Canyon Landfill, 901 Bailey Road, Pittsburg, CA

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

March 6, 2012

Prepared By:

Carol S. Allen

Supervising Air Quality Engineer

TABLE OF CONTENTS

PERMIT TO OPERATE ISSUANCE REPORT

Ameresco Keller Canyon LLC

PLANT # 17667 (SITE # B7667)

APPLICATIONS # 14265 and # 16830

I. BACKGROUND

This project involves a new landfill gas to energy facility located at the Keller Canyon Landfill facility (Site # A4618) in Pittsburg, CA. This energy plant (Site # B7667) will be owned and operated by Ameresco Keller Canyon, LLC, which is an independent entity from the owner of Site # A4618, the Keller Canyon Landfill Company.

At the Ameresco Keller Canyon LLC energy plant (Site # B7667), landfill gas will be treated to remove impurities and then used as fuel in IC engines. Waste gases from the landfill gas treatment system will be controlled by an enclosed waste gas flare. Treated landfill gas will be used as supplemental fuel at this flare to ensure adequate destruction of toxic compounds in the waste gases. The engines will power generators to generate electricity. The electric power will be sold back to the grid.

Pursuant to Application # 14265, the District issued an Authority to Construct for two landfill gas fired IC engines (S-1 and S-2: GE Jenbacher, JGS 616, 2677 bhp, 19.733 MM BTU/hour, 1.914 MW each) on February 28, 2007. This Authority to Construct was renewed on March 5, 2009. The District issued an Authority to Construct for an S-3 Temperature Swing Adsoprtion (TSA) Gas Cleaning System (GE Jenbacher M4 with 4X2 carbon vessels, 2580 pounds of carbon each) and an A-1 Waste Gas Flare (John Zink, ZTOF, 8.25 MM BTU/hour) on June 26, 2008 pursuant to Application # 16830. Application # 16830 also included permit condition changes for the S-1 and S-2 IC Engines.

Initially, Ameresco Keller Canyon was considered to be a Synthetic Minor facility. However, with the addition of the A-1 Waste Gas Flare in 2008, the site could no longer maintain CO emissions less than 100 tons/year. Consequently, Ameresco Keller Canyon submitted a Title V application for this facility (Application # 17615) on March 17, 2008. The Title V Permit for this facility is under evaluation.

Ameresco Keller Canyon began initial testing and operation of the S-1 and S-2 IC Engines, the S-3 TSA Gas Cleaning System, and the A-1 Waste Gas Flare during the week of June 2, 2009. The initial compliance demonstration source tests were conducted during August 4-6, 2009. Although the IC engines and flare complied with the NOx, CO, and NMOC emission limits in the Authority to Construct conditions, formaldehyde emissions from the engines and sulfur content measurements at the flare exceeded the limits identified in the Authority to Construct conditions. The initial flare sulfur content limits were based on the average sulfur content found in the untreated gas from the Keller Canyon Landfill. The gas treatment system (S-3) was removing more sulfur from the landfill gas than anticipated. Consequently, sulfur dioxide emissions from A-1 were higher than anticipated, while sulfur dioxide emissions from the

engines were lower than anticipated. Formaldehyde emissions from both IC engines were higher than anticipated during the initial evaluation of this project.

The District has reevaluated the formaldehyde and sulfur content limits for these devices and is proposing to modify these limits with the issuance of the Permit to Operate for these devices. The proposed sulfur content limits will reflect the full range of possible sulfur removal rates that may be achieved by S-3. Consequently, the District is proposing to increase the maximum permitted sulfur dioxide emission rates at the waste gas flare to accommodate possible spikes in treated gas or waste gas sulfur content.

For formaldehyde emissions, the District is proposing to change the form of the limit as well as the emission rate. A health risk screening analysis was conducted for the proposed new emission limit (0.46 pounds/hour of formaldehyde from each IC engine) in June 2010. As discussed below, the project will comply with the project risk limits at the proposed emission limits.

II. EMISSIONS

As discussed in the Background Section, this report involves modifications to the permit condition limits for the landfill gas fired IC Engines (S-1 and S-2), the S-3 TSA Gas Cleaning System, and the A-1 TSA Waste Gas Flare. The permit condition changes will increase the maximum permitted daily and annual sulfur dioxide emissions for A-1 and for the total site and will impact the maximum permitted TAC emissions for this site. Maximum permitted NOx, CO, NMOC, and PM10 emission rates will remain the same. The new and revised emission limits for each source and for this total facility are discussed in detail below for each pollutant.

Criteria Pollutant Emissions

From the Engineering Evaluation for the Authority to Construct (ATC), the maximum permitted sulfur dioxide (SO_2) emission rate for each IC engine was initially 42.59 pounds/day based on a maximum expected landfill gas sulfur content of 270 ppmv of total reduced sulfur (TRS) compounds (expressed as hydrogen sulfide).

In order to accommodate possible future variations in landfill gas sulfur content (as delivered from Keller Canyon Landfill) and gas treatment system sulfur removal efficiency (which is currently very high), the District is modifying the permitted limits to allow for an hourly peak inlet fuel gas concentration of 600 ppmv of TRS expressed as H_2S. This hourly fuel sulfur content limit will result in a new maximum hourly emission rate of 3.944 pounds of SO_2 per hour. However, the engines will continue to be limited to: (a) 42.59 lbs/day of SO_2 per engine (based on a daily average fuel sulfur content of 270 ppmv of TRS) and (b) 8.637 tons/year of SO_2 for the two engines combined (based on an annual average fuel sulfur content of 150 ppmv of TRS).

As shown below, actual measured sulfur dioxide emission rates from these engines are very low and are far below these proposed hourly, daily, and annual SO_2 emission limits.

Table 1. Measured Sulfur Dioxide Emission Rates from the Ameresco Keller Canyon Engines

	8/4/09 SO2 lbs/hour	8/24/10 SO2 lbs/hour	5/13/11 (District test) SO2 lbs/hour	Projected Daily SO2 Emissions * lbs/day	Projected Annual SO2 Emissions * tons/year
Engine 1	0.0004	0.0003	<0.124	2.98	0.543
Engine 2	0.0004	0.0003	(not tested)	2.98	0.543

* Based on 5/13/11 District source test data and maximum possible operating rates.

From the Engineering Evaluation for the ATC, the maximum permitted sulfur dioxide (SO_2) emission rates from the A-1 Waste Gas Flare were based on the same initial assumptions as the engines (270 ppmv of TRS peak for daily emissions and 150 ppmv of TRS for annual average emissions). The resulting maximum permitted emission rates for A-1 were 17.81 lbs/day of SO_2 and 1.805 tons/year of SO_2.

In order to accommodate possible future variations in landfill gas sulfur content (as delivered from Keller Canyon Landfill) and the observed high sulfur removal efficiency for the gas treatment system, the applicant requested to base the SO_2 emissions from the A-1 flare on a maximum anticipated concentration of 600 ppmv of TRS, expressed as H_2S, in the waste gases delivered to the flare. For this small 8.25 MM BTU/hour flare, this higher inlet TRS concentration will result in 1.649 lbs/hr, 39.57 lbs/day, and 7.222 tons/year of SO_2 emissions.

As shown below, actual measured sulfur dioxide emission rates from the flare have been well below these proposed hourly, daily, and annual SO_2 emission limits.

Table 2. Measured Sulfur Dioxide Emission Rates from the Ameresco Keller Canyon Flare

	10/20/09 SO2 lbs/hour	11/9/10 SO2 lbs/hour	Projected Dailyl SO2 Emissions * lbs/day	Projected Annual SO2 Emissions * tons/year
Flare – burning LFG		0.58		
Flare – burning waste gas		1.65		
Flare – average hourly	0.37	0.78	18.72	3.416

* Based on avg. hourly emission rate from 11/9/10 test and maximum possible operating times.

The new maximum permitted criteria pollutant emission rates for the two IC engines, the flare, and the total site are presented in Table 3.

Table 3. Revised Maximum Permitted Criteria Pollutant Emissions (Plant # 17667)

	Each IC Engine Pounds/Day	Waste Gas Flare Pounds/Day	Total for Site Tons/Year
CO	297.45	39.60	115.796
NO_x	84.99	11.88	33.188
SO_2	42.59	39.57	15.858
POC	26.41	3.30	10.243
PM_{10}	14.16	6.64	6.382
NPOC	1.32	0.17	0.512

The basis for the engine emission limits are presented in Table 4. Equivalent emission factors and outlet concentrations are shown in Table 5.

Table 4. Emission Factor Basis for Each Criteria Pollutant (S-1 and S-2)

Basis for Emission Factor	Pollutant	Limit	Units
BACT, Mfg Guarantee, Permit Condition Limit	CO	2.1	g/bhp-hr
BACT, Mfg Guarantee, Permit Condition Limit	NO_x	0.6	g/bhp-hr
BACT, Permit Condition Limit (daily limit)	SO_2	270	ppmv of TRS (as H_2S) in LFG
BACT, Permit Condition Limit (annual average)	SO_2	150	ppmv of TRS (as H_2S) in LFG
Regulation 8-34-301.4 NMOC Outlet Conc. Limit	POC	120	ppmv as CH_4 @ 3% O_2
BACT, Mfg Guarantee, Permit Condition Limit	PM_{10}	0.1	g/bhp-hr
BAAQMD Calculation	NPOC	5%	of POC emission rate

Table 5. Equivalent Emission Factors and Outlet Concentration Limits (S-1 and S-2)

Pollutant	grams / bhp-hour	pounds / hour	pounds / MM BTU	pounds / M scf LFG	ppmv @ 0% O_2	ppmv @ 3% O_2	ppmv @ 15% O_2	grains/sdcf @ 0% O_2
CO	2.100	12.394	0.62807	0.31212	903	774	257	
NO_x	0.600	3.541	0.17945	0.08918	157	135	45	
$SO_{2\ (hourly)}$	0.668	3.944	0.19985	0.09931	126	108	36	
$SO_{2\ (daily)}$	0.301	1.775	0.08993	0.04469	57	48	16	
$SO_{2\ (annual)}$	0.167	0.986	0.04996	0.02483	31	27	9	
POC	0.186	1.100	0.05577	0.02771	140	120	40	
PM_{10}	0.100	0.590	0.02991	0.01486				0.022
NPOC	0.009	0.055	0.00279	0.00139	7	6	2	

The basis for the flare emission limits are presented in Table 6. Equivalent emission factors and outlet concentrations are shown in Table 7.

Table 6. Emission Factor Basis for Each Criteria Pollutant (From A-1)

Basis for Emission Factor	Pollutant	Limit	Units
RACT, Mfg Guarantee, Permit Condition Limit	CO	0.20	pounds/MM BTU
RACT, Mfg Guarantee, Permit Condition Limit	NO_x	0.06	pounds/MM BTU
RACT, Permit Condition Limit (daily and annual avg limits)	SO_2	600	ppmv of TRS (as H_2S) in A-1 inlet gas
RACT, Mfg Guarantee	PM_{10}	0.001	pounds/hour per scfm of gas burned
Max Expected Inlet NMOC and Regulation 8-34-301.3 NMOC Destruction Efficiency Limit	POC	10,000 and 98%	ppmv of NMOC in A-1 inlet gas and by weight destruction of NMOC
BAAQMD Calculation	NPOC	5%	by weight of POC emission rate

Table 7. Equivalent Emission Factors and Outlet Concentration Limits (From A-1)

Pollutant	pounds / hour	pounds / MM BTU	pounds / M scf	ppmv @ 0% O_2	ppmv @ 3% O_2	ppmv @ 15% O_2	grains/sdcf @ 0% O_2
CO	1.650	0.20000	0.09939	288	246	81	
NO_x	0.495	0.06000	0.02982	53	45	15	
SO_2	1.649	0.19985	0.09931	126	108	36	
PM_{10}	0.277	0.03354	0.01667				0.0244
POC	0.138	0.01668	0.00829	42	36	12	
NPOC	0.007	0.00083	0.00041	2	2	1	

Cumulative Emission Increase Inventory

The cumulative emission increases for this site are summarized below in Table 8. As indicated in the Engineering Evaluation for Application # 16830, the NOx and POC emissions for this project must be offset because total site-wide emissions (see Table 3) will exceed 10 tons/year for each of these pollutants. Since this site will emit less than 35 tons/year of POC and less than 35 tons/year of NOx, the required POC and NOx offsets have been supplied on behalf of the applicant from the District's small facility banking account.

For this Permit to Operate report, the only change to the cumulative emission increase inventory is a correction of the SO_2 cumulative emission increases for Application # 16830. The change in the sulfur content limit for the flare will result in an additional 5.417 tons/year of SO2 emission increases for this flare. The SO_2 data in Table 8 includes the corrected SO_2 cumulative emission increase inventory for Application # 16830.

Table 8. Corrected Plant Cumulative Emission Increase Inventory for Plant # 17667

	Application # 14265			Application # 16830			Total Site Inventory
Tons/Year	Increases	Offsets	Balance	Increases	Offsets	Balance	Balances
CO	95.000		95.000	20.796		20.796	115.796
NO_x	31.020	31.020	0.000	2.168	2.168	0.000	0.000
SO_2	8.637		8.637	7.222		7.222	15.858
POC	9.640	9.640	0.000	0.603	0.603	0.000	0.000
PM_{10}	5.170		5.170	1.212		1.212	6.382
NPOC	0.482		0.482	0.030		0.030	0.512

Toxic Air Contaminant Emissions

This project is subject to Regulation 2, Rule 5. Since the equipment in this application is related to the landfill gas engines that were permitted pursuant to Application 14265, these two applications are considered to be a single project. This project includes the two landfill gas fired engines (S-1 and S-2) that were permitted pursuant to Application 14265, plus the S-3 TSA Gas Cleaning System, and the A-1 TSA Waste Gas Flare. All emissions from S-3 will be vented to A-1. The emission points are P-1 and P-2 (from each engine) and P-3 from the A-1 Flare.

The engines and the flare will burn gases that contain numerous toxic organic compounds and several toxic inorganic compounds. The engines and flare will destroy much of these toxic air contaminants (TACs) during combustion, but some residual organic and inorganic toxic compounds will remain in the emission points. In addition, the combustion process will produce secondary toxic compound emissions including: formaldehyde due to burning organic compounds, hydrogen chloride due to burning chlorinated compounds and hydrogen fluoride due to burning fluorinated compounds. Toxic emissions from the engines and from the flare are discussed in more detail below. Detailed calculations are available in the attached spreadsheets.

From Engines:

For this application, the proposed use of the TSA gas control module is expected to produce a "clean" landfill gas that contains much lower concentrations of VOC and toxic air contaminants than the VOC and TAC concentrations that are currently present in the filtered landfill gas from Keller Canyon Landfill (this filtered landfill gas was the engine fuel evaluated pursuant to Application # 14265). Since the TSA gas control module is a new process and each site's landfill gas composition is unique, the equipment manufacturer will not provide any guarantees about the VOC or toxic air contaminant removal efficiencies that the TSA gas control module will achieve. Based on the consultant's gas concentration projections for the flush gas, the District estimated that the TSA gas control module will remove at least 50% of each TAC from the filtered landfill gas. The engines are expected to achieve at least 85% by weight destruction efficiency for each individual TAC present in the inlet gas (95% minimum destruction efficiency for hydrogen sulfide.) Residual TAC emissions will be calculated using these assumptions. The residual emissions data from each engine are presented in the attached spreadsheet.

For this project, the District has determined that project emissions are approaching the project risk limits in Regulation 2, Rule 5. The limiting criterion is the acute hazard index due to engine

emissions where secondary formaldehyde emissions from the IC engines are the biggest contributor to the acute hazard index. Therefore, formaldehyde emissions from each engine will be limited to 0.46 pounds/hour to ensure compliance with the Regulation 2-5-302.3 acute hazard index limit of 1.0. Secondary emissions of hydrogen chloride and hydrogen fluoride will be based on the maximum expected inlet concentrations of chloride and fluoride ions respectively. This data is presented in the attached spreadsheets.

From Flare:

The carbon desorption process uses heat and clean landfill gas to remove the adsorbed compounds from the carbon. The resulting waste flush gas will contain higher concentrations of VOCs and TACs. Based on data provided by the consultant, the District estimated that the TAC concentrations in the waste flush gas would be approximately twice as high as the untreated Keller Canyon landfill gas. Source test results indicate that the concentrations of some compounds are much higher due to a high removal and desorption efficiencies being achieved by the S-3 gas treatment system. In addition the waste will be blended with treated landfill gas prior to combustion in the flare. For the revised HRSA, average hourly inlet concentrations of the various TACs will be estimated based on the 2010 source test data.

The landfill gas / waste gas blend will be burned in the A-1 Flare, which will achieve higher destruction efficiencies for each individual TACs than the destruction rates expected for an IC engine. Since the waste gas blends that may be burned in this flare will contain lower TAC concentrations than the waste flush gas alone, combustion of the waste flush gas at the maximum flare capacity represents the worst-case scenario. The flare is expected to achieve at least 98% by weight destruction efficiency for each individual TAC present in the inlet gas.

