

Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

BEST ENVIRONMENTAL, INC.

27343 Industrial Boulevard, Unit E.
Hawthorne, California 90250

Newby Island

LFG EFD
13 93

Rating = C.
No Back up or
Cales.

February 16, 1990

~~Laidlaw~~ Gas Recovery Systems
39899 Ballontine Dr. Suite 275
Newark, CA. 94560

To: Mr. Matt L. Nourof, Mechanical Engineer

Subject: Newby Island Plant 2 Site I.C. Engine's Emissions Test

Test Date: February 7 & 8, 1990

Sampling Location: Muffler outlets of the #1, 2 and 3 I.C. engines operated at Gas Recovery Systems Newby Island Plant 2 site in Milpitas, California.

Sampling Personnel: Mike Wiley and Dan Cartner of BEST ENVIRONMENTAL.

Process Description: Gas Recovery Systems operates a seven engines at the Newby Island Plant 2 site. The three engines tested were Waukesha Model VHP7200 GL I.C. engines rated at 1100 kilowatts (1375 kva) and burn landfill gas fuel. The engines operated at approximately 1000 kilowatts during the test period.

Test Program: Three thirty minute test runs for NOx, CO, CO2, O2, THC, and TNMHC were performed at the engine muffler outlets. Stack gas temperatures, moisture content and volumetric flowrates were determined at all locations.

Sampling Methods: The following Source Test Methods of the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB) were used:

Method ST-17	Stack Velocity and Volumetric Flow Rate
Method ST-23	Water Vapor Sampling
CARB 1-100	Continuous NOx, O2, CO2, CO, THC

Instrumentation:

TECO Model 10 NOx analyzer
Horiba Model PIR 2000 CO2 analyzer
Infrared Model IR-2200 O2 analyzer
TECO Model 48 CO analyzer
Bendix Model 8401 Hydrocarbon analyzer
Standard pitot tube, inclined manometer, thermocouple
LSI Model 100 Method 5 sampling box

Test Results: Table 1 presents the results of the #1 engine emissions tests. Average NOx concentration and emission rate were 23 ppm and 0.66 lb/hr. CO concentration and emission rate were 506 ppm and 8.95 lb/hr. No detectable level of TNMHC was measured.

Table 2 presents the results of the #2 engine emissions tests. Average NOx concentration and emission rate were 25 ppm and 0.64 lb/hr. CO concentration and emission rate were 486 ppm and 7.61 lb/hr. No detectable level of TNMHC was measured.

Table 3 presents the results of the #3 engine emissions tests. Average NOx concentration and emission rate were 39 ppm and 1.03 lb/hr. CO concentration and emission rate were 493 ppm and 7.93 lb/hr. No detectable level of TNMHC was measured.

Field data sheets, strip chart recordings, calibration gas certifications and volumetric flowrate calculations are appended to this report. If there are any questions, please call Dan Cartner at (415) 784-0706.

Submitted by,


Dan Cartner
Air Pollution Consultant

TABLE 1
NEWBY ISLAND TEST RESULTS
#1 ENGINE

TEST RUN	A	B	C	AVERAGE
TEST TIME	1346-1416	1424-1454	1459-1529	
O2, %	9.3	9.3	9.3	9.3
CO2, %	10.3	10.3	10.3	10.3
NOx, ppm	22	23	23	23
NOx, @3%O2	34	35	35	35
CO, ppm	500	510	507	506
THC, ppm	2800	2800	2700	2733
TNMHC, ppm	<10	<10	<10	<10
SDCFM	4079	4079	4079	4079
H2O, %	11.3	11.3	11.3	11.3
NOx, lb/hr	0.64	0.67	0.67	0.66
CO, lb/hr	8.85	9.03	8.98	8.95
TNMHC, lb/hr	<0.09	<0.09	<0.09	<0.09

