COVERED SOURCE PERMIT (CSP) REVIEW (0802-01-C)

Covered Source Permit Application No. 0802-01

APPLICANT: County of Kauai
Department of Public Works

RESPONSIBLE OFFICIAL: Mr. Larry Dill
County Engineer
808-241-4996

POC Mr. Troy Tanigawa
Environmental Services Management Engineer
808-241-4838

LOCATION Kekaha Landfill
6900D Kaumualii Highway
Kekaha, HI 96752

MAILING ADDRESS County of Kauai
Moikena Bldg
4444 Rice Street, Suite 275
Lihue, HI 96766

SIC CODE: 4953 (Refuse Systems)

PROPOSED PROJECT:
The proposed project is for the installation and operation of an active landfill gas collection and control system (GCCS) for an existing municipal solid waste landfill modified after May 30, 1991. The landfill is located at Kekaha, which is located in southwestern Kauai.

The collection and control system is required to be installed pursuant to Federal New Source Performance Standards (NSPS) because the landfill fulfills the following criteria:

1. Expanded after May 30, 1991;
2. A design capacity of greater than 2.5 million megagrams (Mg) & 2.5 million cubic meters; and
3. Has an estimated annual non-methane organic compound (NMOC) emission rate of greater than 50 Mg/yr.

The Kekaha Landfill Solid Waste permit was modified on March 5, 2014 to allow for a vertical expansion of Phase II and Cell 1. The expansion increased the design capacity of the landfill to 4,050,999 cubic meters and 2,868,070 Mg. The annual NMOC generated by the landfill is 207.6 Mg/yr.

Landfill gas(LFG) is collected by the landfill gas collection system, which consists of a network of vertical extraction wells, horizontal collectors and pipelines. The landfill gas is then routed to an inlet sump, where landfill gas condensate is collected. The landfill gas is then routed to a knockout vessel to remove particulate from the gas stream. Blowers provide vacuum to the LFG collection system and pressurize the LFG for delivery to the flare. LFG condensate is also routed to the flare for destruction.

The stack for the flare is twenty-five (25) feet (7.62 meters) tall, six (6) inches (0.152 meters) in diameter, and is equipped with sample ports, temperature monitoring devices, UV flame detector assemblies, flame arrestor and pneumatic shutdown assembly at the flare inlet.

The extraction wells will be operated with a working vacuum that produces the highest sustainable flow of LFG without drawing in excessive air. Maximum well temperatures are to be maintained below 131 °F (55 °C), with an oxygen concentration of less than 5%. To demonstrate compliance with the operating parameter limits, the wells will be monitored monthly for pressure (vacuum) and temperature, along with methane, carbon dioxide, and oxygen concentrations. Wells determined to be operating outside of compliance limits will be adjusted by changing the amount of vacuum in the well.

In addition to well monitoring, the landfill surface is required to be monitored on a quarterly basis. If the surface readings exceed 500 parts per million (ppm) of methane, corrective action is required. The landfill is also required to perform a monthly cover inspection to check for air infiltration or landfill gas migration. Other monitoring devices on the landfill gas collection and control system include a continuous temperature monitor for the flare and a continuous recording flow meter for recording landfill gas flow to the flare.

AIR POLLUTION CONTROL EQUIPMENT:

All of equipment to be installed is for air pollution control of the MSW landfill gas. The collection and control system is required by the Federal NSPS to be designed and operated to reduce NMOC by ninety-eight (98) weight-percent, or to reduce the outlet NMOC concentration to less than twenty (20) ppm by volume, dry basis as hexane at three (3) percent oxygen.