The maximum expected TAC concentrations in the waste flush gas and the residual and secondary TAC emission rate estimates for the A-1 Flare and the total project are summarized in the attached spreadsheets.

III. STATEMENT OF COMPLIANCE

Regulation 2, Rule 1 (CEQA and Public Notice Requirements)

On June 25, 2002, the Contra Costa County Board of Supervisors adopted a Mitigated Negative Declaration for a similar landfill gas energy project at the Keller Canyon Landfill Site and approved Land Use Permit (LUP) 012115, an amendment to LUP 2020-89 for the Keller Canyon Landfill Facility, for the construction and operation of a landfill gas power plant at the Keller Canyon Landfill. The original LFG to Energy Plant that was proposed by Energy Development Incorporated was never built, and the District cancelled Authority to Construct # 19432 in February 2003.

In February 2006, Ameresco Keller Canyon LLC submitted Application # 14265 for a similar landfill gas power plant for the Keller Canyon Landfill Facility. On February 13, 2007, Contra Costa County concluded that Ameresco's proposed landfill gas power plant was substantially equivalent to the previously approved landfill gas power plant. Contra Costa County stated that a land use permit amendment would not be required for Ameresco's landfill gas power plant, and that Ameresco must comply with all land use permit conditions that were approved for the EDI power plant project in June 2002.

The District concluded that Ameresco had satisfied the requirements of Regulation 2-1-408.1 and that no further CEQA review was required. The District issued the Authority to Construct for the two 2677 bhp IC Engines on February 28, 2007.

Application #16830 modified the previously approved landfill gas to energy project by adding a landfill gas treatment system and a waste gas flare and by increasing the CO emission limit at the two engines from 95 tons/year to the maximum capacity level of 116 tons/year. The total criteria pollutant emission increases for this application are: 20.8 tons/year of CO, 2.2 tons/year of NO_x, 0.6 tons/year of POC, 7.2 tons/year of SO_2, and 1.2 tons/year of PM_{10}. As with the previous application, all NO_x emissions for this project will be fully offset by emission reduction credits from the District's small facility banking account. In addition, the POC emissions from the site will now trigger the POC offset requirement. Therefore, all POC emissions for both Applications # 14265 and 16830 will be fully offset with emission reduction credits from the District's small facility banking account. Although the Application # 16830 modification resulted in some net increases in CO, SO_2, and PM_{10} emissions, the use of the gas treatment system produces a cleaner fuel for the engines, and the use of this clean fuel will reduce the overall health impacts from this project. The cancer risk for this project will be reduced by 20% and the chronic hazard index will be reduced by 38% from the currently approved project.

The potential need for a gas treatment system was discussed in the December 12, 2006 Project Overview and Description (Section 10.6) that the Applicant prepared for Contra Costa County and BAAQMD Application # 14265. Thus, this current project was included in the February 2007 update to the 2001 Mitigated Negative Declaration that Contra Costa County approved for a landfill gas to energy facility at this location. The District concluded that the gas treatment system would not result in any significant impacts after the required mitigation measures were incorporated. The higher flare SO2 emission levels that will be authorized by the issuance of this Permit to Operate will not change this prior CEQA conclusion. Therefore, no additional CEQA review is required.

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

The permit condition changes authorized by this permit issuance will result in an additional 5.417 tons/year of SO_2 emission increases for a total of 7.222 tons/year of SO_2 emission increases for Application # 16830 and a total of 15.858 tons/year of SO_2 emission increases for the whole project. Since SO_2 project emission increases are less than 40 tons/year, this permit condition change does not constitute a major modification. Therefore, Regulation 2-2-405 does not apply.

Regulation 2, Rule 2 (NSR – BACT for S-1 and S-2 Engines)

The primary BACT determinations for the S-1 and S-2 Engines are presented in the Final Engineering Evaluation Reports for Applications #14265 and #16830. As shown in Table 3, each of the proposed IC engines will emit more than 10 pounds per day of CO, NO_x, POC, SO_2, and PM_{10}. Therefore, BACT is required for each of these pollutants. The BACT requirements for these engines were described in detail in the Engineering Evaluation Reports for Application # 14265 and # 16830. This permit issuance will not increase either the daily criteria pollutant emission limits or the annual criteria pollutant emission limits for either engine. Therefore, this action does not trigger a new BACT review for the engines.

Regulation 2, Rule 2 (NSR – BACT for S-3 TSA Gas Cleaning System)

Since uncontrolled POC emissions from the S-3 TSA Gas Cleaning System will exceed 10 pounds/day of POC emissions, S-3 was required to employ BACT for POC emissions from S-3. The POC emissions from S-3 are controlled by the A-1 TSA Waste Gas Flare. This flare meets the BACT control criteria for POC emissions from S-3. Consequently, the secondary pollutant emissions from A-1 are allowed to meet a RACT level of control pursuant to Regulation 2-2-112 instead of BACT. From Table 3, secondary pollutant emissions of CO, NO_x, and SO_2 will each exceed 10 pounds/day of emissions. Therefore, the applicant must meet RACT for the secondary CO, NO_x, and SO_2 emissions from A-1.

CO:

From Document # 80.1, the BACT(2) requirement for secondary CO emissions from an enclosed landfill gas flare is the use of good combustion practices. Compliance with this BACT(2) requirement constitutes a RACT level of control for secondary CO emissions. For many other landfill gas flares, the District has determined that meeting a maximum CO emission limit of 0.2 pounds of CO per MM BTU is indicative of good combustion practice and is a reasonable and achievable CO emission limit for an enclosed landfill gas flare. This emission rate is still considered an appropriate RACT level emission limit today.

Based on specifications provided by John Zink Company, the flare is expected to comply with a maximum emission limit of 0.20 lbs CO/MM BTU. Furthermore, the 11/9/2010 source test on this flare found a maximum measured CO emission rate of 0.11 lbs of CO/MM BTU. Therefore, A-1 is complying with the proposed RACT limit of 0.20 lbs CO/MM BTU. Proposed Condition #23962, Parts 6 and 11 will demonstrate compliance with this RACT limit based on annual source testing of the flare.

NO_x:

From Document # 80.1, the BACT(2) requirement for secondary NO_x emissions from an enclosed landfill gas flare is having a NO_x emission limit of 0.06 pounds of NO_x per MM BTU. This NO_x emission rate is still considered an appropriate RACT level emission limit today, especially for such a small specialty purpose flare. Compliance with a NO_x emission limit of 0.06 lbs/MM BTU constitutes a RACT level of control for secondary NO_x emissions from A-1. Based on specifications provided by John Zink Company, the proposed flare is expected to comply with a maximum emission limit of 0.06 pounds of NO_x lbs/MM BTU. Furthermore, the 11/9/2010 source test on this flare found a maximum measured NOx emission rate of 0.0.052 lbs of NOx/MM BTU. Therefore, A-1 is complying with the proposed RACT limit of 0.06 lbs NOx/MM BTU. Proposed Condition #23962, Parts 6 and 11 will demonstrate compliance with this RACT limit based on annual source testing of the flare.

SO_2:

Document #80.1 has no BACT(2) controls for reducing SO_2 emissions. The BACT(1) level of control for SO_2 emissions includes the use of a scrubber or other approved gas pretreatment system to remove sulfur compounds from the gas. As discussed previously, the gas pretreatment system (S-3) is actually functioning as a sulfur removal system for the engine fuel. A-1 is controlling the reduced sulfur compound emissions from S-3 and results in secondary SO2 emissions. Requiring additional sulfur removal for this small flare would be extremely expensive and would not constitute a reasonable level of control for this small device. In such

cases, RACT for secondary emissions should be no less stringent than the District's Best Available Retrofit Control Technology (BARCT) level for these emissions.

The District's BARCT control level for SO_2 emissions is contained in Regulation 9, Rule 1. Section 9-1-302 limits the concentration in the exhaust from any emission point to 300 ppmv of SO_2, dry basis. For the proposed sulfur content limit of 600 ppmv of TRS in the combined inlet gases to the A-1 Flare, the maximum possible outlet SO_2 concentration is 126 ppmv of SO_2 at 0% excess O_2 This proposed maximum outlet concentration is less than one quarter of the BARCT limit. Since the proposed inlet sulfur concentration limit for A-1 will result in SO_2 emissions that are far below the BARCT emission rate limit, no additional SO_2 controls are deemed to be necessary for A-1. A-1 is meeting RACT by emitting less than the BARCT limit of 300 ppmv of SO_2 (dry basis) in any emission point.

Regulation 2, Rule 2 (NSR – Offsets)

As discussed in the Engineering Evaluation Reports for the Authority to Construct issuance actions under Applications # 14265 and # 16830, NO_x and POC offsets were required for this project and have been supplied on behalf of this site from the District's small facility banking account. This current permit to operate issuance action will not result in any additional NO_x or POC emission increases at this site. Therefore, Regulation 2-2-302 is not triggered for this permit condition change and permit to operate issuance action.

Although this permit condition change and permit to operate issuance action will result in additional SO_2 emission increases for this project, the SO_2 offset requirements in Regulation 2-2-303 do not apply, because this site is not a major facility for SO_2 or PM_{10} emissions. As shown in Table 3, maximum potential SO_2 and PM_{10} emissions from this site are each less than 100 tons/year.

Regulation 2, Rule 2 (NSR – PSD)

PSD review is required for facilities that emit more than 250 tons/year of a regulated air pollutant, or that emit more than 100 tons/year if the facility is one of 28 source categories that are subject to the lower PSD threshold of 100 tons/year. Landfill gas fired IC engines, gas treatment systems, and flares are not in one of the 28 special PSD source categories. Therefore, the PSD threshold for this site is 250 tons/year. Since this facility will emit less than 250 tons/year of each pollutant, PSD does not apply.

Regulation 2, Rule 5 (NSR – Toxic Air Contaminants)

Since toxic air contaminant (TAC) emissions for this project will exceed risk screen trigger levels, a Health Risk Screening Analysis (HRSA) is required for this project pursuant to Regulation 2-5-401. The District conducted an HRSA for this project in accordance with the BAAQMD HRSA Guidelines. The results of this HRSA are summarized below. A detailed HRSA report is attached.

Table 9. HRSA Results: Total Project Risk

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
Residential Receptor	9.97	0.31	0.96
Worker Receptor	8.37	0.52	

Table 10. HRSA Results: Source Risks			
	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
S-1 IC Engine			
Residential Receptor	4.58	0.14	No Applicable Standard
Worker Receptor	3.99	0.25	
S-2 IC Engine			
Residential Receptor	4.72	0.15	No Applicable Standard
Worker Receptor	4.33	0.27	
A-1 Flare			
Residential Receptor	0.67	0.02	No Applicable Standard
Worker Receptor	3.74	0.22	

TBACT:
Regulation 2-5-301 requires best available control technology for toxic air contaminants (TBACT) for each source that has a source risk of more than 1.0 in a million cancer risk or more than 0.2 chronic hazard index. As shown in Table 10, each engine and the flare have source risks that exceed one or more of these TBACT thresholds. Therefore, S-1, S-2, and A-1 must each satisfy TBACT requirements. In order to determine appropriate TBACT requirements, the major risk contributors need to be identified. From the detailed HRSA report, the top contributors to cancer risk are: formaldehyde emissions from the engines and benzene emissions from the flare. The primary contributors to chronic hazard index are formaldehyde from the engines and hydrogen chloride from the flare. Formaldehyde is a secondary POC emission that is formed due to combustion of methane and organic compounds. Benzene is a residual POC. Acid gases, such as HCl are formed as a result of combustion of halogenated contaminants in the inlet gas.

The District's BACT/TBACT Guideline for IC Engines - Landfill or Digester Gas Fired; Greater than 250 hp (Document # 96.2.2) describes previously approved BACT and TBACT requirements for the type of engine in this project. TBACT constitutes compliance with the emission limits and control technologies that are specified as BACT for POC emissions. Since the primary contributors to the cancer risk resulting from the engines in this project are POCs, TBACT for the proposed engines will be the use of the same technology as BACT for POC emissions. Source test data for similar engines located at another Bay Area facility confirm that there is a general correlation between CO and POC emissions and formaldehyde emissions. Therefore, minimizing CO and POC emissions from these engines will also minimize formaldehyde emissions and health risks.

Under Application # 14265, the District concluded that that the proposed engines would comply with TBACT requirements by using lean burn technology and complying with the outlet NMOC concentration specified in Regulation 8-34-301.4, which is equivalent to about 0.2 g/bhp-hour. As a result of Application # 16830, these engines will now be burning clean landfill gas produced by the landfill gas treatment system instead of the filtered landfill gas that was approved pursuant to Application # 14265. Use of this clean landfill gas fuel is expected to minimize CO and POC emissions.

Further reduction of secondary and residual organic TACs from these engines would require the installation of add-on control technology such as oxidation catalysts. Since the engines are already built and operating, requiring the site to retrofit these engines with oxidation catalysts

would be prohibitively expensive. This type of add-on control retrofit is not justifiable since the site is able to meet the project risk limits with the permit condition changes proposed in this action.

The District's BACT/TBACT Guideline for Enclosed Landfill Gas Flares (Document #80.1) describes previously approved BACT and TBACT requirements for enclosed landfill gas flares. Compliance with the POC BACT criteria, specifically the minimum retention time and minimum operating temperature requirements, constitutes TBACT for enclosed flares. The A-1 Flare is designed to have a retention time of 0.7 seconds and has an operating temperature range of 1400-1800 °F. These design criteria satisfy the TBACT requirements for A-1. Proposed Condition #23962, Part 4 requires a minimum operating temperature of no less than 1400 °F and will ensure compliance with these TBACT requirements.

Project Risks:
Regulation 2-5-302 limits project risks to 10.0 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. The revised total project risks are identified in Table 9, and these revised project risks are all less than the Regulation 2-5-302 project risk limits. Therefore, this project – with the permit condition changes proposed by this action – will comply with Regulation 2-5-302.

Regulation 2, Rule 6 (Major Facility Review)
Ameresco Keller Canyon submitted an application for an initial Title V permit for this facility on March 17, 2008 (Application # 17615). This Title V application satisfies the Regulation 2-6-404 requirements for submittal of a timely application for major facility review. All Title V permitting requirements will be discussed in detail in the Statement of Basis for Application # 17615.

BAAQMD Regulation 6 (Particulate Matter – General Requirements)
Properly operating landfill gas fired IC engines and landfill gas flares will have no visible particulate emissions. Therefore, the S-1 and S-2 engines and the A-1 Flare are expected to comply with the Regulation 6-1-301 Ringelmann 1.0 limitation and the Regulation 6-1-302 20% opacity limitation. Each stack is also subject to the Regulation 6-1-310 particulate weight limitation of 0.15 grains/dscf. At the engine manufacturer's guaranteed emission rate of 0.1 grams/bhp-hour, the grain loading in the exhaust will be 0.022 grains/dscf for at an outlet oxygen concentration of 0% by volume. At a typical oxygen concentration of 13% by volume, the grain loading will be less than 0.01 grains/dscf (less than 10% of the limit). At the flare manufacturer's guaranteed emission rate of 0.001 lbs/hr per scfm of gas, the grain loading in the exhaust will be 0.024 grains/dscf for at an outlet oxygen concentration of 0% by volume. At a typical oxygen concentration of 13% by volume, the grain loading will be less than 0.01 grains/dscf (less than 10% of the limit). Since the proposed PM_{10} emission rates are far below the Regulation 6-1-310 limit and non-compliance is highly unlikely, additional monitoring to verify compliance with this limit is not justifiable. Therefore, the District is not proposing to include a PM_{10} emission limit in the permit conditions for the engines or the flare and is not proposing any source testing for PM_{10} emissions.

BAAQMD Regulation 8, Rule 34 (Solid Waste Disposal Sites)

Landfill gas combustion operations are subject to Regulation 8, Rule 34. The IC engines (S-1 and S-2) are energy recovery devices that are subject to Regulations 8-34-301.2, 8-34-301.4, 8-34-412, 8-34-413, 8-34-501.2, 8-34-501.4, 8-34-501.6, 8-34-501.10, 8-34-501.11, 8-34-501.12, 8-34-503, 8-34-504, 8-34-508, and 8-34-509. The A-1 TSA Waste Gas Flare is subject to Regulations 8-34-301.2, 8-34-301.3, 8-34-412, 8-34-413, 8-34-501.2, 8-34-501.3, 8-34-501.4, 8-34-501.6, 8-34-501.10, 8-34-501.12, 8-34-503, 8-34-504, 8-34-507, and 8-34-508.

Regulation 8-34-301.2 limits the leaks from any component of a landfill gas emission control system to 1000 ppmv expressed as methane. Properly operated landfill gas fired engines and flares are not expected to result in any component leaks in excess of this limit. Regulations 8-34-503 and 504 require quarterly testing of all control system components that contain landfill gas using a portable gas analyzer. Regulations 8-34-501.4, 501.6, and 501.12 require the site to maintain records of these test results for at least five years. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.2. The facility plans to use a consulting firm to comply with the necessary testing and record keeping provisions.