Where,

TNMHC = Total Non-Methane Hydrocarbons

THC = Total Hydrocarbons

CO = Carbon Monoxide

O2 = Oxygen

CO2 = Carbon Dioxide

NOx = Total Oxides of Nitrogen

NOx, @3%O2 = ppm NOx corrected to 3% oxygen

SDCFM = Standard Dry Cubic Feet Per Minute

Calculations:

$$\text{NOx ppm @3\%O2} = \text{ppm NOx} \times 17.9 - (20.9 - \%O2)$$

$$\text{lb/hr} = \text{ppm} \times \text{SDCFM} \times \text{Molecular Weight} \times 1.55 \times 10^{-7}$$

TABLE 2
NEWBY ISLAND TEST RESULTS
#2 ENGINE

TEST RUN TEST TIME	A 1020-1050	B 1057-1127	C 1130-1200	AVERAGE
O2, %	9.2	9.1	9.2	9.2
CO2, %	10.7	10.7	10.8	10.7
NOx, ppm	23	26	26	25
NOx, @3%O2	35	39	40	38
CO, ppm	502	480	475	486
THC, ppm	2700	2400	2400	2500
TNMHC, ppm	<10	<10	<10	<10
SDCFM	3610	3610	3610	3610
H2O, %	11.1	11.1	11.1	11.1
NOx, lb/hr	0.59	0.67	0.67	0.64
CO, lb/hr	7.86	7.52	7.44	7.61
TNMHC, lb/hr	<0.09	<0.09	<0.09	<0.09

Where,

TNMHC = Total Non-Methane Hydrocarbons
 THC = Total Hydrocarbons
 CO = Carbon Monoxide
 O2 = Oxygen
 CO2 = Carbon Dioxide
 NOx = Total Oxides of Nitrogen
 NOx, @3%O2 = ppm NOx corrected to 3% oxygen
 SDCFM = Standard Dry Cubic Feet Per Minute

Calculations:

$$\text{NOx ppm @3\%O2} = \text{ppm NOx} \times 17.9 - (20.9 - \% \text{O2})$$

$$\text{lb/hr} = \text{ppm} \times \text{SDCFM} \times \text{Molecular Weight} \times 1.55 \times 10^{-7}$$

TABLE 3
NEWBY ISLAND TEST RESULTS
#3 ENGINE

TEST RUN	A	B	C	AVERAGE
TEST TIME	1117-1147	1158-1228	1235-1305	
O2, %	9.4	9.5	9.3	9.4
CO2, %	10.4	10.4	10.4	10.4
NOx, ppm	40	37	40	39
NOx, @3%O2	62	58	62	61
CO, ppm	500	489	489	493
THC, ppm	2400	2400	2500	2433
TNMHC, ppm	<10	<10	<10	<10
SDCFM	3706	3706	3706	3706
H2O, %	10.6	10.6	10.6	10.6
NOx, lb/hr	1.06	0.98	1.06	1.03
CO, lb/hr	8.04	7.86	7.89	7.93
TNMHC, lb/hr	<0.09	<0.09	<0.09	<0.09

Where,

TNMHC = Total Non-Methane Hydrocarbons
 THC = Total Hydrocarbons
 CO = Carbon Monoxide
 O2 = Oxygen
 CO2 = Carbon Dioxide
 NOx = Total Oxides of Nitrogen
 NOx, @3%O2 = ppm NOx corrected to 3% oxygen
 SDCFM = Standard Dry Cubic Feet Per Minute

Calculations:

$$\text{NOx ppm @3\%O}_2 = \text{ppm NOx} \times \frac{17.9}{20.9 - \%O_2}$$

$$\text{lb/hr} = \text{ppm} \times \text{SDCFM} \times \text{Molecular Weight} \times 1.55 \times 10^{-7}$$



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
AIR AND ENERGY ENGINEERING RESEARCH LABORATORY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

May 9, 1994

Randy Strait
E. H. Pechan & Associates, Inc.
3514 University Drive, Suite 3
Durham, North Carolina 27707

Dear Randy:

Enclosed are two copies of several test reports from Laidlaw and Energy Tactics who are developers/operators of landfill gas to energy projects. Please review the reports and determine if the data can be used to combine with the AP-42 data. Also let me know if these reports contain any data on toxic emissions. To the extent that they do, we need to provide to Radian for use on another project. Also be aware that I have agreed to not release the name of the sites from which we obtained the data. I think all that we need to do is identify the type of energy facility, test date, state but not the name of the landfill or city. Make sure that this is what you do in developing the report on the methodology.