APPLICABLE FEDERAL REQUIREMENTS:

New Source Performance Standards (NSPS):

40 CFR Part 60, Subpart WWW - *Standards of Performance for Municipal Solid Waste Landfills;*

40 CFR Part 60, Subpart A - *Standards of Performance for New Stationary Sources, - General Provisions;*

The facility is subject to NSPS because the following criteria have been satisfied:

1. *The landfill was modified or constructed after May 30, 1991*. The landfill was recently issued a permit for the vertical expansion, so the landfill was modified after May 30, 1991
2. *The maximum capacity exceeds 2.5 million megagrams and 2.5 million cubic meters.* The application states that the capacity is 4,050,999 cubic meters and 2,868,070 Mg.

Landfills subject to the Federal requirements are also required to calculate annual NMOC emissions generated by their facility. Facilities that exceed 50 Mg/yr are required to install and operate a landfill gas collection and control system. Annual NMOC emissions from the Kekaha Landfill are in excess of 50 Mg/yr, requiring the installation of the landfill gas collection and control system.

National Emission Standards for Hazardous Air Pollutants (NESHAP):
40 CFR Part 63, Subpart AAAA - *National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills*
40 CFR Part 63, Subpart A - *National Emission Standards for Hazardous Air Pollutants for Source Categories, - General Provisions*;

The facility is subject to NESHAP for landfills because waste was accepted after November 8, 1987, the design capacity is greater than 2.5 million megagrams and 2.5 million cubic meters, and the estimated uncontrolled nonmethane organic compound (NMOC) emissions is equal to or greater than fifty (50) megagrams per year. Facilities are not subject to the NESHAP regulations unless the 50 Mg/yr annual emission limit is exceeded.

The NESHAP rule adds startup, shutdown and malfunction requirements, adds operating condition deviations for out-of-bounds monitoring parameters, requires timely control of bioreactor landfills, and changes the reporting frequency for compliance reporting from annually to every six (6) months.

APPLICABLE STATE REQUIREMENTS:
Hawaii Administrative Rules (HAR)
Chapter 11-59, Ambient Air Quality Standards
Chapter 11-60.1, Air Pollution Control
- Subchapter 1, General Requirements
- Subchapter 2, General Prohibitions
  - 11-60.1-31 Applicability
  - 11-60.1-32 Visible Emissions
  - 11-60.1-33 Fugitive Dust
- Oxides from fuel combustion
- Subchapter 5, Covered Sources
- Subchapter 6, Fees for Covered Sources, Noncovered Sources, & Agricultural Burning
  - 11-60.1-111 Definitions
  - 11-60.1-112 General fee provisions for covered sources
  - 11-60.1-113 Application fees for covered sources
  - 11-60.1-114 Annual fees for covered sources
- Subchapter 8, Standards of Performance for Stationary Sources
- Subchapter 9, Hazardous Air Pollutant Sources

NONAPPLICABLE REQUIREMENTS:

PREVENTION OF SIGNIFICANT DETERIORATION (PSD):
PSD applies to new stationary sources in an attainment area which emit or have the potential to emit 250 TPY (or 100 TPY for 28 named source categories) of any regulated pollutant, to a

major stationary source making a major modification involving a significant net emissions increase (e.g., 15 tons per year PM_{10} [HAR 11-60.1-1]), or to a non-major source undergoing a modification that is major by itself. The proposed facility is not classified in one of the source categories with a 100 ton per year PSD trigger, and does not have a pollutant that exceeds 250 tons per year, 10 tons of any individual HAP or 25 tons total HAPs, so PSD does not apply.

PSD applicability for CO_2 is determined by calculating the equivalent CO_2 emissions (CO_2e) generated by the facility. CO_2e emissions are calculated pursuant to 40 CFR Part 98. If the CO_2e emissions exceed 100,000 tons per year, a PSD review is required. The CO_2e levels are presented in the following table:

Pollutant	Flare Emissions (TPY)[1]	Fugitive Emissions (TPY)[2]	Totall CO_2e Emissions (TPY)
CH_4	10.59	13,412.44	13,423
CO_2	16,497.08	2,142.28	18,639
N_2O	30.78	0	30.78
		Total CO_2e emissions	32,093

1. Uncontrolled annual emissions obtained from LandGEM model
2. LGGS control efficiency is 75%
3. CH_4 multiplier is 21, N_2O multiplier is 310; CO_2 multiplier is 1.