Regulation 8-34-301.3 requires each enclosed flare to achieve 98% by weight destruction efficiency for NMOC or to emit less than 30 ppmv of NMOC, expressed as methane at 3% oxygen, dry basis. This requirement is echoed in Condition #23962, Part 3 of the proposed permit conditions for the gas treatment system and flare, because this NMOC emission limit is also a BACT requirement for S-3. Regulations 8-34-412 and 413 and Condition #23962, Part 11 will require this site to conduct annual source tests on the flare to demonstrate compliance with the NMOC emission limit. The maximum outlet concentration from the flare measured during the 11/9/2010 source test was 2.9 ppmv of NMOC at 3% O2. Therefore, A-1 is complying with Regulation 8-34-301.3. In addition, Regulation 8-34-507 requires a continuous temperature monitor and recorder for this flare. In Condition #23962, Part 4, the temperature limit was initially be set to no less than 1400 F to ensure compliance with BACT and TBACT requirements. During the 8/5/2009 source test on this flare, the NMOC limit was met (non-detect) while the flare was operating at 1524 ^{o}F. In accordance with the criteria in Part 4, the minimum flare operating temperature will be set to 1474 ^{o}F. Regulation 8-34-501.3 and Condition #23962, Part 4 require this site to maintain continuous records of flare combustion zone temperature. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.3. The facility plans to use independent source testing and consulting firms to comply with these requirements.

Regulation 8-34-301.4 requires each energy recovery device to achieve 98% by weight destruction efficiency for NMOC or to emit less than 120 ppmv of NMOC, expressed as methane at 3% oxygen, dry basis. This requirement is echoed in Condition #23400, Part 5 of the permit conditions. Regulations 8-34-412 and 413 and Condition # 23400, Part 9 of the proposed permit conditions will require this site to conduct annual source tests to demonstrate compliance with the NMOC emission limit. In addition, Regulation 8-34-509 requires this site to establish a key emission control system operating parameter and monitoring schedule for each engine that will demonstrate compliance with Regulation 8-34-301.4 on an on-going basis. The Applicant requested to use engine cylinder temperature as the key parameter. Source testing for NMOC emissions was conducted on these engines on 8/4/09 and 8/24/10. The results are shown below.

Table 11. Engine Source Test Data for Establishment of Key Operating Parameter

		8/4/09	8/24/10
Engine 1	NMOC at 3% O2	51.6 ppmv	54.5 ppmv
	Cylinder Temp	956 ^{o}F	947 ^{o}F
Engine 2	NMOC at 3% O2	40.1 ppmv	51.7 ppmv
	Cylinder Temp	965 ^{o}F	946 ^{o}F

The average measured NMOC emissions from these engines was 49.5 ppmv of NMOC at 3% O_2 compared to the limit of 120 ppmv of NMOC at 3% O_2. Engine cylinder temperatures ranged from 946-965 ^{o}F with an average of 953.5 ^{o}F. For Engine 1, a 9 ^{o}F drop in engine temperature resulted in a 2.9 ppmv increase in NMOC emissions. For Engine 2, a 19 ^{o}F drop in engine temperature resulted in a 11.6 ppmv increase in NMOC emissions. However, the data above is too limited and the temperature and NMOC emission changes are too small to establish a good correlation between engine cylinder temperature and NMOC emissions. Based on a statistical analysis of the data, the observed changes in cylinder temperature and NMOC emissions are less than the expected variation of these values. Therefore, the minimum engine cylinder temperature will be established based on the minimum expected variability of the data. The proposed temperature limit is the average temperature minus three standard deviations = 927 ^{o}F. The District will continue to evaluate the engine cylinder temperature and NMOC emissions data to determine if a different minimum engine cylinder temperature limit is appropriate.

Regulation 8-34-501.4 and 8-34-501.11 require this site to maintain records of the key parameter monitoring data and all other test data necessary to demonstrate compliance with this rule. These monitoring and record keeping requirements are sufficient to demonstrate compliance with Regulation 8-34-301.4. The facility plans to use independent source testing and consulting firms to comply with these requirements.

In order to determine actual landfill gas consumption rates for energy recovery devices and the operating times for all landfill gas control system devices, Regulation 8-34-508 requires continuous monitoring of the landfill gas flow rates to the engines, and Regulation 8-34-501.2 requires records of all emission control system downtime. These monitoring and record keeping requirements will also demonstrate compliance with the heat input limits in Conditions #23400 and #23962. The TSA gas treatment system flare and the engines will be equipped with the necessary flow rate monitoring and recording devices.

BAAQMD Regulation 9, Rule 1 (Sulfur Dioxide)

Regulation 9-1-301 limits ground level sulfur dioxide concentrations (outside of areas that are physically secured against public access) to 0.5 ppmv averaged over 3 minutes, 0.25 averaged over 60 minutes, and 0.05 ppmv averaged over 24 hours. The sulfur dioxide emissions due to both the two existing Keller Canyon Landfill flares and the proposed Ameresco engines and flare were evaluated using the same procedures that were used for the HRSA, except that only off-site receptors were evaluated, because the Keller Canyon Landfill Company's (KCLC's) property is secured against public access. The maximum hourly ground level concentration occurring outside of KCLC's property line is 186.3 $\mu g/m^3$. based on a maximum hourly inlet concentrations of 600 ppmv of TRS for each device. This maximum expected 1-hour ground level impact is equal to about 0.070 ppmv of SO_2. Standard sampling time conversion factors were used to determine 3-minute average SO_2 concentration (0.118 ppmv) and 24-hour average SO_2 concentration (0.027 ppmv) based on this modeled 1-hour impact. The worst case impacts from

the Keller Canyon Landfill Gas Flares and the Ameresco Energy Plant combined are predicted to be less than the Regulation 9-1-301 limits stated above.

Regulation 9-1-302 limits SO_2 concentration in any exhaust point to 300 ppmv (dry basis). At the proposed peak landfill gas sulfur content of 600 ppmv for each source, the maximum possible concentration in the exhaust will be 126 ppmv of SO_2 at 0% oxygen. Therefore, the proposed landfill gas sulfur concentration limit of 600 ppmv will ensure compliance with Regulation 9-1-302. The landfill gas sulfur content monitoring requirements proposed in Condition #23400, Part 7 and Condition #23962, Part 7 are adequate for demonstrating compliance with the proposed peak landfill gas sulfur content limits and this Regulation 9-1-302 sulfur dioxide limit.

BAAQMD Regulation 9, Rule 2 (Hydrogen Sulfide)

Regulation 9-2-301 limits the off-site ground level hydrogen sulfide (H_2S) concentration to 0.06 ppmv averaged over any 3 consecutive minutes and 0.03 ppmv averaged over any 60 consecutive minutes. Maximum 1-hour ground level H_2S concentrations were evaluated using the same air dispersion modeling assumptions that were used for the HRSA and using the maximum hourly H_2S emission rates from Ameresco's proposed engines and flare plus from KCLC's landfill and flares. For areas outside of the KCLC property boundary that are accessible to the general public, the maximum hourly off-site ground level concentration resulting from both facilities combined, was determined to be 0.019 ppmv H_2S and the 3-minute average concentration was determined to be 0.031 ppmv H_2S. These concentrations are less than the Regulation 9-2-301 limits. Note that the modeling analysis indicates that the fugitive H_2S emission from the KCLC landfill is the dominating contributor to the off-site ground level concentrations discussed above.

BAAQMD Regulation 9, Rule 8 (NO_x and CO from Stationary IC Engines)

Regulation 9, Rule 8 applies to stationary internal combustion engines rated at 50 bhp or more. Section 302 limits nitrogen oxides (NO_x) and carbon monoxide (CO) emissions from spark-ignited waste gas fired IC engines. Sections 306, 330 and 331 do not apply to the engines at this site. Regulation 9-8-302.1 currently limits the outlet NO_x concentration to 70 ppmv NO_x, corrected to 15% O_2, dry basis. Regulation 9-8-302.3 limits the outlet CO concentration to 2000 ppmv, corrected to 15% oxygen, dry basis, for any waste gas fired engines. At the proposed BACT limits for NO_x and CO, the outlet concentrations for the proposed engines will be: 45 ppmv of NO_x at 15% O_2 and 257 ppmv of CO at 15% O_2. Therefore, the engines will comply with the requirements Regulation 9, Rule 8. The initial source test required pursuant to Condition # 23400, Part 9 will satisfy the initial compliance demonstration requirements of Regulation 9-8-501.

Federal Requirements (NSPS and NESHAPs for MSW Landfills)

Keller Canyon Landfill is subject to the NSPS for MSW Landfills (40 CFR Part 60, Subpart WWW), which requires KCLC to collect and control landfill gas from Keller Canyon Landfill. In accordance with 40 CFR Part 60.752(b)(2)(iii), KCLC may satisfy the requirements of this NSPS by: (A) routing the collected gas to an open flare, (B) routing the collected gas to a control system that meets the specified NMOC limits, or (C) routing the collected gas to a treatment system that processes this gas for subsequent sale or use. Treating the landfill gas to remove excess water and particulates and delivering the gas to Ameresco Keller Canyon LLC satisfies the requirements of 40 CFR Part 60.752(b)(2)(iii)(C) for KCLC.

No additional NSPS or NESHAPs requirements apply to the down stream off-site user of landfill gas from a facility that is subject to 40 CFR Part 60.752(b)(2)(iii)(C). Therefore, Ameresco's

engines and flare are not subject to 40 Part 60, Subpart WWW or to 40 CFR Part 63, Subpart AAAA.

Federal Requirements (NSPS for IC Engines)

A new NSPS standard, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (40 CFR Part 60 Subpart JJJJ) is potentially applicable to the two new landfill gas fires IC engines. Section 40 CFR Part 60.4230(a), see below, describes the types of spark ignited (SI) internal combustion engines (ICE) that are subject to Subpart JJJJ. Sections 60.4230(a)(1-3) do not apply to landfill gas fired engines larger than 500 bhp. Section 60.4230(a)(4) does apply to S-1 and S-2, because these engines commenced construction after June 12, 2006. The applicant stated that the initial work order for the engines was placed in December 2006 and that the purchase order was issued February 23, 2007. To be subject to the emission control requirements of Subpart JJJJ, the S-1 and S-2 IC engines must meet one of the four manufacturing criteria in Part 60.4230(a)(4)(i-iv) below:

§ 60.4230 Am I subject to this subpart?

(a) The provisions of this subpart are applicable to manufacturers, owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE) as specified in paragraphs (a)(1) through (6) of this section. For the purposes of this subpart, the date that construction commences is the date the engine is ordered by the owner or operator.

(4) Owners and operators of stationary SI ICE that commence construction after June 12, 2006, where the stationary SI ICE are manufactured:

(i) On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 HP (except lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP);

(ii) on or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP;

(iii) on or after July 1, 2008, for engines with a maximum engine power less than 500 HP; or

(iv) on or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 KW (25 HP).

Since S-1 and S-2 are larger than 1350 bhp and are not emergency engines, Sections 60.4230(a)(4)(ii-iv) do not apply. Section 60.4230(a)(4)(i) applies to these engines, if the engines are manufactured on or after July 1, 2007. In accordance with 40 CFR Part 1068.30, the "date of manufacture" is the date on which the crankshaft is installed in an engine block, unless a manufacturer assigns a date later in the assembly process. Although the applicant was unable to determine the crankshaft installation date from the engine manufacturer, GE Jenbacher, GE Jenbacher reported that their "ready to ship" date, or X Work Date, for these engines was June 30, 2007. Clearly, this ready to ship date is later in the manufacturing process than the crankshaft installation date. Since this ready to ship date is prior to July 1, 2007, the S-1 and S-2 IC engines do not meet the 7/1/07 or newer manufacture date criteria in Section 60.4230(a)(4)(i), and S-1 and S-2 are not subject to the emission control requirements of Subpart JJJJ.

The S-1 and S-2 IC engines are required to meet the initial notification requirements of Regulations 40 CFR Part 60.7(a)(1) and 40 CFR Part 60.4245(c)(1-5) and to maintain records of all notifications and engine maintenance per 40 CFR Part 60.4245(a)(1-2).

Federal Requirements (NESHAPs for IC Engines)

A new NESHAP, 40 CFR Part 63 Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, may apply to any stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. Although this site is not a major source of HAP (because the emissions of each HAP are less than 10 tons/year and the emissions of all HAP are less than 25 tons/year), it is an

area source of HAP. In accordance with 40 CFR Part 63.6590(a)(2)(iii), see below, S-1 and S-2 are new RICE located at an area source, because these engines commenced construction after June 12, 2006 (note that the initial work order for these engines was placed in December 2006).

§ 63.6590 What parts of my plant does this subpart cover?

This subpart applies to each affected source.

(a) *Affected source.* An affected source is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand.
  (2) *New stationary RICE.*
  (i) A stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after December 19, 2002.
  (ii) A stationary RICE with a site rating of equal to or less than 500 brake HP located at a major source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12, 2006.
  (iii) A stationary RICE located at an area source of HAP emissions is new if you commenced construction of the stationary RICE on or after June 12, 2006.

(c) *Stationary RICE subject to Regulations under 40 CFR Part 60.* An affected source that meets any of the criteria in paragraphs (c)(1) through (7) of this section must meet the requirements of this part by meeting the requirements of 40 CFR part 60 subpart IIII, for compression ignition engines or 40 CFR part 60 subpart JJJJ, for spark ignition engines. No further requirements apply for such engines under this part.
  (1) A new or reconstructed stationary RICE located at an area source;

In accordance with Section 63.6590(c)(1), new RICE located at area sources of HAP must comply with the requirements of Subpart ZZZZ by meeting the emission limit or control requirements of the appropriate NSPS. Therefore, S-1 and S-2 must comply with the requirements of 40 CFR Part 60 Subpart JJJJ in order to meet the requirements of 40 CFR Part 63 Subpart ZZZZ.

In accordance with Section 63.6595(a)(6-7), a new RICE located at an area source must comply with the applicable requirements by January 18, 2008 if start-up occurs before this date or upon start-up if start-up occurs after this date. For S-1 and S-2, start-up began on June 2, 2009; therefore, these engines are subject to the applicable standards upon start-up.

In accordance with 40 CFR Part 60.4243(e), stationary SI ICE larger than 100 hp must comply with the emission standards in Table 1 of Subpart JJJJ. From Table 1, landfill and digester gas fired ICE that are 500 bhp or larger are subject to the following emission limits for engines with a manufacture date on or after 7/1/2007 but before 2/1/2010.

Table 12. Applicable Emission Limits for S-1 and S-2 from Table 1 of Part 60 Subpart JJJJ

	g/bhp-hr	ppmv at 15% O_2, dry basis
NO_x	3.0	220
CO	5.0	610
VOC (as propane)	1.0	80

In accordance with Part 60.4243(h), compliance with these emission limits may be demonstrated by one of the following methods:

(h) If you are an owner/operator of an stationary SI internal combustion engine with maximum engine power greater than or equal to 500 HP that is manufactured after July 1, 2007 and before July 1, 2008,

and must comply with the emission standards specified in sections 60.4233(b) or (c), you must comply by one of the methods specified in paragraphs (h)(1) through (h)(4) of this section.

(1) Purchasing an engine certified according to 40 CFR part 1048. The engine must be installed and configured according to the manufacturer's specifications.
(2) Keeping records of performance test results for each pollutant for a test conducted on a similar engine. The test must have been conducted using the same methods specified in this subpart and these methods must have been followed correctly.
(3) Keeping records of engine manufacturer data indicating compliance with the standards.
(4) Keeping records of control device vendor data indicating compliance with the standards.

The owner/operator is expected to demonstrate compliance with the above emission limits by maintaining records of engine manufacturer data that indicate compliance with these standards. The S-1 and S-2 engines are required to meet the following limits pursuant to BACT:

NOx	0.6 grams/bhp-hour	or	45 ppmv at 15% O_2
CO	2.1 grams/bhp-hour	or	257 ppmv at 15% O_2

The engine manufacturer has guaranteed that the engines will comply with these BACT limits, which are less than half of the Part 60 Subpart JJJJ standards. BAAQMD Regulation 8-34-301.4 requires that the S-1 and S-2 engines comply with a maximum NMOC outlet concentration limit of 120 ppmv at 3% O_2 (expressed as methane), which is equal to 40 ppmv at 15% O_2 (expressed as methane) or 13 ppmv at 15% O_2 (expressed as propane). This District regulatory limit is less than 20% of the Part 60 Subpart JJJJ standard. Furthermore, the District NMOC limit includes formaldehyde, which may be excluded from the Subpart JJJJ VOC standard. District approved source tests have demonstrated that these engines are complying with all of these NO_x, CO, and NMOC limits. Therefore, these engines are expected to remain in compliance with the 40 CFR Part 60, Subpart JJJJ, Table 1 standards with a high margin of compliance.

