PRELIMINARY 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

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PRELIMINARY DETERMINATION OF COMPLIANCE

Ameresco Keller Canyon LLC

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APPLICATION # 16830

A. 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.

B. 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.

<u>Criteria Pollutant Emissions</u>

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

C. STATEMENT OF COMPLIANCE

<u>Regulation 2, Rule 1 (CEQA and Public Notice Requirements)</u>

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.

This preliminary engineering evaluation documents and explains BAAQMD's preliminary decision on this project. The notification and public comment requirements of this section will be satisfied upon the APCO's approval of this preliminary decision.

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

<u>BAAQMD Regulation 9, Rule 8 (NO_x and CO from Stationary IC Engines)</u>

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.

<u>Federal Requirements (NSPS and NESHAPs for MSW Landfills)</u>

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.

D. 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.~~

~~4~~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)

~~5~~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)

~~6~~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)

~~7~~6. In order to demonstrate on-going compliance with Part ~~6~~7 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~~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. 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 ~~8~~7a and ~~8~~7b 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

E. 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, 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.

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

April 9, 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/M scf	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/M scf	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 Concentration, ppbv	Destruct Eff.	Emission Factor lbs/M scf	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/M scf	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 = Σ (ER, g/s)$_i$ / (acute REL)$_i$
Chronic REL Weighted Emission Rate = Σ (ER, g/s)$_i$ / (chronic REL)$_i$
Cancer Risk Weighted Emission Rate = Σ (ER, g/s)$_i$ * (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