A PSD review for CO_2 is not required since CO_2e emissions are less than 100,000 tons per year.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REQUIREMENTS:
Pursuant to HAR §11-60.1-81(14), the application of BACT is required for all pollutants that have the potential to emit or increase emissions above significant amounts considering any limitations, enforceable by the Director, on the covered source to emit a pollutant.

To determine what constitutes a significant amount, refer to the definition of "significant" listed in HAR §11-60.1-1. Pursuant to the definition, a "significant: amount is a rate of emissions that would equal or exceed an of the following pollutant and emission rates:

Pollutant	Significant Level (tpy)	Calculated Emissions (tpy)
Carbon Monoxide	100	50.188
Nitrogen Oxides	40	2.676
Sulfur dioxide	40	7.122
PM	25	1.137
PM_{10}	15	1.137
Ozone	40 of VOC	2.51
Lead	0.6	0
Asbestos	0.007	0
Beryllium	0.0004	0
Mercury	0.1	0
Vinyl Chloride	1	0
Fluorides	3	0
Sulfuric acid mist	7	0
Total reduced sulfur	10	0
Reduced sulfur compounds	10	0

Since the significant level was not exceeded for any of the listed pollutants, a BACT analysis is not required.

ANNUAL EMISSIONS REPORTING RULE (AERR):
Consolidated Emissions Reporting Rule (CERR) is not an applicable requirement because annual emissions from the facility do not exceed the minimum than reporting levels for a Type B source pursuant to 40 CFR Part 51, Subpart A. (see following table)

AERR Reporting Requirements

Pollutant	Facility Emissions (tpy)	AERR Triggering Levels (tpy)		Internal Reporting Threshold (tpy)
		1-yr Reporting Cycle (Type A Sources)	3-yr Reporting Cycle (Type B Sources)	
VOC	0.142	≥ 250	≥ 100	≥ 25
PM_{10}	1.137	≥ 250	≥ 100	≥ 25
$PM_{2.5}$	1.137	≥ 250	≥ 100	≥ 25
NO_x	2.676	≥ 2,500	≥ 100	≥ 25
SO_x	7.122	≥ 2,500	≥ 100	≥ 25
CO	50.166	≥ 2,500	≥ 1,000	≥ 250
HAPs (total)	0.09	n/a	n/a	≥ 5

SYNTHETIC MINOR APPLICABILITY:
The facility does not propose any operational restrictions to not exceed major source emission levels. Therefore, the facility is not a synthetic minor source.

COMPLIANCE ASSURANCE MONITORING:
Compliance Assurance Monitoring (CAM) applies to facilities that fulfill all of the following criteria:

1. Facility is a major source that is required to obtain a Part 70 (Title V) or 71 (Federal Plan) permit.
2. Facility is subject to emission limitation or standard for the applicable pollutant.
3. Facility uses a control device to achieve compliance.
4. Potential pre-control emissions of applicable pollutant are at least 100 percent of major source amount
5. Facility is subject to a federal standard (NSPS or NESHAPS) promulgated before November 15, 1990.

The landfill NSPS (40 CFR Part 60, Subpart WWW) was promulgated on March 12, 1996, and the landfill NESHAP was promulgated on January 16, 2003. Therefore, the landfill gas collection and control equipment are not subject to CAM provisions.

INSIGNIFICANT ACTIVITIES/EXCEPTIONS:
The insignificant activities listed by the applicant are:

ID	Description	Capacity	Exemption
EGEN1	Emergency Backup Diesel Engine Generator	125 kW	HAR §11-60.1-82(f)(5)
Tank 1	Diesel fuel tank	2,000 gal	HAR §11-60.1-82(f)(1)

ALTERNATIVE OPERATING SCENARIOS:
No alternate operating scenarios were proposed by the applicant.