Any performance tests that are required under Subpart JJJJ must be conducted in accordance with the requirements of 40 CFR Part 60.4244. The owner/operator must maintain records of all notifications, engine maintenance, documentation that either the engine is certified or is operating in compliance with the above standards, and all performance tests pursuant to 40 CFR Part 60.4245.

IV. PERMIT CONDITIONS

The District is proposing to make the revisions identified below in Condition # 23400 for the S-1 and S-2 IC Engines and in Condition # 23962 for the S-3 TSA Gas Cleaning Systems and the A-1 TSA Waste Gas Flare. These condition changes will clarify the parametric monitoring requirements and limits for this equipment.

Condition # 23400

FOR S-1 AND S-2 LFG-FIRED INTERNAL COMBUSTION ENGINES AND GENSETS:

1. The S-1 and S-2 Internal Combustion (IC) Engines shall be fired exclusively on landfill gas collected from the Keller Canyon Landfill. (Basis: Cumulative Increase)

2. The heat input to each IC Engine (S-1 and S-2) shall not exceed 172,861 MM BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for each IC engine operating continuously. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the heat input to each engine for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured

landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The landfill gas flow rate to each engine shall be monitored and recorded continuously in accordance with Regulation 8-34-508. The landfill gas methane content supplied to either engine shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to any engine operation and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. Carbon Monoxide (CO) emissions from each IC Engine (S-1 and S-2) shall not exceed 2.1 grams of CO per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a carbon monoxide concentration in the engine exhaust of no more than 257 ppmv of CO, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 257 ppmv of CO shall not be deemed a violation of this part, if the Permit Holder can demonstrate that CO emissions did not exceed 2.1 g/bhp-hour during the test period. (Basis: Regulation 2-6-423.2.1, BACT, and Cumulative Increase)

4. Nitrogen Oxide (NO_x) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.6 grams of NO_x (calculated as NO_2) per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a nitrogen oxide concentration in the engine exhaust of no more than 45 ppmv of NO_x, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 45 ppmv of NO_x shall not be deemed a violation of this part, if the Permit Holder can demonstrate that NO_x emissions did not exceed 0.6 g/bhp-hour during the test period. (Basis: BACT and Offsets)

5. Each IC Engine (S-1 and S-2) shall comply with either the destruction efficiency requirements or the non-methane organic compound (NMOC) outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulations 2-5-302 and 8-34-301.4, BACT, TBACT, and Offsets)

6. In order to demonstrate on-going compliance with Part ~~7~~5 and Regulation 8-34-509, the Permit Holder shall~~ maintain the [insert description of key emission control system operating parameter] within [insert minimum and/or maximum operating ranges for key parameter]. [Add monitoring method and frequency after key parameter is established.] The Permit Holder shall determine the key parameter that will be monitored and shall establish the operating ranges for this key parameter during the initial compliance demonstration test. To facilitate the evaluation of potential key parameters (engine cylinder temperature, stack oxygen concentration, and lambda – λ – a comparison of the actual versus ideal air-to-fuel ratio), each engine shall be equipped with devices that will continuously monitor engine cylinder temperature and stack gas oxygen concentration during the initial compliance demonstration test. The Permit Holder shall obtain District approval for all source test and monitoring procedures that will be used to evaluate potential key operating parameters prior to conducting the initial compliance demonstration test~~ use average engine cylinder temperature as the key emission control system operating parameter for these engines, and the Permit Holder shall comply with the following limits and procedures. (Basis: Regulations 8-34-501.11 and 8-34-509)

a. For S-1, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.
b. For S-2, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.
c. For each engine (S-1 and S-2), each cylinder shall be equipped with a manufacturer's thermocouple that continuously and accurately reads the cylinder temperature. The average temperature for all the cylinders in the engine, shall be recorded at least once every 15 minutes of operation.
d. These temperature records shall be used to compute and record the rolling 3-hour average engine cylinder temperature for each engine.
e. For each engine, the rolling 3-hour average engine cylinder temperature shall be compared to the limits in Parts 6a and 6b to assess compliance with this part. The permit holder shall identify and record any rolling 3-hour periods (excluding start-up and shut-down periods) when the average engine cylinder temperature exceeds a limit, and the permit holder shall notify the District of each deviation.

7. Sulfur Dioxide (SO_2) emissions from each IC Engine (S-1 and S-2) shall not exceed ~~0.3 grams of SO_2 per brake horsepower hour~~ 42.6 pounds of SO_2 per day. In addition, the emissions from S-1 and S-2 combined shall not exceed 8.64 tons of SO_2 during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with these SO_2 emission limits by complying with the landfill gas concentration limits, monitoring and record keeping requirements identified in Parts 7a ~~and 7b~~-e below. (Basis: BACT and Cumulative Increase)

~~a. The concentration of total reduced sulfur (TRS) compounds in the landfill gas sent to the engines shall not exceed 270 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement. Compliance with this landfill gas concentration limit shall be demonstrated using either a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS or a District approved portable analysis method that reports only the H_2S concentration. If the portable analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the measured or calculated TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = measured TRS / measured % CH_4 * 50).~~
~~b. The annual weighted average concentration of TRS in the landfill gas sent to the engines shall not exceed 150 ppmv of TRS, expressed as H_2S and corrected to a landfill gas methane concentration of 50% by volume. Compliance with this annual average concentration limit shall be determined using the following procedures.~~
~~i. On a daily basis, the Permit Holder shall use a District approved portable hydrogen sulfide monitor (or other District approved method) to determine the concentration of H_2S in the landfill gas that is sent to S-1 or S-2. This H_2S monitoring is required on any normal working day (Monday through Friday, excluding Saturday, Sunday, and Holidays) during which the engine operates for 3 or more consecutive hours~~

~~between the hours of 6:00 AM and 6:00 PM. After collecting 120 daily monitoring events, this monitoring frequency may be reduced to a weekly basis, provided that the maximum measured H_2S concentration was not more than 200 ppmv of H_2S. Weekly H_2S monitoring is required for any calendar week (Sunday 12:00 AM through Saturday 11:59 PM) during which the engine operates for 3 or more consecutive hours on a normal working day as defined above.~~

~~ii. For each day (or week) that an H_2S measurement is taken, the Permit Holder shall record, in the data acquisition system or other District approved log, the date and time that the H_2S measurement was taken and the measured H_2S concentration in ppmv. The TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (calculated TRS = 1.2 * measured H_2S). Methane concentrations measured pursuant to Part 2 shall be used to correct the TRS concentration to a landfill gas methane concentration of 50% by volume (corrected TRS = calculated TRS / measured % CH_4 * 50). For any day (or week) that an engine operates but an H_2S measurement is not required, the recorded TRS concentration for that day (or week) shall be equal to the corrected TRS concentration that was determined for the previous day (or week).~~

~~iii. The Permit Holder shall use a data acquisition system to calculate and record the weighted average TRS concentration for each calendar month based on the daily TRS concentration data recorded pursuant to Part 7b(ii) – or weekly TRS concentration data if the testing frequency has been reduced to weekly in accordance with Part 7b(i) – and the continuous landfill gas flow rate data recorded pursuant to Part 2. The monthly weighted average TRS concentration is equal to the sum of the daily landfill gas flow rate to both engines times the TRS concentration for each day of the month divided by the total landfill gas flow rate for that month.~~

~~iv. The Permit Holder shall use a data acquisition system to calculate and record the annual weighted average TRS concentration for each rolling 12 month period using the monthly average TRS concentration determined pursuant to Part 7b(iii) and the monthly landfill gas flow rate data recorded pursuant to Part 2.~~

~~v. The annual weighted average TRS concentration determined pursuant to Part 7b(iv) shall be compared to the Part 7b limit above for each consecutive 12 month period.~~

a. The concentration of total reduced sulfur (TRS) compounds in the treated landfill gas burned in the engines shall not exceed 600 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement.

b. On a monthly basis, the Permit Holder shall use either a District approved portable hydrogen sulfide monitor or a District laboratory analysis method to determine the concentration of TRS (measured as H_2S and corrected to 50% methane) in the treated landfill gas that is delivered to S-1 or S-2. Methane concentrations measured pursuant to Part 2 shall be used to correct the calculated TRS concentrations to a landfill gas methane concentration of 50% by volume

(corrected TRS = measured TRS / measured % CH_4 * 50). The sampling dates and results shall be recorded in a District approved log.

i. If the portable H_2S analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S).

ii. If a laboratory analysis method is used, the TRS concentration shall be calculated as the sum of the measured concentrations for the individual sulfur compounds, expressed as H_2S.

c. If the corrected TRS concentration determined pursuant to Part 7b is 150 ppmv of TRS or less for each monthly measurement during a rolling 12 month period, no additional calculations are required to verify compliance with the SO2 emission limits identified above in Part 7. If any corrected TRS concentration measurement is greater than 150 ppmv of TRS during a rolling 12 month period, the Permit Holder shall use the calculation procedures in Parts 7d and 7e to demonstrate compliance with the daily and annual SO2 emission limits above.

d. Daily SO2 emission calculation are not required if the corrected TRS concentration is 270 ppmv of TRS or less. For each month when the TRS concentration measured pursuant to Part 7b is greater than 270 ppmv of TRS, the Permit Holder shall determine the maximum daily SO2 emission rate (DE_SO2, pounds/day) using the following equation:

DE_SO2 = Q_d * C_TRS * 1.66E-7, pounds/day, where:

Q_d is the maximum daily landfill gas flow rate (scf/day) to any single engine during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

e. Annual SO2 emission calculations shall be conducted for each rolling 12 month period, if any Part 7b corrected TRS concentration measurements are greater than 150 ppmv of TRS during that period. For each rolling 12-month period, the Permit Holder shall determine the annual emission rate to the two engines combined (AE_SO2, tons/year) using the following equations:

AE_SO2 = sum of all ME_SO2 for the rolling 12 month period under evaluation, tons/year, and

ME_SO2 = Q_m * C_TRS * 8.28E-11, tons/month, where:

Q_m is the total combined landfill gas flow rate (scf/month) to the two engines combined during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

*8. Formaldehyde emissions from each IC Engine (S-1 and S-2) shall not exceed ~~10. pounds per million standard cubic feet of methane burned~~ 0.46 pounds per hour per engine. (Basis: Regulation 2-5-302.3)

9. In order to demonstrate compliance with Parts 3, 4, 5, 7, and 8 above and Regulations 8-34-301.4, 9-1-302, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within ~~60 days of initial start-up of each engine and annually thereafter~~ 12 months of the previous source test. This source test shall be conducted while the engine is operating at or near the maximum operating rate and shall determine all items identified in Parts 9a-~~k~~m below. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report~~s for the initial compliance demonstration test shall be submitted to the Source Test Section and the Engineering Division within 60 days of the test date. Subsequent annual source test reports~~ shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 60 days of the test date. (Basis: BACT, TBACT, Offsets, Cumulative Increase, and Regulations 2-5-302, 2-6-423.2.1, 8-34-301.4, 8-34-412, 9-1-302, 9-8-302.1, and 9-8-302.3)

a. Operating rate for each engine during the test period (bhp);
b. Total flow rate of all gaseous fuel to each engine (dry basis, sdcfm);
c. Concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), total non-methane organic compounds (NMOC), hydrogen sulfide (H_2S), and total reduced sulfur compounds (TRS) in the gaseous fuel burned in the engines (percent by volume or ppmv);
d. High heating value for the landfill gas (BTU/scf);
e. Heat input rate to each engine averaged over the test period (BTU/hour);
f. Exhaust gas flow rate from each engine based on EPA Method 19 (dry basis, sdcfm);
g. Concentrations (dry basis) of NO_x, CO, CH_4, NMOC, SO_2, and O_2 in the exhaust gas from each engine (ppmv or percent by volume);
h. NO_x and CO concentrations corrected to 15% O_2 in the exhaust gas from each engine (ppmv);
i. NO_x and CO emission rates from each engine (grams/bhp-hour);
j. NMOC concentrations corrected to 3% O_2 in the exhaust gas from each engine (ppmv);
k. NMOC and methane destruction efficienc~~y~~ies achieved by each engine (weight percent);
l. Formaldehyde emission rate from each engine (pounds/hour ~~and pounds/million scf CH_4 burned~~);
m. ~~[Insert testing requirement for a key emission control system operating parameter once this parameter has been established.]~~ Average engine cylinder temperature for each engine, averaged over the test period, with average cylinder temperatures recorded at least once every 15 minutes as required in Part 6c.

~~10. In order to demonstrate compliance with Part 6 above and Regulation 8-34-509, the Permit Holder shall conduct a sufficient number of additional initial compliance demonstrate tests on each engine to determine an appropriate key emission control system operating parameter and the minimum, typical, and maximum operating ranges for that parameter. These tests shall demonstrate a correlation between the proposed key~~

~~parameter and the engine's NMOC emission rate over all expected operating ranges for the engine. For each engine operating level that is being evaluated, the compliance test shall determine either the NMOC concentration in the engine exhaust (ppmv corrected to 3% O_2) or NMOC destruction efficiency (weight percent) and at least one of the following: average temperature of all engine cylinders during the test period (degrees F); stack gas oxygen concentration during the test period as measured by the continuous stack gas oxygen monitor (percent by volume); or a comparison (λ) of the actual air-to-fuel ratio versus the ideal air-to-fuel ratio. Calculation of the λ parameter requires measurement of the stack gas oxygen concentration using a continuous stack gas oxygen monitor, measurement of the landfill gas flow rate using a continuous landfill gas flow rate monitor, and measurement of the landfill gas methane content using a continuous methane sensor. If any of these additional initial compliance demonstration tests that are not conducted concurrently with the Part 9 test, the Permit Holder shall follow the source test notification and reporting procedures that are described in Part 9 above. An additional report shall be prepared that describes the results of all these additional initial compliance demonstration tests, that discusses the correlations found between the NMOC emission rate and the proposed parameters, and that identifies the proposed key parameter and the proposed operating limits. This additional report shall be submitted to the Engineering Division by no later than 150 days after the initial start-up date for the engine. (Basis: Regulations 8-34-501.11 and 8-34-509)~~

Condition # 23962

FOR S-3 TSA GAS CLEANING SYSTEM AND A-1 TSA WASTE GAS FLARE:

1. All waste flush gas generated by the carbon desorption cycle at S-3 shall be vented to the A-1 TSA Waste Gas Flare. Landfill gas delivered from Keller Canyon Landfill may be burned in A-1 or blended with the flush gas prior to combustion in A-1, if the use of this supplemental landfill gas is necessary to ensure proper operation of A-1. The A-1 flare shall be operated continuously during any time that gas is being vented to this flare. (Basis: BACT)

2. The heat input rate to the A-1 Flare shall not exceed 72,270 million BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for the flare operating continuously. In order to demonstrate compliance with this part, the A-1 flare shall be equipped with a continuous gas flow meter and recorder, and the owner/operator shall maintain records of the heat input to A-1 for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The methane content in the inlet gas shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to initial operation of A-1 and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)
3. The A-1 Flare shall either achieve 98% by weight destruction of the total non-methane organic compounds (NMOC) in the inlet gas or shall emit no more than 30 ppmv of NMOC, expressed as methane and corrected to 3% oxygen, in the exhaust gas from A-1. (Basis: BACT)

4. In order to ensure compliance with Part 3 and to ensure adequate destruction of the toxic air contaminants present in the inlet gas, the owner/operator shall maintain the combustion zone temperature of the A-1 Flare at a minimum temperature of ~~1400~~ 1474 degrees F, averaged over any 3-hour period. If a source test demonstrates compliance with all applicable requirements at a different temperature, the APCO may revise th~~ese~~is minimum temperature requirement~~s~~ in accordance with the procedures identified in Regulation 2-6-414 or 2-6-415 and the following criteria. The minimum combustion zone temperature for the flare shall be equal to the average combustion zone temperature determined during the most recent complying source test minus 50 degrees F, provided that the minimum combustion zone temperature is not less than 1400 degrees F. To demonstrate compliance with this part, the A-1 flare shall be equipped with a temperature monitor with readout display and continuous recorder. One or more thermocouples shall be placed in the primary combustion zone of the flare and these thermocouples shall accurately indicate the combustion zone temperature at all times. (Basis: BACT and TBACT)

5. Nitrogen oxide (NOx) emissions from the A-1 flare shall not exceed 0.06 pounds of NOx, expressed as NO2, per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 15 ppmv of NO_x, expressed as NO_2 at 15% oxygen on a dry basis. (Basis: RACT)

6. Carbon monoxide (CO) emissions from the A-1 flare shall not exceed 0.20 pounds of CO per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 81 ppmv of CO at 15% oxygen on a dry basis. (Basis: RACT)

7. Sulfur dioxide (SO2) emissions from the A-1 flare shall not exceed ~~0.09~~ 1.65 pounds of SO2 per~~ million BTU of heat input~~ hour~~, based on any single test or measurement~~. Compliance with this emission limit shall be demonstrated using one of the procedures identified in subparts a-c below. (RACT)
   a. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and calculate the SO2 emissions in units of pounds per hour ~~MM BTU of heat input~~ using District approved test methods and calculation procedures; or
   b. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and have an outlet sulfur dioxide concentration that does not exceed ~~16~~35 ppmv of SO2 at 15% oxygen on a dry basis; or
   c. Collect a sample of each ~~the~~ inlet gas to A-1 during the compliance demonstration test required by Part 11, analyze th~~is~~ese sample~~s~~ for total reduced sulfur compounds (TRS) using a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS, and have a TRS concentration in ~~the~~ each inlet gas that does not exceed ~~270~~600 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume.