I am expecting test reports from Waste Management, BFI, Pacific Energy, and Los Angeles Sanitation District. As soon as I receive the information, I will get copies made and pass along to you. Do not hesitate contacting me at 541-2709 if you have any questions about the enclosed information.

Sincerely,

Susan A. Thorne
Global Emissions & Control Division (MD-63)

Enclosures

cc: Deanie Gagnon, POO
Mike Maxwell, GWCB

April 20, 1994

Ms. Susan A. Thornloe
Global Emissions and Control Division
US EPA
Office of Research and Development
Research Triangle Park, North Carolina 27711

Re: Data Request

Dear Susan:

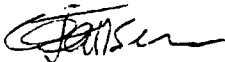
Per your request of March 15, 1994, please find attached completed data forms as far as we were easily able to provide the data.

I have also included copies of source test reports on gas turbines, a steam turbine, and one of our recip. projects. I understand that the data will be used in your research but the projects will not be specifically identified in any publications.

Thank you again for your help to New England Power as they try to convince the Rhode Island Public Utilities Commission that landfill gas to energy projects are worthwhile and benefit the public.

Please call me at 510-656-8593 directly if I can provide anything more.

Regards,



G. R. Jansen
Vice President

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LFG To Energy Projects for Laidlaw Gas Recovery Systems

SECTION 1. GENERAL INFORMATION						
Site ID #	Laidlaw2	Laidlaw3	Laidlaw4	Laidlaw5	Laidlaw6	Laidlaw7
Status	Active	Active	Active	Active	Active	Active
1 Landfill Name	MOUNTAIN VIEW Mountain View Gas Recovery	AMERICAN CANYON American Canyon Gas Recovery	SACRAMENTO	COYOTE CANYON Coyote Canyon Gas Recovery	SYCAMORE CANYON	NEWBY ISLAND
2 Facility Name						
3 Location - Sta	CA	CA	CA	CA	CA	CA
4 Location - City	Mountain View	Napa Co.	Sacramento	Orange Co.	San Diego	San Jose
5 Ownership-Pub	Public	Private	Public	Private	Public	Private
6 Landfill Ownership; Owner #1	City of Mountain View	Napa County	City of Sacramento	Irvine Company	San Diego County	BFI
7 Landfill Ownership; Owner #2					Herzog Contract	
8 LF Contact Name & Phone #						
9 Energy Facility Developer	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
10 Energy Facility Owner	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
11 Contact for Energy Facility	George Jansen	George Jansen	George Jansen	George Jansen	George Jansen	George Jansen
12 Phone # of Energy Facility Contact	510 656-8327	510 656-8327	510 656-8327	510 656-8327	510 656-8327	510 656-8327
13 Energy Facility O&M Co.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
14 Energy Facility O&M Contact	George Jansen	George Jansen	George Jansen	George Jansen	George Jansen	George Jansen
15 Phone # of O&M Contact	510 656-8327	510 656-8327	510 656-8327	510 656-8327	510 656-8327	510 656-8327
16 LFG Extr. Owner	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
17 Contact Person & Phone # for LFG Extr. Owner	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327
18 LFG Extr. O&M Co.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
19 Contact & Phone # for LFG Extr. O&M Co.	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327
20 Energy Customer #1	Pacific G&E	Pacific G&E	Associations Earl Ruby	So. Cal Edison	San Diego G&E	Pacific G&E
21 Contact for Energy Cust. #1						

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

[illegible]

NA = Not Applicable
Please verify the above Information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