PROJECT EMISSIONS:
Landfill emissions after the installation of the landfill gas collection and control systems will consist of emissions from the flare burning the landfill gas and surface emissions from the landfill itself.

To determine the emissions from the flares, it was assumed that the landfill gas has a methane concentration of 50% by volume, and the landfill gas is saturated with water vapor. Flare emissions are as follows:

Adjusted Flow Rate:	254.52	cubic feet/min of Methane
	15,271.30	cubic feet/hr of Methane
	1.53E-02	million cubic feet/hour Methane
	32,640	cubic feet/hour of landfill gas

Pollutant	Emission Factor	Units	(lb/hr)	(g/s)	(ton/yr)
NO_2	40	lb/10^6 dscf Methane	0.611	0.077	2.676
CO	750	lb/10^6 dscf Methane	11.453	1.443	50.166
PM_{25}[2]	17	lb/10^6 dscf Methane	0.260	0.033	1.137
SO_2	4.98E-05	lb/scf landfill gas	1.626	0.205	7.122
VOC[3]	9.96E-07	lb/scf landfill gas	0.033	0.004	0.142

Notes:

1. NO2, PM and CO emission factors obtained from AP-42, table 2.4.5 (11/98)
2. Pursuant to table 2.4.5, footnote b; PM=PM10=PM25.
3. VOC emission factor assumes 98% of VOC destroyed by flare.
4. SO2 and VOC emission factors obatined by mass balance.

HAP emissions from the flare are derived using landfill gas concentrations referenced in AP-42, Section 2.4, Municipal Solid Waste Landfills and the specified flow rate for the flare. HAP flare emissions are:

LANDFILL FLARE HAP EMISSIONS

Flare flow rate (per flare)	544	ft^3/min
LFG Generation Rate	8,096,533	m^3/yr
Flare destruction efficiency	98%	

Pollutant	Median ppmv	Mol. Wt (g/g-mole)	Grav. Conc. (mg/m^3)	Uncontrolled Emissions (tpy)	Controlled Emissions (tpy)
1,1,1-Trichloroethane (methyl chloroform)	0.48	133.41	2.66	2.38E-02	4.75E-04
1,1,2,2-Tetrachloroethane	1.11	167.85	7.75	6.92E-02	1.38E-03
1,1-Dichloroethane (ethylidene dichloride)	2.35	98.97	9.67	8.63E-02	1.73E-03
1,1-Dichloroethene (vinylidene chloride)	0.2	96.94	0.81	7.20E-03	1.44E-04
1,2-Dichloroethane (ethylene dichloride)	0.41	98.96	1.69	1.51E-02	3.01E-04
1,2-Dichloropropane (propylene dichloride)	0.18	112.99	0.85	7.55E-03	1.51E-04
Acrylonitrile	6.33	53.06	13.97	1.25E-01	2.49E-03
Carbon disulfide	0.58	76.13	1.84	1.64E-02	3.28E-04
Carbon tetrachloride	0.004	153.84	0.03	2.28E-04	4.57E-06
Carbonyl sulfide	0.49	60.07	1.22	1.09E-02	2.19E-04
Chlorobenzene	0.25	112.56	1.17	1.04E-02	2.09E-04
Chloroethane (ethyl chloride)	1.25	64.52	3.35	2.99E-02	5.99E-04
Chloroform	0.03	119.39	0.15	1.33E-03	2.66E-05
Chloromethane	1.21	50.49	2.54	2.27E-02	4.54E-04
Dichloromethane (methylene chloride)	14.3	84.94	50.53	4.51E-01	9.02E-03
Ethylbenzene	4.61	106.16	20.36	1.82E-01	3.63E-03
Hexane (n)	6.57	86.18	23.55	2.10E-01	4.20E-03
Hydrogen sulfide	35.5	34.08	50.33	4.49E-01	8.98E-03
Mercury (total)	2.53E-04	200.61	0.00	1.88E-05	3.77E-07
Methyl isobutyl ketone	1.87	100.16	7.79	6.95E-02	1.39E-03
Pentane (n)	3.29	72.15	9.87	8.81E-02	1.76E-03
Perchloroethylene (tetrachloroethylene)	3.73	165.83	25.73	2.30E-01	4.59E-03
Trichloroethylene (trichloroethene)	2.82	131.38	15.41	1.38E-01	2.75E-03
Vinyl chloride	7.34	62.5	19.08	1.70E-01	3.41E-03
Xylenes (mixed)	12.1	106.16	53.43	4.77E-01	9.54E-03
Benzene	1.91	78.11	6.21	5.54E-02	1.11E-03
Toluene	39.3	92.13	150.61	1.34E+00	2.69E-02
				TOTAL HAPs	8.58E-02