*8. Formaldehyde emissions from the flare (A-1) shall not exceed~~ 0.8 pounds per million standard cubic feet of methane burned~~ 2.3E-3 pounds per hour. (Basis: Regulation 2-5-302)

*9. ~~If the concentration of a toxic air contaminants (TACs) in the inlet gas to the A-1 flare exceeds any of the levels listed below, the owner/operator shall submit a permit application to the District, within 30 days receiving the analysis results, that requests a modification of these limits and verifies that project health impacts have not exceeded the limits specified in Regulation 2-5-302.~~ The concentration of toxic air contaminants (TACs) in the inlet gas to the A-1 Flare shall not exceed any of the levels listed below. (Basis: Regulation 2-5-302)

Compound	Concentration (ppbv, dry basis)
Acrylonitrile	1,000
Benzene	~~40,000~~20,000
Carbon Tetrachloride	~~500~~400
Chloroform	~~500~~400
Ethylene Dibromide	~~500~~400
Ethylene Dichloride	1,000
Methylene Chloride	40,000
Perchloroethylene	8,000
Trichloroethylene	4,000
Vinyl Chloride	4,000

10. The A-1 flare shall be equipped with both local and remote alarms, automatic combustion air control, automatic gas shutoff valves, and automatic start/restart system. (Basis: BACT)

11. In order to demonstrate compliance with Parts 3 through ~~6, 7a, 7b, and~~ 8 above, the owner/operator shall conduct an annual compliance demonstration source test at the A-1 TSA Waste Gas Flare ~~within 60 days of initial start-up of A-1 and~~ within 12 months of the previous test date ~~for each subsequent year~~. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report shall be submitted to the Source Test Section within 60 days of the test date. Each annual source test shall measure or determine the criteria in subparts a-i below. (Basis: RACT, BACT, TBACT, Regulation 2-5-302 and 9-1-302)

a. inlet gas flow rate to the flare (scfm, dry basis);
b. concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), and total non-methane organic compounds (NMOC) in the inlet gas to the flare;
c. inlet heat input rate to the flare in units of MM BTU (HHV) per hour;
d. stack gas flow rate from the flare (scfm, dry basis);
e. concentrations (dry basis) of CH_4, NMOC, NO_x, CO, SO_2, and O_2, in the flare stack gas;
f. NMOC and CH_4 destruction efficiency~~ies~~ achieved by the flare (by weight);
g. average combustion zone temperature in the flare during the test period;
h. NO_x, CO, and SO_2 emission rates from the flare in units of pounds per hour and pounds per MM BTU,
i. formaldehyde emissions from the flare in units of pounds~~/~~ per hour ~~and pound/MM scf CH_4 burned~~.

12. In order to demonstrate compliance with Parts 7c and 9, the owner/operator shall conduct a characterization of the flare inlet gas concurrent with the annual source test required by Part 11 above. In addition to the compounds listed in Part 11b, the flare inlet gas shall be analyzed for, as a minimum, the organic compounds listed below. If the owner/operator is electing to demonstrate compliance with Part 7 using the methods in Part 7c instead of Parts 7a or 7b, the permit holder shall analyze the flare inlet gas for, as a minimum, the sulfur compounds listed below, and the owner/operator does not need to conduct the SO2 analysis or calculations in Parts 11e and 11h. All concentrations shall be reported on a dry basis. The test report shall be submitted to the Compliance and Enforcement Division and Source Test Section within 60 days of the test date. (Basis: Regulations 2-5-501 and Cumulative Increase)

Organic Compounds
Acrylonitrile
Benzene
Carbon Tetrachloride
Chloroform
Ethylene Dibromide
Ethylene Dichloride
Methylene Chloride
Perchloroethylene
Trichloroethylene
Vinyl Chloride

Sulfur Compounds
Carbon Disulfide
Carbonyl Sulfide
Dimethyl Sulfide
Ethyl Mercaptan
Hydrogen Sulfide
Methyl Mercaptan

V. RECOMMENDATION

The District recommends issuance of the Permit to Operate for the following equipment, subject to the revised permit condition #23400 identified above.

S-1 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

S-2 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

The District recommends issuance of the Permit to Operate for the following equipment, subject to the revised permit condition #23962 identified above.

S-3 **Temperature Swing Adsorption Gas Cleaning System**; GE Jenbacher, M4 TSA System, 4 X 2 with 2580 lbs of carbon per vessel; abated by **A-1 TSA Waste Gas Flare**; John Zink Company, ZTOF Enclosed Flare, 8.25 MM BTU/hr, fired on TSA waste flush gas, landfill gas, or a blend of these gases, 275 scfm.

Prepared By:	Date:
Carol S. Allen Senior Air Quality Engineer	February 27, 2012

APPENDIX F

Engineering Evaluation
Permit Application No. 24349

ENGINEERING EVALUATION REPORT

Ameresco Keller Canyon LLC

PLANT # 17667 (SITE # B7667)

APPLICATION # 24349

I. BACKGROUND

This project involves a modification of the formaldehyde emission limit for two landfill gas fired engines located at the Ameresco Keller Canyon LLC Energy Plant in Pittsburg, CA (S-1 and S-2 at Plant # 17667).

When the Permit to Operate for this facility was issued in March 2012, the District issued a formaldehyde emission limit for the engines of 0.46 pounds/hour. This limit was set in order to ensure compliance with the Regulation 2, Rule 5 project risk limits. In particular, the acute HI and cancer risk from this project were at the maximum emission limit. At the time that the permit to operate was issued, the District had only been informed of testing completed through March 2011. The March 2011 source test found formaldehyde emissions at the engines of 0.428 pounds/hour from S-1 and 0.435 pounds/hour from S-2. Since these emission rates complied with the proposed limit, the District issued the Permit to Operate for the facility.

After this permit to operate was issued, the applicant informed the District that another source test had been conducted on the engines in October 2011. The results of this test were formaldehyde emissions of 0.622 pounds/hour from S-1 and 0.593 pounds/hour from S-2. These emission rates exceed the limit of 0.46 pounds/hour issued in March 2012.

The applicant submitted Application # 24349 to request another increase of the formaldehyde emission. The District had indicated that equipment modifications may be necessary in order to increase this limit. However, after detailed review of the as-built energy facility, the District determined that some corrections of the building and stack parameters were necessary. These building and stack parameter corrections were incorporated into the air dispersion modeling program, and the District found that the revised HRSA (May 2012) resulted in lower project risks for both acute hazard index and residential cancer risk compared to the February 2012 HRSA. Therefore, the District has now determined that some increases in formaldehyde emission rate would be possible without additional stack modifications or add-on controls.

As discussed in the HRSA results below, a formaldehyde emission rate of 0.73 pounds/hour of formaldehyde will result in compliance with all of the project risk limits. The applicant has approved a new formaldehyde emission limit of 0.73 pounds/hour per engine and is not requesting any stack height increases or add-on controls for these engines at this time.

II. EMISSIONS

The applicant has requested to increase the formaldehyde emission limit for their IC engines up to the maximum rate that would still pass an HRSA. The District has determined that this maximum allowable emission rate is 0.73 pounds/hour of formaldehyde per engine. Detailed

changes to the toxic air contaminant emission rates for this facility and ISCST3 input factors for the HRSA are presented in the attached spreadsheets.

The proposed change to the formaldehyde emission limit for the IC engines will not results in any changes to the current maximum permitted emission levels of any criteria pollutants. Therefore, this permit limit change will not require any changes to the Plant Cumulative Emission Increase Inventory for this site.

III. STATEMENT OF COMPLIANCE

Regulation 2, Rule 1 (CEQA and Public Notice Requirements)

This application involves a permit condition change for an existing facility that does not involve any physical modifications. The only change is to the formaldehyde emission limit. Since the revised emission limit does not trigger new source review under Regulation 2, Rule 2, and it will comply with all project risk limits in Regulation 2, Rule 5, this proposed permit condition change satisfies the requirements of 2-1-312.11. There is no possibility that this proposed formaldehyde emission limit change could result in any significant adverse environmental impact. Therefore, no additional CEQA review is required.

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

Regulation 2, Rule 2 (NSR)

The permit condition change authorized by this permit action will not result in any additional criteria pollutant emissions. Therefore, the BACT, Offset, and public notification requirements of Regulation 2, Rule 2 do not apply.

Regulation 2, Rule 5 (NSR – Toxic Air Contaminants)

This permit action will increase the formaldehyde emission rate from 0.46 pounds/hour per engine to 0.73 pounds/hour per engine. This action triggers a Health Risk Screening Analysis (HRSA). Since this project involves subsequent modifications to the IC engines and the waste gas flare was part of a previous application for this site where the HRSA for this previous project was conducted less than two years ago, this current project includes all proposed emissions from the two IC engines and the waste gas flare.

The District conducted an HRSA for this project in accordance with the BAAQMD HRSA Guidelines. The results of this HRSA are summarized below. A detailed HRSA report is attached.

Table 1. HRSA Results: Total Project Risk

	Cancer Risk (per million)	Chronic Hazard Index	Acute Hazard Index
Residential Receptor	9.98	0.126	0.98
Worker Receptor	7.03	0.204	

TBACT:

As discussed in detail in the Permit to Operate Report for Application # 16830, the landfill gas fired engines and the waste gas flare must each satisfy TBACT requirements because the cancer risk from each device will exceed 1 in a million cancer risk. From the detailed HRSA report, the top contributors to cancer risk are: formaldehyde emissions from the engines and benzene emissions from the flare.

The District's BACT/TBACT Guideline for IC Engines - Landfill or Digester Gas Fired; Greater than 250 hp (Document # 96.2.2) describes previously approved BACT and TBACT requirements for the type of engine in this project. TBACT constitutes compliance with the emission limits and control technologies that are specified as BACT for POC emissions. Since the primary contributors to the cancer risk resulting from the engines in this project are POCs, TBACT for the engines will be the use of the same technology as BACT for POC emissions. Source test data for similar engines located at another Bay Area facility confirm that there is a general correlation between CO and POC emissions and formaldehyde emissions. Therefore, minimizing CO and POC emissions from these engines will also minimize formaldehyde emissions and health risks.

Under Application # 14265, the District concluded that that the proposed engines would comply with TBACT requirements by using lean burn technology and complying with the outlet NMOC concentration specified in Regulation 8-34-301.4, which is equivalent to about 0.2 g/bhp-hour. As a result of Application # 16830, these engines will now be burning clean landfill gas produced by the landfill gas treatment system instead of the filtered landfill gas that was approved pursuant to Application # 14265. Use of this clean landfill gas fuel is expected to minimize CO and POC emissions.

Further reduction of secondary and residual organic TACs from these engines would require the installation of add-on control technology such as oxidation catalysts. Since the engines are already built and operating, requiring the site to retrofit these engines with oxidation catalysts would be extremely expensive. This type of add-on control retrofit is not justifiable unless the site is unable to meet the project risk limits. TBACT will be satisfied by using lean-burn engine technology with the engines tuned to minimize CO and POC emissions and by using a landfill gas fuel that has been pretreated to remove POCs and siloxanes.

The District's BACT/TBACT Guideline for Enclosed Landfill Gas Flares (Document #80.1) describes previously approved BACT and TBACT requirements for enclosed landfill gas flares. Compliance with the POC BACT criteria, specifically the minimum retention time and minimum operating temperature requirements, constitutes TBACT for enclosed flares. The A-1 Flare is designed to have a retention time of 0.7 seconds and has an operating temperature range of 1400-1800 °F. These design criteria satisfy the TBACT requirements for A-1. Condition #23962, Part 4 requires a minimum operating temperature of no less than 1400 °F and will ensure compliance with these TBACT requirements.

Project Risks:
Regulation 2-5-302 limits project risks to 10.0 in a million cancer risk, 1.0 chronic hazard index, and 1.0 acute hazard index. The revised total project risks are identified in Table 1, and these revised project risks are all less than the Regulation 2-5-302 project risk limits. Therefore, this project – with the permit condition changes proposed by this action – will comply with Regulation 2-5-302.

Regulation 2, Rule 6 (Major Facility Review)
Ameresco Keller Canyon submitted an application for an initial Title V permit for this facility on March 17, 2008 (Application # 17615). This Title V application satisfies the Regulation 2-6-404 requirements for submittal of a timely application for major facility review. All Title V permitting requirements will be discussed in detail in the Statement of Basis for Application # 17615.

District Regulations:

As discussed in detail in the Permit to Operate Report for Applications # 14265 and # 16830, the landfill gas fired IC engines are subject to: BAAQMD Regulation 6, Rule 1; BAAQMD Regulation 8, Rule 34; and BAAQMD Regulation 9, Rules 1, 2 and 8. The current permit conditions for the engines were imposed to ensure compliance with all applicable regulatory limits in these rules. Annual source testing requirements will demonstrate compliance with NOx, CO, NMOC, and SO2 emission limits. Landfill gas is a clean fuel that results in very low particulate emissions compared to the Regulation 6, Rule 1 limits. Therefore, testing is not required in order to demonstrate compliance with particulate emission limits.

The proposed formaldehyde emission limit change at the engines will not affect compliance with any of the District regulations listed above.

Federal Requirements (NESHAPs for IC Engines)

As discussed in the Permit to Operate Report for Applications # 14265 and # 16830, the S-1 and S-2 landfill gas fired IC engines at this site are subject to a federal NESHAP: 40 CFR Part 63 Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. In accordance with Section 63.6590(c)(1), new RICE located at area sources of HAP must comply with the requirements of Subpart ZZZZ by meeting the emission limit or control requirements of the appropriate NSPS. Therefore, S-1 and S-2 must comply with the requirements of 40 CFR Part 60 Subpart JJJJ in order to meet the requirements of 40 CFR Part 63 Subpart ZZZZ.

In accordance with Section 63.6595(a)(6-7), a new RICE located at an area source must comply with the applicable requirements by January 18, 2008 if start-up occurs before this date or upon start-up if start-up occurs after this date. For S-1 and S-2, start-up began on June 2, 2009; therefore, these engines were subject to the applicable standards upon start-up.

In accordance with 40 CFR Part 60.4243(e), stationary SI ICE larger than 100 hp must comply with the emission standards in Table 1 of Subpart JJJJ. From Table 1, landfill and digester gas fired ICE that are 500 bhp or larger are subject to the following emission limits for engines with a manufacture date on or after 7/1/2007 but before 2/1/2010.

Table 2. Applicable NESHAP Emission Limits for S-1 and S-2

	g/bhp-hr	ppmv at 15% O_2, dry basis
NO_x	3.0	220
CO	5.0	610
VOC (as propane)	1.0	80

The owner/operator is expected to demonstrate compliance with the above emission limits by maintaining records of engine manufacturer data that indicate compliance with these standards. The S-1 and S-2 engines are required to meet the following limits pursuant to BACT:

NOx	0.6 grams/bhp-hour	or	45 ppmv at 15% O_2
CO	2.1 grams/bhp-hour	or	257 ppmv at 15% O_2

The engine manufacturer has guaranteed that the engines will comply with these BACT limits, which are less than half of the Part 60 Subpart JJJJ standards. BAAQMD Regulation 8-34-301.4 requires that the S-1 and S-2 engines comply with a maximum NMOC outlet concentration limit of 120 ppmv at 3% O_2 (expressed as methane), which is equal to 40 ppmv at 15% O_2 (expressed as methane) or 13 ppmv at 15% O_2 (expressed as propane). This District regulatory limit is less

than 20% of the Part 60 Subpart JJJJ standard. Furthermore, the District NMOC limit includes formaldehyde, which may be excluded from the Subpart JJJJ VOC standard. District approved source tests have demonstrated that these engines are complying with all of these NO_x, CO, and NMOC limits. Therefore, these engines are expected to remain in compliance with the 40 CFR Part 60, Subpart JJJJ, Table 1 standards with a high margin of compliance.

Any performance tests that are required under Subpart JJJJ must be conducted in accordance with the requirements of 40 CFR Part 60.4244. The owner/operator must maintain records of all notifications, engine maintenance, documentation that either the engine is certified or is operating in compliance with the above standards, and all performance tests pursuant to 40 CFR Part 60.4245.

IV. PERMIT CONDITIONS

The District is proposing to make the revisions identified below in Condition # 23400 for the S-1 and S-2 IC Engines. The applicant has reviewed and approved this change.

Condition # 23400

FOR S-1 AND S-2 LFG-FIRED INTERNAL COMBUSTION ENGINES AND GENSETS:

1. The S-1 and S-2 Internal Combustion (IC) Engines shall be fired exclusively on landfill gas collected from the Keller Canyon Landfill. (Basis: Cumulative Increase)

2. The heat input to each IC Engine (S-1 and S-2) shall not exceed 172,861 MM BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for each IC engine operating continuously. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the heat input to each engine for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The landfill gas flow rate to each engine shall be monitored and recorded continuously in accordance with Regulation 8-34-508. The landfill gas methane content supplied to either engine shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to any engine operation and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. Carbon Monoxide (CO) emissions from each IC Engine (S-1 and S-2) shall not exceed 2.1 grams of CO per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a carbon monoxide concentration in the engine exhaust of no more than 257 ppmv of CO, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 257 ppmv of CO shall not be deemed a violation of this part, if the Permit Holder can demonstrate that CO emissions did not exceed 2.1 g/bhp-hour during the test period. (Basis: Regulation 2-6-423.2.1, BACT, and Cumulative Increase)

4. Nitrogen Oxide (NO_x) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.6 grams of NO_x (calculated as NO_2) per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a nitrogen oxide concentration in the engine exhaust of no more than 45 ppmv of NO_x, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 45 ppmv of NO_x

shall not be deemed a violation of this part, if the Permit Holder can demonstrate that NO_x emissions did not exceed 0.6 g/bhp-hour during the test period. (Basis: BACT and Offsets)

5. Each IC Engine (S-1 and S-2) shall comply with either the destruction efficiency requirements or the non-methane organic compound (NMOC) outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulations 2-5-302 and 8-34-301.4, BACT, TBACT, and Offsets)

6. In order to demonstrate on-going compliance with Part 5 and Regulation 8-34-509, the Permit Holder shall use average engine cylinder temperature as the key emission control system operating parameter for these engines, and the Permit Holder shall comply with the following limits and procedures. (Basis: Regulations 8-34-501.11 and 8-34-509)
   a. For S-1, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.
   b. For S-2, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.
   c. For each engine (S-1 and S-2), each cylinder shall be equipped with a manufacturer's thermocouple that continuously and accurately reads the cylinder temperature. The average temperature for all the cylinders in the engine, shall be recorded at least once every 15 minutes of operation.
   d. These temperature records shall be used to compute and record the rolling 3-hour average engine cylinder temperature for each engine.
   e. For each engine, the rolling 3-hour average engine cylinder temperature shall be compared to the limits in Parts 6a and 6b to assess compliance with this part. The permit holder shall identify and record any rolling 3-hour periods (excluding start-up and shut-down periods) when the average engine cylinder temperature exceeds a limit, and the permit holder shall notify the District of each deviation.

7. Sulfur Dioxide (SO_2) emissions from each IC Engine (S-1 and S-2) shall not exceed 42.6 pounds of SO_2 per day. In addition, the emissions from S-1 and S-2 combined shall not exceed 8.64 tons of SO_2 during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with these SO_2 emission limits by complying with the landfill gas concentration limits, monitoring and record keeping requirements identified in Parts 7a-e below. (Basis: BACT and Cumulative Increase)
   a. The concentration of total reduced sulfur (TRS) compounds in the treated landfill gas burned in the engines shall not exceed 600 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement.
   b. On a monthly basis, the Permit Holder shall use either a District approved portable hydrogen sulfide monitor or a District laboratory analysis method to determine the concentration of TRS (measured as H_2S and corrected to 50% methane) in the treated landfill gas that is delivered to S-1 or S-2. Methane concentrations measured pursuant to Part 2 shall be used to correct the calculated TRS concentrations to a landfill gas methane concentration of 50% by volume (corrected TRS = measured TRS / measured % CH_4 * 50). The sampling dates and results shall be recorded in a District approved log.

i. If the portable H_2S analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S).

ii. If a laboratory analysis method is used, the TRS concentration shall be calculated as the sum of the measured concentrations for the individual sulfur compounds, expressed as H_2S.

c. If the corrected TRS concentration determined pursuant to Part 7b is 150 ppmv of TRS or less for each monthly measurement during a rolling 12 month period, no additional calculations are required to verify compliance with the SO2 emission limits identified above in Part 7. If any corrected TRS concentration measurement is greater than 150 ppmv of TRS during a rolling 12 month period, the Permit Holder shall use the calculation procedures in Parts 7d and 7e to demonstrate compliance with the daily and annual SO2 emission limits above.

d. Daily SO2 emission calculation are not required if the corrected TRS concentration is 270 ppmv of TRS or less. For each month when the TRS concentration measured pursuant to Part 7b is greater than 270 ppmv of TRS, the Permit Holder shall determine the maximum daily SO2 emission rate (DE_SO2, pounds/day) using the following equation:

DE_SO2 = Q_d * C_TRS * 1.66E-7, pounds/day, where:

Q_d is the maximum daily landfill gas flow rate (scf/day) to any single engine during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

e. Annual SO2 emission calculations shall be conducted for each rolling 12 month period, if any Part 7b corrected TRS concentration measurements are greater than 150 ppmv of TRS during that period. For each rolling 12-month period, the Permit Holder shall determine the annual emission rate to the two engines combined (AE_SO2, tons/year) using the following equations:

AE_SO2 = sum of all ME_SO2 for the rolling 12 month period under evaluation, tons/year, and

ME_SO2 = Q_m * C_TRS * 8.28E-11, tons/month, where:

Q_m is the total combined landfill gas flow rate (scf/month) to the two engines combined during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

*8. Formaldehyde emissions from each IC Engine (S-1 and S-2) shall not exceed ~~0.46~~ 0.73 pounds per hour per engine. (Basis: Regulation 2-5-302.1~~&~~3)

9. In order to demonstrate compliance with Parts 3, 4, 5, 7, and 8 above and Regulations 8-34-301.4, 9-1-302, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within 12 months of the previous source test. This source test shall be conducted while the engine is operating at or near the maximum

operating rate and shall determine all items identified in Parts 9a-m below. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test reports shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 60 days of the test date. (Basis: BACT, TBACT, Offsets, Cumulative Increase, and Regulations 2-5-302, 2-6-423.2.1, 8-34-301.4, 8-34-412, 9-1-302, 9-8-302.1, and 9-8-302.3)

a. Operating rate for each engine during the test period (bhp);
b. Total flow rate of all gaseous fuel to each engine (dry basis, sdcfm);
c. Concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), total non-methane organic compounds (NMOC), hydrogen sulfide (H_2S), and total reduced sulfur compounds (TRS) in the gaseous fuel burned in the engines (percent by volume or ppmv);
d. High heating value for the landfill gas (BTU/scf);
e. Heat input rate to each engine averaged over the test period (BTU/hour);
f. Exhaust gas flow rate from each engine based on EPA Method 19 (dry basis, sdcfm);
g. Concentrations (dry basis) of NO_x, CO, CH_4, NMOC, SO_2, and O_2 in the exhaust gas from each engine (ppmv or percent by volume);
h. NO_x and CO concentrations corrected to 15% O_2 in the exhaust gas from each engine (ppmv);
i. NO_x and CO emission rates from each engine (grams/bhp-hour);
j. NMOC concentrations corrected to 3% O_2 in the exhaust gas from each engine (ppmv);
k. NMOC and methane destruction efficiencies achieved by each engine (weight percent);
l. Formaldehyde emission rate from each engine (pounds/hour);
m. Average engine cylinder temperature for each engine, averaged over the test period, with average cylinder temperatures recorded at least once every 15 minutes as required in Part 6c.

V. RECOMMENDATION

The District recommends issuance of a Change of Permit Conditions for the following equipment, subject to the revised permit condition #23400 identified above.

S-1 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

S-2 **LFG-Fired Internal Combustion Engine and Genset**; GE Jenbacher, JGS 616 GS-L.L; 4-stroke, 16 cylinder, 6,090 in^3 displacement; 2,677 bhp, 19.733 MM BTU/hour, 1.914 MW nominal power output.

Prepared By:	Date:
Carol S. Allen Supervising Air Quality Engineer	May 15, 2012

APPENDIX A

Revised Health Risk Screening Analysis for Application # 24349

APPENDIX G

Engineering Evaluation
Permit Application No. 25693

ENGINEERING EVALUATION REPORT

Ameresco Keller Canyon LLC

PLANT # 17667 (SITE # B7667)

APPLICATION # 25693

A. BACKGROUND

Ameresco Keller Canyon LLC, or "Ameresco", operates a landfill gas to energy plant in Pittsburg, CA. Landfill gas is delivered to this site from the Keller Canyon Landfill (Plant # 4618). Ameresco treats the landfill gas at S-3 prior to combustion in the IC engines (S-1 and S-2).

The S-3 Temperature Swing Adsorption Gas Cleaning System includes a regenerative carbon adsorber that removes siloxane, organic, and sulfur compounds from the landfill gas. During the regeneration cycle, the carbon bed is heated and flushed with a scavenger gas to remove the collected compounds. The scavenger gas is then mixed with treated landfill gas and vented to the A-1 Waste Gas Flare for abatement. The combustion process at A-1 converts essentially all of the sulfur compounds in the scavenger and landfill gases into sulfur dioxide (SO_2). Other secondary flare emissions include carbon monoxide (CO), nitrogen oxides (NO_x), particulate matter (PM_{10} and $PM_{2.5}$), formaldehyde, and acid gases such as hydrogen chloride (HCl) and hydrogen fluoride (HF). The A-1 flare also emits residual precursor and non-precursor organic compounds (POC and NPOC), toxic air contaminants (TAC), and greenhouse gases (GHG).

When A-1 was initially permitted (see Application # 16830), the District estimated that the concentration of contaminants in the mixture of landfill gas and scavenger gas delivered to the flare would be about 4 times higher than the concentration of these contaminants in the Keller Canyon Landfill gas that is delivered to the site. While this assumption has proved to be acceptable when averaged over the entire 5-day desorption cycle, Ameresco has occasionally observed higher concentrations during shorter periods of time when the heating cycle reaches the boiling point for certain compounds. In particular, during the October 2012 annual source test event, Ameresco discovered that sulfur compounds are desorbed early in the cycle at roughly 30-42 hours after desorption is initiated and that the peak concentration of sulfur compounds in the desorption cycle waste gas could be much higher than previously anticipated. This high concentration of sulfur compounds in the desorption cycle gas resulted in sulfur dioxide emissions levels from A-1 that exceeded the current SO_2 emission limit of 1.65 pounds/hour in Condition # 23962, Part 7. However, this emission excursion only occurred during a few hours when sulfur desorption was occurring at high rates. Once the bulk of the sulfur compounds was removed from the adsorption media, SO_2 outlet concentrations dropped to the levels typically observed for the Keller Canyon Landfill facility's landfill gas flares (60 ppmv of SO_2 or less).

The District and the Applicant have agreed that the Disitrict's current SO_2 emission limit of 1.65 pounds/hour for A-1 was established based on a District assumption that has turned out to be inaccurate. The District's maximum inlet sulfur content assumption of 600 ppmv as H_2S was found to be too low for short term measurements (hourly or daily averages), and thus, the hourly emission limit of 1.65 pounds/hour of SO_2 is not achievable. For hourly and daily emissions, this waste gas flare should instead

be permitted at the Regulation 9-1-302 SO_2 emission limit, which limits the outlet concentration of SO_2 to 300 ppmv, dry basis, at the as-found oxygen concentration. As discussed below, compliance with the Regulation 9-1-302 SO_2 outlet concentration limit will satisfy the SO_2 RACT requirements for this waste gas flare and is therefore the correct basis for a short term (hourly or daily average) emission rate limit for this flare.

For the annual average sulfur dioxide emissions from the A-1 Waste Gas Flare, the District has determined that the initial emission estimate on which the cumulative SO_2 emission increases were based is also too low. The District has recalculated the maximum expected amount of sulfur that could be transferred to Ameresco Keller Canyon, LLC from the Keller Canyon Landfill (KCL) facility based on the heat input limits for Ameresco's engines and flare and the landfill gas sulfur content limit for Keller Canyon's landfill gas (300 ppmv of total reduced sulfur, dry basis). A revised site-wide annual SO_2 emission limit for Ameresco Keller Canyon, LLC will be established using this data. Monitoring requirements will be revised to demonstrate compliance with the new SO_2 limits.

In May 2012, the District conducted an updated risk screening analysis (see Application # 24349). The primary purpose of this updated HRSA was to increase the formaldehyde emission limits for the IC engines. However, the District also included revised inlet waste gas concentration assumptions in this May 2012 risk screen, because the 2011 source test data found higher inlet TAC concentrations as well as higher inlet sulfur concentrations for the A-1 flare. Since this risk demonstrated compliance with all Regulation 2, Rule 5 toxic NSR requirements, the District is proposing to include the revised inlet gas assumptions in this permit application and plans to revise the concentration limits in Part 9 of the permit conditions for S-3. In addition to these changes, the District plans to remove compounds that have not been detected future test requirements.

Based on a review of preliminary laboratory results for the 2013 source test, Ameresco found that the proposed inlet TAC concentrations discussed above would not be sufficient for a few compounds, and Ameresco requested that the District increase these concentration limits accordingly. The source tests for the last 3 years have demonstrated that this flare has been routinely achieving greater than 99.5% destruction efficiency for non-methane organic compounds. In calculating toxic emissions from the flare, the District previously assumed that the flare would only achieve 98% destruction for each individual TAC. In light of the high NMOC destruction efficiency observed during the last three source tests, the District is planning to revise the flare destruction efficiency assumption to 98.5% for each individual TAC. This revised destruction efficiency assumption will allow the District to increase the inlet TAC limits for this flare without increasing the toxicity weighted emission rate for TAC compounds emitted from the flare. Detailed emissions calculations are presented in the attached spreadsheets. Since toxicity weighted emission for the flare will not be increased, a revised health risk assessment is not necessary for this application.

B. EMISSIONS

The current sulfur dioxide emission limits for the two engines, the waste gas flare, and the entire facility are summarized in the table below.

Table 1. Summary of Current SO_2 Emission Limits and Equivalent Inlet Sulfur Concentrations

	Hourly Limits		Daily Limits		Annual Limits	
	Inlet TRS, ppmv	Pounds / Hour	Inlet TRS, ppmv	Pounds / Day	Inlet TRS, ppmv	Tons / Year
S-1 IC Engine # 1	600	3.94	270	42.6	150 *	8.637
S-2 IC Engine # 2	600	3.94	270	42.6		
A-1 Waste Gas Flare	600	1.65	600	39.6	600	7.222
Site-Wide Total						15.858

* The 150 ppmv sulfur content limit for the engines is a BACT limit for SO_2 emissions from IC engines. The S-3 Gas Treatment System and A-1 Waste Gas Flare are functioning as SO_2 BACT control devices for the engines by removing sulfur from the fuel delivered to the engines. As a result, S-3 and A-1 are required to meet RACT for SO_2 emissions instead of BACT pursuant to BAAQMD Regulation 2-2-112. As discussed later in this report, RACT for SO_2 emissions from a flare is satisfied by complying with BAAQMD's Regulation 9-1-302 outlet concentration limit (300 ppmv of SO_2 in the flare exhaust at the as-found oxygen concentration).

For the A-1 Waste Gas Flare, the basis for each of the sulfur dioxide emission rate calculations will be changed from inlet assumptions to a combination of inlet and outlet assumptions. For example, the current SO_2 emission rate limits listed in Table 1 are based on the following assumptions for the flare:

- 16,600 scf/hour of combined waste gases (8.25 MM BTU/hour),
- 398,400 scf/day of combined waste gases (198 MM BTU/day),
- 145,429,000 scf/year of combined waste gases (72,270 MM BTU/year)
- 600 ppmv of total reduced sulfur compounds in the combined waste gases vented to A-1

The revised sulfur dioxide emission limits for this facility are summarized in Table 2 below. The revised SO_2 emission limits for the A-1 Waste Gas Flare will be based on the following assumptions:

- 300 ppmv of SO_2 in the A-1 exhaust gas at 15% O_2, dry basis (Regulation 9-1-302 limit and worst case outlet oxygen level)
- 533,800 scf/hour of exhaust gas at 15% O_2 (8.25 MM BTU/hour of combined waste gases at 50% CH_4 and 50% CO_2)
- 12,811,800 scf/day of exhaust gas at 15% O_2 (198 MM BTU/day of combined waste gases at 50% CH_4 and 50% CO_2)
- 841,126,300 scf/year of landfill gas transferred to Ameresco (418,000 MM BTU/year of landfill gas at 50% CH_4)
- 300 ppmv of sulfur (dry basis) in the untreated landfill gas transferred to Ameresco (based on permit condition limit for Keller Canyon landfill gas)

Table 2. Summary of Proposed Revised SO_2 Emission Limits and Equivalent Concentrations

	Hourly Limits		Daily Limits		Annual Limits	
	Inlet TRS, ppmv	Pounds / Hour	Inlet TRS, ppmv	Pounds / Day	Inlet TRS, ppmv	Tons / Year
S-1 IC Engine # 1	600	3.94	270	42.6	150	8.637
S-2 IC Engine # 2	600	3.94	270	42.6		
	Outlet SO_2, ppmv at 15% O_2	Pounds / Hour	Outlet SO_2, ppmv at 15% O_2	Pounds / Day	Sulfur in KCL gas, ppmv	Tons / Year
A-1 Waste Gas Flare	300	13.86	300	332.5	300	12.247
Site-Wide Total					300	20.884

The revised SO_2 emission factor (for the hourly and daily emission rate calculations for A-1) is calculated below. Waste gas flares typically operate at about 10% oxygen in the flue gas. As a worst case assumption, the District assumed the maximum outlet oxygen concentration would be 15%. Thus, the basis for the emission factor is 300 ppmv of SO_2 in the flare exhaust at 15% O_2, dry basis. Ambient oxygen concentration was assumed to be 20.95%. The waste gas fuel was assumed to be similar to landfill gas containing 50% methane and 50% carbon dioxide, which generates 9605 sdcf of flue gas (at 0% O_2)/MM BTU and has a heat content of 496.9 BTU/scf of waste gas.