Abbreviations:
Mol. = Molecular
Wt. = Weight
Grav. = Gravimetric
Conc. = Concentration
Gen. = Generation

Fugitive HAP emissions were determined using landfill gas concentrations referenced in AP-42, section 2.4, Municipal Solid Waste Landfills. Due to the fact that the LGCS system has an efficiency of 75%, the flow rate was assumed to be 25% of the landfill gas flow rate determined by LandGEM. HAP emissions are as follows:

LANDFILL FUGITIVE HAP EMISSIONS

Landfill gas flow rate	136	ft^3/min
Collection system efficiency	75%	
Controlled landfill fugitive gas flow rate	34	ft^3/min
	5.06E+05	m^3/yr

Pollutant	Median ppmv	Mol. Wt (g/g-mole)	Grav. Conc. (mg/m^3)	Uncontrolled Emissions (tpy)
1,1,1-Trichloroethane (methyl chloroform)	0.48	133.41	2.66	9.98E-08
1,1,2,2-Tetrachloroethane	1.11	167.85	7.75	2.90E-07
1,1-Dichloroethane (ethylidene dichloride)	2.35	98.97	9.67	3.63E-07
1,1-Dichloroethene (vinylidene chloride)	0.2	96.94	0.81	3.02E-08
1,2-Dichloroethane (ethylene dichloride)	0.41	98.96	1.69	6.33E-08
1,2-Dichloropropane (propylene dichloride)	0.18	112.99	0.85	3.17E-08
Acrylonitrile	6.33	53.06	13.97	5.24E-07
Carbon disulfide	0.58	76.13	1.84	6.88E-08
Carbon tetrachloride	0.004	153.84	0.03	9.59E-10
Carbonyl sulfide	0.49	60.07	1.22	4.59E-08
Chlorobenzene	0.25	112.56	1.17	4.39E-08
Chloroethane (ethyl chloride)	1.25	64.52	3.35	1.26E-07
Chloroform	0.03	119.39	0.15	5.58E-09
Chloromethane	1.21	50.49	2.54	9.52E-08
Dichloromethane (methylene chloride)	14.3	84.94	50.53	1.89E-06
Ethylbenzene	4.61	106.16	20.36	7.63E-07
Hexane (n)	6.57	86.18	23.55	8.83E-07
Hydrogen sulfide	35.5	34.08	50.33	1.89E-06
Mercury (total)	2.53E-04	200.61	0.00	7.91E-11
Methyl isobutyl ketone	1.87	100.16	7.79	2.92E-07
Pentane (n)	3.29	72.15	9.87	3.70E-07
Perchloroethylene (tetrachloroethylene)	3.73	165.83	25.73	9.64E-07
Trichloroethylene (trichloroethene)	2.82	131.38	15.41	5.78E-07
Vinyl chloride	7.34	62.5	19.08	7.15E-07
Xylenes (mixed)	12.1	106.16	53.43	2.00E-06
Benzene	1.91	78.11	6.21	2.33E-07
Toluene	39.3	92.13	150.61	5.64E-06
			TOTAL	1.80E-05

Abbreviations:

Mol. = Molecular
Wt. = Weight
Grav. = Gravimetric
Conc. = Concentration
Gen. = Generation