New SO_2 Emission Factors for A-1 Waste Gas Flare:
(300 ppmv of SO_2 in flue gas @15% O_2)*(20.95-0)/(20.95-15)
= 1056 ppmv of SO_2 in flue gas @0% O_2

(1056 ft^3 SO_2/1E6 ft^3 flue gas @0% O_2)*(9605 ft^3 flue gas @)% O_2/1 MM BTU)/
(387 ft^3 SO_2/1 lbmol SO_2)*(64.06 lbs SO_2/1 lbmol SO_2) = 1.6794 lbs SO_2/MM BTU

(1.6794 lbs SO_2/MM BTU)*(1 MM BTU/1E6 BTU)*(496.9 BTU/scf)*(1000 scf/M scf)
= 8.345E-1 lbs SO_2/M scf of combined waste gases burned

Maximum Hourly SO_2 Emissions from A-1:
(1.6794 lbs SO_2/MM BTU)*(8.25 MM BTU/hour) = 13.86 lbs/hour SO_2

As discussed in the background section, the maximum hourly SO_2 emissions above will only occur during the desorption cycle for the gas treatment system carbon media, which typically lasts for 3-12 hours. As a worst case scenario, the District assumes that sulfur compound desorption could occur at the maximum hourly rate for 24 hours/day. but this scenario is highly unlikely.

Maximum Daily SO_2 Emissions from A-1:
(1.6794 lbs SO_2/MM BTU)*(198 MM BTU/hour) = 332.5 lbs/day SO_2

Carbon adsorption regeneration events typically occur about once each week. However, it is difficult to estimate the average SO_2 emission rate per regeneration cycle because the carbon retention rate for sulfur compounds is not constant. If the District assumes that the maximum hourly SO_2 emission rate would continue for the entire maximum permitted annual firing rate of 72,270 MM BTU/year for A-1, annual SO_2 emissions would be 60.7 tons/year of SO_2, which – as shown below - is unrealistically high. Therefore, the District decided to calculate the annual SO_2 emissions from A-1 using a mass balance approach.

Operation of the two engines and the A-1 flare combined will require a maximum of 418,000 MM BTU/year of landfill gas. Keller Canyon Landfill has a permit condition limiting the sulfur content in the landfill gas from this site to 300 ppmv (based on landfill gas at 50% CH_4 and 496.9 BTU/scf). If all of the sulfur in this landfill gas is converted to SO_2, the maximum possible sulfur dioxide emissions from the Ameresco facility will be:

(418,000 MM BTU/year)*(1E6 BTU/1 MM BTU)/(496.9 BTU/ft^3 LFG)*(300 ft^3 S/1E6 ft^3 LFG)/
(387 ft^3 S/1 lbmol S)*(1 lbmol SO_2/1 lbmol S)*(64.06 lbs SO_2/1 lbmol SO_2)/(2000 lbs SO_2/ton SO_2)
= 20.884 tons/year of SO_2

The two engines are limited to an annual average emission rate of 4.3183 tons/year of SO_2 per

engine, or 8.637 tons/year for the two engines combined, based on the BACT standard for these engines (150 ppmv annual average fuel sulfur content limit). The District assumes that all of the remaining sulfur will be emitted as SO_2 from A-1.

Maximum Annual SO_2 Emissions from A-1:
(20.884 tons/year from facility) – (8.637 tons/year from engines) = 12.247 tons/year from A-1

Application #25693 Cumulative Emission Increases:

Under Applications # 14265 and # 16830, Ameresco Keller Canyon LLC (Plant # 17667) was charged a total of 10.442 tons/year of SO_2 to the cumulative emission increase inventory for this site.

```
  post 4/5/91            S O 2  increases                  as of 10-29-13    .

Ameresco Keller Canyon LLC  [plant: 17667]
-------------------------------------------------------------------------------
Application   incr.   contemp reduction   ratio      offsets      Bank No.
-------------------------------------------------------------------------------
 14265       8.637
 16830       1.805
-------------------------------------------------------------------------------
            10.442 tpy SO2 permitted since 4/5/91(*)
            10.442 tpy SO2 currently subject to offsets
              .049 tpy SO2 in 2013 emissions inventory
```

As discussed above, the new facility wide SO_2 emissions limit will be 20.884 tons/year. The increase in cumulative SO_2 emissions for this site is:
(20.884 – 10.442) = 9.558 tons/year of SO_2 cumulative emission increases.

All of these 9.558 tons/year of cumulative SO_2 emission increases will be attributed to Application # 25693.

The current and revised TAC concentration assumptions and revised hourly and annual emission levels are presented below.

Table 3. Summary of Revised TAC Emissions and Equivalent Inlet Concentrations

Significant TACs in LFG	Current Concentration Limit, ppbv	Revised Concentration Limit, ppbv	Revised Emissions lbs/hour	Revised Emissions lbs/year
Acrylonitrile (353)	1000	delete	0	0
Benzene (41)	20000	100,000	5.026E-03	44.03
Carbon Tetrachloride (60)	400	delete	0	0
Chloroform (390)	400	delete	0	0
Ethyl Benzene (333)		200,000	1.366E-02	119.69
Ethylene Dibromide (420)	400	delete	0	0
Ethylene Dichloride (107)	1000	10,000	6.368E-04	5.58
Hydrogen Sulfide (5020)	600000	5,042,000	1.106-01	333.27
Methylene Chloride (396)	40000	10,000	5.465E-04	4.79
Perchloroethylene (210)	8000	15,000	1.601E-03	14.02
Trichloroethylene (295)	4000	10,000	8.454E-04	7.41
Vinyl Chloride (518)	4000	500	2.011E-05	0.18
Secondary TACs	Ion Concen.	Ion Concen.	lbs/hour	lbs/year
Formaldehyde (124)			1.000E-03	8.76
HCl (8010)	100000	100000	1.564E-01	1370.13

HF (8020)	10000	10000	8.582E-03	75.18

C. STATEMENT OF COMPLIANCE

Regulation 2, Rule 1 (CEQA and Public Notice Requirements)

This application involves a permit condition change for an existing facility that does not involve any physical modifications. The changes involve the sulfur dioxide emission limits and TAC emissions for the A-1 Waste Gas Flare. Since the revised emission limits will comply with all applicable new source review (NSR) and toxic NSR requirements, do not trigger SO_2 offsets, and are not considered to be a significant revision, this proposed permit condition change satisfies the requirements of 2-1-312.11. There is no possibility that these proposed flare emission limit changes could result in any significant adverse environmental impacts. Therefore, no additional CEQA review is required.

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

Regulation 2, Rule 2 (NSR)

The permit condition changes will impact the sulfur dioxide emission limits for the A-1 Waste Gas Flare. Since A-1 is acting as a BACT control device for SO_2 emissions from the landfill gas fired engines (S-1 and S-2), this flare qualifies for the Regulation 2-2-112 exemption from BACT requirements for SO_2 emissions. As discussed in Regulation 2-2-112, secondary emissions from abatement devices that are meeting BACT or BARCT for another source must meet a RACT level of control instead of BACT. Since the District would not allow a regenerative carbon system at S-3 without a subsequent combustion related emission control system, such as A-1, it is not possible for this site to avoid SO_2 emissions from A-1 and no other control methods are available except by changing to a non-regenerative adsorption media. Regenerative adsorption media typically have lower environmental impacts than non-regenerative media for this type of project and are commonly the most cost-effective option as well. Thus, the current proposal is the preferable approach and the SO_2 emissions from A-1 cannot be avoided.

The only applicable sulfur dioxide emission limits are in BAAQMD Regulation 9, Rule 1. Section 9-1-301 limits ground level SO_2 concentration levels and Section 9-1-302 limits the SO_2 concentration in any exhaust point to 300 ppmv of SO_2 (dry basis) at the as-found oxygen concentration. In cases where the sulfur dioxide emissions cannot be avoided and no further controls are feasible, compliance with the Regulation 9-1-302 SO_2 outlet concentration limit is considered to be RACT. Compliance with this outlet concentration limit is also expected to ensure compliance with the Section 9-1-301 ground level concentration limits. As shown in the emissions section, the new SO_2 limits for A-1 are based on the Regulation 9-1-302 outlet SO_2 concentration limit and will satisfy RACT for A-1.

Since this facility will emit less than 100 tons/year of SO_2, it is not a major facility for SO_2. Therefore, the Regulation 2-2-302 offset requirements do not apply.

As discussed in previous applications, all non-fugitive criteria pollutant emissions will be less than 250 tons/year per pollutant and less than 100,000 tons/year of GHG emissions. Therefore, this site is not a PSD major facility.

Regulation 2, Rule 5 (NSR – Toxic Air Contaminants)

This permit action will include permit condition changes for toxic air contaminants that were previously evaluated under Application # 24349. As discussed in the HRSA report for Application # 24349, the inlet concentration estimates for some compounds were increased and for other compounds were reduced base on 2011 source test data. The revised emission estimates for the flare were evaluated in addition to the revised formaldehyde emission limit for the engines. The engine emissions remain the driving factor

for health risks with formaldehyde emissions dominating both cancer risk and acute hazard index impacts. The May 2012 HRSA results are summarized below.

Table 4. Summary of May 2012 HRSA Results

	Each Engine	A-1	Total Project
Cancer Risk (per million)	4.88	0.22	9.98
Chronic Hazard Index	0.09	0.17	0.20
Acute Hazard Index	0.49	0.05	0.98

This application raises the sulfur dioxide emission limit and could therefore also increase the residual hydrogen sulfide emissions. As shown in Table 3, the revised hydrogen sulfide emission estimates are: 0.15 pounds/hour and 444.4 pounds/year, which exceed the acute risk screen trigger level (0.093 pounds/hour) and the chronic risk screen trigger level (390 pounds/year) from Table 2-5-1 in Regulation 2, Rule 5.

The District used the emission rates above and the May 2012 HRSA to estimate the revised health risks. Since hydrogen sulfide is not a carcinogen, increasing hydrogen sulfide emissions will not impact cancer risk.

For the May 2012 HRSA, the acute hazard index was determined for each target organ, and the target organ with the highest impacts was the eye system. More than 99% of the maximum acute hazard index was due to engine formaldehyde emissions. Hydrogen sulfide emissions can cause central nervous system impacts but do not impact the eyes. A comparison of the revised acute weighted emissions for each target organ indicates that central nervous system impacts from the revised hydrogen sulfide emissions above will still be less than 15% of the eye system impacts. Thus, raising the hydrogen sulfide emissions will not impact the eye system and will not change the previously determined maximum acute HI of 0.98 for this facility.

A comparison of the chronic weighted emissions for the flare indicates that raising the hydrogen sulfide emissions will increase chronic hazard impacts from the flare by 65%. This increase will result in a chronic HI for A-1 of 0.28 and a maximum project chronic HI of 0.31. This impact is well below the Regulation 2-5-302.2 limit of 1.0.

Table 5. Estimated Impacts including H_2S Increases Allowed Under Application # 25693

	Each Engine	A-1	Total Project
Cancer Risk (per million)	4.88	0.22	9.98
Chronic Hazard Index	0.09	0.28	0.31
Acute Hazard Index	0.49	0.05	0.98

Regulation 2, Rule 6 (Major Facility Review)

Ameresco Keller Canyon submitted an application for an initial Title V permit for this facility on March 17, 2008 (Application # 17615). This Title V application satisfies the Regulation 2-6-404 requirements for submittal of a timely application for major facility review. All Title V permitting requirements will be discussed in detail in the Statement of Basis for Application # 17615.

District Regulations:

As discussed in previous applications, the A-1 Waste Gas Flare is subject to and expected to comply with Regulation 6, Rule 1 for particulate emissions; Regulation 8, Rule 34 for NMOC emissions; Regulation 9, Rule 1 for sulfur dioxide emissions; and Regulation 9, Rule 2 for hydrogen sulfide emissions. This application will not impact particulate, NMOC, or hydrogen sulfide emission limits.

This application will increase SO_2 emission limits; however, the A-1 Flare will be required by both concentration and emission rate limits to meet the Regulation 9-1-302 SO_2 outlet concentration limit. The emission rate limits are intended to ensure compliance with Section 9-1-302. The May 2013 Source Tests shows that even at the peak hourly emission rate of 1.86 pounds/hour of SO_2, the outlet sulfur dioxide concentration was 90 ppmv at 12% O_2 (60 ppmv at 15% O_2). Thus, the compliance margin is 300:90 or 3.3:1.

The District will require annual source testing for A-1 and monthly monitoring of the delivered landfill gas and the engine fuel gas to estimate the amount of sulfur removed by S-3 and transferred to A-1. Compliance with Regulation 9-1-302 is expected to ensure that Ameresco also meets the ground level concentration limits in Regulation 9-1-301. Ground level SO_2 monitoring would be very expensive and is not justifiable for this facility, which emits less than 21 tons/year of SO_2.

D. PERMIT CONDITIONS

The District is proposing to make the revisions identified below in Condition # 23962 for the S-3 TSA Gas Cleaning System and the A-1 TSA Waste Gas Flare. Condition # 23400 for the S-1 and S-2 IC Engines is included below for reference, but this condition contains no proposed revisions.

Condition # 23962

FOR S-3 TSA GAS CLEANING SYSTEM AND A-1 TSA WASTE GAS FLARE:

1. All waste flush gas generated by the carbon desorption cycle at S-3 shall be vented to the A-1 TSA Waste Gas Flare. Landfill gas delivered from Keller Canyon Landfill may be burned in A-1 or blended with the flush gas prior to combustion in A-1, if the use of this supplemental landfill gas is necessary to ensure proper operation of A-1. The A-1 flare shall be operated continuously during any time that gas is being vented to this flare. (Basis: BACT)

2. The heat input rate to the A-1 Flare shall not exceed 72,270 million BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for the flare operating continuously. In order to demonstrate compliance with this part, the A-1 flare shall be equipped with a continuous gas flow meter and recorder, and the owner/operator shall maintain records of the heat input to A-1 for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The methane content in the inlet gas shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to initial operation of A-1 and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. The A-1 Flare shall either achieve 98% by weight destruction of the total non-methane organic compounds (NMOC) in the inlet gas or shall emit no more than 30 ppmv of NMOC, expressed as methane and corrected to 3% oxygen, in the exhaust gas from A-1. (Basis: BACT)

4. In order to ensure compliance with Part 3 and to ensure adequate destruction of the toxic air contaminants present in the inlet gas, the owner/operator shall maintain the combustion zone temperature of the A-1 Flare at a minimum temperature of 1474 degrees F, averaged over any 3-

hour period. If a source test demonstrates compliance with all applicable requirements at a different temperature, the APCO may revise this minimum temperature requirement in accordance with the procedures identified in Regulation 2-6-414 or 2-6-415 and the following criteria. The minimum combustion zone temperature for the flare shall be equal to the average combustion zone temperature determined during the most recent complying source test minus 50 degrees F, provided that the minimum combustion zone temperature is not less than 1400 degrees F. To demonstrate compliance with this part, the A-1 flare shall be equipped with a temperature monitor with readout display and continuous recorder. One or more thermocouples shall be placed in the primary combustion zone of the flare and these thermocouples shall accurately indicate the combustion zone temperature at all times. (Basis: BACT and TBACT)

5. Nitrogen oxide (NO_x) emissions from the A-1 flare shall not exceed 0.06 pounds of NO_x, expressed as NO_2, per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 15 ppmv of NO_x, expressed as NO_2 at 15% oxygen on a dry basis. (Basis: RACT)

6. Carbon monoxide (CO) emissions from the A-1 flare shall not exceed 0.20 pounds of CO per million BTU of heat input. Compliance with this emission limit may be demonstrated by not exceeding the following exhaust gas concentration limit: 81 ppmv of CO at 15% oxygen on a dry basis. (Basis: RACT)

7. Sulfur dioxide (SO_2) emissions from the A-1 flare shall not exceed the following limits:

~~1.65 pounds of SO2 per hour. Compliance with this emission limit shall be demonstrated using one of the procedures identified in subparts a-c below. (RACT)~~

~~a. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and calculate the SO2 emissions in units of pounds per hour using District approved test methods and calculation procedures; or~~

~~b. Measure the concentration of SO2 in the exhaust gas from A-1 during the compliance demonstration test required by Part 11 and have an outlet sulfur dioxide concentration that does not exceed 35 ppmv of SO2 at 15% oxygen on a dry basis; or~~

~~c. Collect a sample of each inlet gas to A-1 during the compliance demonstration test required by Part 11, analyze these samples for total reduced sulfur compounds (TRS) using a District approved laboratory analysis method that reports the sum of the measured concentrations for individual sulfur compounds as TRS, and have a TRS concentration in each inlet gas that does not exceed 600 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume.~~

a. The SO_2 emission rate from A-1 shall not exceed 13.9 pounds per hour; and (Basis: RACT)

b. The outlet SO_2 concentration in the stack from A-1 shall not exceed the Regulation 9-1-302 outlet SO_2 concentration limit (at the as-found oxygen concentration); and (Basis: Regulation 9-1-302)

c. The SO_2 emissions from A-1, S-1, and S-2 combined shall not exceed 20.9 tons of SO_2 during any consecutive 12-month period. The owner/operator shall demonstrate compliance with this emission limit by complying with heat input limits and monitoring procedures in Condition # 23962, Part 2 and in Condition # 23400, Part 2, and by demonstrating that the landfill gas delivered to this facility from Keller Canyon Landfill (Plant #4618) contains no more than 300 ppmv of total reduced sulfur compounds (dry basis), expressed as H_2S and averaged over any consecutive rolling 12-month period; and (Cumulative Increase)

d. To demonstrate compliance with the Condition # 23962, Part 7c average landfill gas sulfur content limit, the owner/operator shall conduct monthly measurements on the untreated landfill gas delivered to the site from Plant # 4618, concurrent with the monthly measurements of treated landfill gas required by Condition # 23400, Part 7b. The owner/operator shall use either a District approved portable hydrogen sulfide monitor or a District laboratory analysis method to determine the concentration of total reduced sulfur compounds (TRS, expressed as H_2S) in the untreated landfill gas that is delivered to this facility; and (Cumulative Increase)

i. If the portable H_2S analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S),

ii. If a laboratory analysis methods is used, the TRS concentration shall be calculated as the sum of the measured concentrations for the individual sulfur compounds, expressed as H_2S.

e. The owner/operator shall record the sampling dates, measurement results, and TRS calculations in a District approved log. The owner/operator shall calculate and record the average TRS content in the untreated landfill gas for each consecutive rolling 12-month period and shall compare this average to the limit in Part 7c. (Cumulative Increase)

*8. Formaldehyde emissions from the flare (A-1) shall not exceed ~~2.3~~1.0E-3 pounds per hour. (Basis: Regulation 2-5-302)

*9. The concentration of toxic air contaminants (TACs) in the inlet gas to the A-1 Flare shall not exceed any of the levels listed below, unless the owner/operator can demonstrate to the APCO's satisfaction that flare emissions have not exceeded the emission rates specified below. This demonstration shall be made using District approved calculation procedures within 60 days of receiving test results. (Basis: Regulation 2-5-302)

Compound	Concentration (pp~~b~~mv, dry ~~basis~~)	Emissions pounds/year
~~Acrylonitrile~~	~~1,000~~	
Benzene	~~20,000~~100.	44.0
~~Carbon Tetrachloride~~	~~400~~	
~~Chloroform~~	~~400~~	
Ethyl Benzene	200.	119.7
~~Ethylene Dibromide~~	~~400~~	
Ethylene Dichloride	~~1,000~~10.	5.6
Methylene Chloride	~~40,000~~10.	4.8
Perchloroethylene	~~8,000~~15.	14.0
Trichloroethylene	~~4,000~~10.	7.4
Vinyl Chloride	~~4,000~~0.5	0.2

10. The A-1 flare shall be equipped with both local and remote alarms, automatic combustion air control, automatic gas shutoff valves, and automatic start/restart system. (Basis: BACT)

11. In order to demonstrate compliance with Parts 3 through 8 above, the owner/operator shall conduct an annual compliance demonstration source test at the A-1 TSA Waste Gas Flare within 12 months of the previous test date. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report shall be submitted to the Source Test Section within 60 days

of the test date. Each annual source test shall measure or determine the criteria in subparts a-i below. (Basis: RACT, BACT, TBACT, Regulation 2-5-302 and 9-1-302)

a. inlet gas flow rate to the flare (scfm, dry basis);
b. concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), and total non-methane organic compounds (NMOC) in the inlet gas to the flare;
c. inlet heat input rate to the flare in units of MM BTU (HHV) per hour;
d. stack gas flow rate from the flare (scfm, dry basis);
e. concentrations (dry basis) of CH_4, NMOC, NO_x, CO, SO_2, and O_2 (and concentrations of organic compounds listed in Part 12, if required), in the flare stack gas;
f. NMOC and CH_4 destruction efficiencies achieved by the flare (by weight);
g. average combustion zone temperature in the flare during the test period;
h. NO_x, CO, and SO_2 concentrations corrected to 15% O_2 (dry basis), and NO_x, CO, and SO_2 emission rates from the flare in units of pounds per hour and pounds per MM BTU,
i. formaldehyde emissions from the flare in units of pounds per hour.

12. In order to demonstrate compliance with Parts 7c and 9, the owner/operator shall conduct a characterization of the flare inlet gas concurrent with the annual source test required by Part 11 above. In addition to the compounds listed in Part 11b, the flare inlet gas shall be analyzed for, as a minimum, the organic compounds listed below. If the owner/operator is electing to demonstrate compliance with Part 7 using the methods in Part 7c instead of Parts 7a or 7b, the permit holder shall analyze the flare inlet gas for, as a minimum, the sulfur compounds listed below, and the owner/operator does not need to conduct the SO2 analysis or calculations in Parts 11e and 11h. If the owner/operator elects to demonstrate compliance with the emission limits in Part 9 instead of the inlet concentration limits, the owner/operator shall analyze the flare stack gases for the organic compounds listed below in addition to the compounds specified in Part 11e. All concentrations shall be reported on a dry basis. The test report shall be submitted to the Compliance and Enforcement Division and Source Test Section within 60 days of the test date. (Basis: Regulations 2-5-501 and Cumulative Increase)

Organic Compounds
~~Acrylonitrile~~
Benzene
~~Carbon Tetrachloride~~
~~Chloroform~~
Ethyl Benzene
~~Ethylene Dibromide~~
Ethylene Dichloride
Methylene Chloride
Perchloroethylene
Trichloroethylene
Vinyl Chloride

Sulfur Compounds
Carbon Disulfide
Carbonyl Sulfide
Dimethyl Sulfide
Ethyl Mercaptan
Hydrogen Sulfide
Methyl Mercaptan

Condition # 23400

FOR S-1 AND S-2 LFG-FIRED INTERNAL COMBUSTION ENGINES AND GENSETS:

1. The S-1 and S-2 Internal Combustion (IC) Engines shall be fired exclusively on landfill gas collected from the Keller Canyon Landfill. (Basis: Cumulative Increase)

2. The heat input to each IC Engine (S-1 and S-2) shall not exceed 172,861 MM BTU (HHV) during any consecutive 12-month period. This limit is based on the full rated input capacity for each IC engine operating continuously. The Permit Holder shall demonstrate compliance with this limit by maintaining records of the heat input to each engine for each day, for each calendar month, and for each rolling 12-month period. Heat input shall be calculated using District approved procedures based on measured landfill gas flow rate data and measured landfill gas methane concentration data. The calculated heat input rates shall be recorded in a data acquisition system or electronic spreadsheet. The landfill gas flow rate to each engine shall be monitored and recorded continuously in accordance with Regulation 8-34-508. The landfill gas methane content supplied to either engine shall be monitored and recorded continuously using a gas chromatograph or other District approved device. The flow meters and methane sensor shall be installed and properly calibrated prior to any engine operation and shall be maintained in good working condition. (Basis: Offsets and Cumulative Increase)

3. Carbon Monoxide (CO) emissions from each IC Engine (S-1 and S-2) shall not exceed 2.1 grams of CO per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a carbon monoxide concentration in the engine exhaust of no more than 257 ppmv of CO, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 257 ppmv of CO shall not be deemed a violation of this part, if the Permit Holder can demonstrate that CO emissions did not exceed 2.1 g/bhp-hour during the test period. (Basis: Regulation 2-6-423.2.1, BACT, and Cumulative Increase)

4. Nitrogen Oxide (NO_x) emissions from each IC Engine (S-1 and S-2) shall not exceed 0.6 grams of NO_x (calculated as NO_2) per brake-horsepower-hour. The Permit Holder may demonstrate compliance with this emission rate limit by having a nitrogen oxide concentration in the engine exhaust of no more than 45 ppmv of NO_x, corrected to 15% oxygen, dry basis. An exhaust concentration measurement of more than 45 ppmv of NO_x shall not be deemed a violation of this part, if the Permit Holder can demonstrate that NO_x emissions did not exceed 0.6 g/bhp-hour during the test period. (Basis: BACT and Offsets)

5. Each IC Engine (S-1 and S-2) shall comply with either the destruction efficiency requirements or the non-methane organic compound (NMOC) outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulations 2-5-302 and 8-34-301.4, BACT, TBACT, and Offsets)

6. In order to demonstrate on-going compliance with Part 5 and Regulation 8-34-509, the Permit Holder shall use average engine cylinder temperature as the key emission control system operating parameter for these engines, and the Permit Holder shall comply with the following limits and procedures. (Basis: Regulations 8-34-501.11 and 8-34-509)
   a. For S-1, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.
   b. For S-2, the average engine cylinder temperature shall be maintained at a minimum of 927 degrees F, averaged over each rolling 3-hour operating period, excluding start-up and shut-down periods.

c. For each engine (S-1 and S-2), each cylinder shall be equipped with a manufacturer's thermocouple that continuously and accurately reads the cylinder temperature. The average temperature for all the cylinders in the engine, shall be recorded at least once every 15 minutes of operation.

d. These temperature records shall be used to compute and record the rolling 3-hour average engine cylinder temperature for each engine.

e. For each engine, the rolling 3-hour average engine cylinder temperature shall be compared to the limits in Parts 6a and 6b to assess compliance with this part. The permit holder shall identify and record any rolling 3-hour periods (excluding start-up and shut-down periods) when the average engine cylinder temperature exceeds a limit, and the permit holder shall notify the District of each deviation.

7. Sulfur Dioxide (SO_2) emissions from each IC Engine (S-1 and S-2) shall not exceed 42.6 pounds of SO_2 per day. In addition, the emissions from S-1 and S-2 combined shall not exceed 8.64 tons of SO_2 during any consecutive 12-month period. The Permit Holder shall demonstrate compliance with these SO_2 emission limits by complying with the landfill gas concentration limits, monitoring and record keeping requirements identified in Parts 7a-e below. (Basis: BACT and Cumulative Increase)

a. The concentration of total reduced sulfur (TRS) compounds in the treated landfill gas burned in the engines shall not exceed 600 ppmv of TRS, expressed as hydrogen sulfide (H_2S) and corrected to a landfill gas methane concentration of 50% by volume, based on any individual source test or measurement.

b. On a monthly basis, the Permit Holder shall use either a District approved portable hydrogen sulfide monitor or a District laboratory analysis method to determine the concentration of TRS (measured as H_2S and corrected to 50% methane) in the treated landfill gas that is delivered to S-1 or S-2. Methane concentrations measured pursuant to Part 2 shall be used to correct the calculated TRS concentrations to a landfill gas methane concentration of 50% by volume (corrected TRS = measured TRS / measured % CH_4 * 50). The sampling dates and results shall be recorded in a District approved log.

   i. If the portable H_2S analysis method is used, the TRS concentration shall be calculated by multiplying the measured H_2S concentration by 1.2 (TRS = 1.2 * H_2S).

   ii. If a laboratory analysis method is used, the TRS concentration shall be calculated as the sum of the measured concentrations for the individual sulfur compounds, expressed as H_2S.

c. If the corrected TRS concentration determined pursuant to Part 7b is 150 ppmv of TRS or less for each monthly measurement during a rolling 12 month period, no additional calculations are required to verify compliance with the SO_2 emission limits identified above in Part 7. If any corrected TRS concentration measurement is greater than 150 ppmv of TRS during a rolling 12 month period, the Permit Holder shall use the calculation procedures in Parts 7d and 7e to demonstrate compliance with the daily and annual SO_2 emission limits above.

d. Daily SO_2 emission calculation are not required if the corrected TRS concentration is 270 ppmv of TRS or less. For each month when the TRS concentration measured pursuant to Part 7b is greater than 270 ppmv of TRS, the Permit Holder shall determine the maximum daily SO_2 emission rate (DE_SO2, pounds/day) using the following equation:

   DE_SO2 = Q_d * C_TRS * 1.66E-7, pounds/day, where:

   Q_d is the maximum daily landfill gas flow rate (scf/day) to any single engine during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

e. Annual SO_2 emission calculations shall be conducted for each rolling 12 month period, if any Part 7b corrected TRS concentration measurements are greater than 150 ppmv of TRS during that period. For each rolling 12-month period, the Permit Holder shall determine the annual emission rate to the two engines combined (AE_SO2, tons/year) using the following equations:

AE_SO2 = sum of all ME_SO2 for the rolling 12 month period under evaluation, tons/year, and

ME_SO2 = Q_m * C_TRS * 8.28E-11, tons/month, where:

Q_m is the total combined landfill gas flow rate (scf/month) to the two engines combined during the month under evaluation and is determined based on the landfill gas flow rate data recorded pursuant to Part 2,

C_TRS is the corrected concentration of TRS (ppmv of TRS expressed as H2S and corrected to a landfill gas methane concentration of 50% by volume) measured pursuant to Part 7b for the month under evaluation.

*8. Formaldehyde emissions from each IC Engine (S-1 and S-2) shall not exceed 0.73 pounds per hour per engine. (Basis: Regulation 2-5-302.1&3)

9. In order to demonstrate compliance with Parts 3, 4, 5, 7, and 8 above and Regulations 8-34-301.4, 9-1-302, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within 12 months of the previous source test. This source test shall be conducted while the engine is operating at or near the maximum operating rate and shall determine all items identified in Parts 9a-m below. The Source Test Section of the District shall be contacted to obtain approval of the source test procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test reports shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 60 days of the test date. (Basis: BACT, TBACT, Offsets, Cumulative Increase, and Regulations 2-5-302, 2-6-423.2.1, 8-34-301.4, 8-34-412, 9-1-302, 9-8-302.1, and 9-8-302.3)

a. Operating rate for each engine during the test period (bhp);
b. Total flow rate of all gaseous fuel to each engine (dry basis, sdcfm);
c. Concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), total non-methane organic compounds (NMOC), hydrogen sulfide (H_2S), and total reduced sulfur compounds (TRS) in the gaseous fuel burned in the engines (percent by volume or ppmv);
d. High heating value for the landfill gas (BTU/scf);
e. Heat input rate to each engine averaged over the test period (BTU/hour);
f. Exhaust gas flow rate from each engine based on EPA Method 19 (dry basis, sdcfm);
g. Concentrations (dry basis) of NO_x, CO, CH_4, NMOC, SO_2, and O_2 in the exhaust gas from each engine (ppmv or percent by volume);
h. NO_x and CO concentrations corrected to 15% O_2 in the exhaust gas from each engine (ppmv);
i. NO_x and CO emission rates from each engine (grams/bhp-hour);
j. NMOC concentrations corrected to 3% O_2 in the exhaust gas from each engine (ppmv);
k. NMOC and methane destruction efficiencies achieved by each engine (weight percent);
l. Formaldehyde emission rate from each engine (pounds/hour);

m. Average engine cylinder temperature for each engine, averaged over the test period, with average cylinder temperatures recorded at least once every 15 minutes as required in Part 6c.

E. RECOMMENDATION

The District recommends issuance of a Change of Permit Conditions for the following equipment, subject to the revised Permit Condition #23962 identified above.

A-1 **TSA Waste Gas Flare;** John Zink Company, ZTOF Enclosed Flare, 8.25 MM BTU/hour; abating **S-3 Temperature Swing Adsorption Gas Cleaning System**.

Signed By: Carol S. Allen ***11/21/13***

Prepared By: Date:

Carol S. Allen
Supervising Air Quality Engineer