The total emissions from the flare and fugitive emissions from the landfill surface is:

Flare Emissions

Flare No.	Emissions (tpy)						
	NO_x	CO	SO_x	PM_{25}	HAP	NMOC	VOC
1	2.68	50.17	7.12	1.14	0.09	0.38	0.15
Total Flare Emisions	2.68	50.17	7.12	1.14	0.09	0.38	0.15
Landfill Fugitive Emissions					1.80E-05	6.07	2.37
Total Emissions	2.68	50.17	7.12	1.14	0.09	6.45	2.51

AIR QUALITY ASSESSMENT:

To determine the ambient air impact from the operation of gas collection and control system, the EPA approved AERSCREEN modeling program was used. Parameter settings used in the assessment included simple terrain, default meteorology, and a rural input setting. Building downwash was not considered, since no buildings are located in the vicinity of the landfill. The analysis only addressed emissions from the flare since it is the only point source of emissions. The input parameters used are:

EMISSION RATES AND STACK PARAMETERS FOR AIR MODELING

EMISSION RATES					STACK PARAMETERS			
SO_2 (g/s)	NO_X (g/s)	CO (g/s)	PM_{10} (g/s)	Pb (g/s)	Height (m)	Temp (K)	Velocity (m/s)	Diameter (m)
1.000	1.000	1.000	1.0	N/A	7.62	1033.15	14.851	0.152

The result from the model demonstrated that the normalized concentration was 277.8 µg/m^3 per g/s, and was located 62 meters from the stack. The normalized concentration is then multiplied by the actual emission rate for the pollutants in question. A summary of the ambient air quality impacts is shown in the following table:

Normalized Concentration =			277.8	µg/m^3 per g/s				
Pollutant	**Avg. Period**	**Emission Rate (g/s)**	**Time Factor**	**CONCENTRATION (µg/m^3)**				**% of std.**
				Conc.	**Bkgrnd[1]**	**Total**	**Std**	
CO	1-HR	1.443	1	400.90	1,374	1,775	10,000	17.7
	8-HR	1.443	0.7	280.63	1,088	1369	5,000	27.4
NO_x	1-HR	0.077	1	21.38	41	62	188	33.2
	Ann.	0.077	0.2	4.28	5	9	70	13.3
PM_{10}	24-HR	0.033	0.4	3.63	51	55	150	36.4
	Ann.	0.033	0.2	1.82	16	18	50	35.6
PM_{25}	24-HR	0.033	0.4	3.63	12.6	16	35	46.4
	Ann.	0.033	0.2	1.82	5.3	7	15	47.4
SO_2	1-HR	0.205	1	56.92	16	73	75	97.2
	3-HR	0.205	0.9	51.23	34	85	1,300	6.6
	24-HR	0.205	0.4	22.77	9	32	365	8.7
	Ann.	0.205	0.2	11.38	4	15	80	19.2

Notes:
1. Background concentrations obtained from Kapolei monitoring station, 2011
2. Averaging factor of 0.9 to convert from 1-hr to 3-hr per AERSCREEN model guidance.
3. Averaging factor of 0.7 to convert from 1-hr to 8-hr per AERSCREEN model guidance.
4. Averaging factor of 0.4 to convert from 1-hr to 24-hr per AERSCREEN model guidance.
5. Averaging factor of 0.2 to convert from 1-hr to annual per DOH modeling guidance.

The air modeling analysis demonstrates that the operation of the equipment complies with State and Federal ambient air quality standards.

OTHER ISSUES:
None

SIGNIFICANT PERMIT CONDITIONS:
None; permit conditions taken verbatim from applicable federal regulations.

CONCLUSION AND RECOMMENDATION:
The construction and operation of the gas collection and control system for the Kekaha Landfill complies with all applicable state and federal requirements. Recommend issuance of covered source permit pending 30 day public comment period and 45-day EPA review.

Kevin Kihara
May 13, 2014