3/15/94

SECTION 3. LANDFILL GAS EXTRACTION SYSTEM									
1	Date Extr. Data Collected								
2	Reason for Gas Extraction System - Env. Compliance/ Energy Recovery/ Other?								
3	Date Extr. Start-up								
4	Amount of Waste Influenced by Extraction System, (10E6tons)								
5	Area Influenced by Extraction System, (Acres)	100	200	70	40	300	100	170	
6	Range(Avg) of Depth for Welled Refuse, (ft)								
7	Number of Vertical Wells	100	65	46				50	
8	Range of Well Depth, (ft)								
9	Pipe Material	PVC	PVC & HDPE	PVC	HDPE	PVC	PVC	HDPE	
10	Range of Well Spacing, (ft)								
11	Hor. Trenches, (number)								
12	Trenches - Range of Hor. Spacing, (ft)								
13	Trenches - Range of Vert. Spacing, (ft)								
14	Trenches, Lineal Feet (ft)								
15	Header System: above/ below	Below	Below	Above	Below	Below	Below	Below	
16	Header Pipe Material	PVC & HDPE	PVC & HDPE	HDPE	HDPE	HDPE	PVC	HDPE	
17	Est. of Efficiency Coll. System, (%)								
18	Range of CH4 Conc., (vol.%)	45	45	45	50	45	50	45	
19	Extraction Rate, (MCFD or scfm)	2200	1528	556	1389	8,000 10,000	833	1000	
20	Extraction Rate, (10E6 scfy)								
21	Flare Mfg					Zink			
22	Flare Model								
23	Flare Design Cap., (cfm)					2,000			

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laldlaw Gas Recovery Systems

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24	Collected Condensate, (gall/d) (Provide as range)	-	300	200	-	1,000	300	1,000
25	Cond Disposal Cost, \$/gal	-	70	70	-	-	70	70
SECTION 4. LANDFILL GAS ENERGY EQUIPMENT								
1	Energy Prdt? (Elec, POG, direct gas sales, other)	Electricity	Pacific Gas & Electric Co.	Electricity	Pacific Gas & Electric Co.	Electricity	Direct Gas Sales	Electricity
2	Energy Customer?	Pacific Gas & Electric Co.	Dec-85	Dec-85	Blue Diamond Almond Growers	Southern California Edison Co.	San Diego Gas & Electric Co.	Pacific Gas & Electric Co.
3	Start-Up Date for Energy Equip.	Jan-83	Dec-85	Dec-85	Jun-09	Feb-89	Dec-88	Aug-84
4	Boiler Mfg				X	ZURN		
5	Boiler Model							
6	Boiler LFG Use rate, (%)							
7	Engine Mfg	Cooper-Superior	Cooper-Superior	Cooper-Superior		To 10,000 CFM		Cooper-Superior/Waukesha
8	Engine Model							
9	Engine Cap., rated (kW) MW	2.2	3.75	1.55		2		2.5
10	Engine Cap., net (kW) MW	2	3	1.3		1.2		4.2
11	Gas Turbine Mfg						Solar	
12	Gas Turbine, Model						Saturn	
13	Gas Turb Cap, rated/net, (kW)						1.72	
14	Steam Turbine Mfg					GE		
15	Steam Turbine Model							
16	Steam Turbine Cap, rated/net, (kW)					22 MW		
17	Number of Units					1	2	7
18	Generator Mfg					GE		
19	Current On-line Time, (%)	90%	85%	85%	100%	90%	85%	85%
20	General Average On-line Time (last 5 yrs), (%)	85%+	85%+	85%+	92%	86%	85%	85%
21	Gross Heat Rate, HHV, (BTU/KW)	13,000	13,000	13,000	-	12,000	14,000	12,000

NA = Not Applicable
Please verify the above information and provide data where blanks are found.

[illegible]

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LFG To Energy Projects for Laldlaw Gas Recovery Systems

3/15/94

SECTION 6. Other Information Related to Energy Projects									
1	Please provide any information you feel is impt. in evaluating data for this project.								
2	Please identify any technical barriers impacting the success of this project.								
3	Please identify any nontechnical barriers impacting the success of this project.								Disposal of Condensate is affecting all projects.
4	Please identify any issues with obtaining permits for energy projects or that limit the amount of gas being utilized for energy recovery.								
5	Please identify any issues with obtaining energy contract for project.								

NA = Not Applicable
Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

SECTION 1. GENERAL INFORMATION					
Site ID #	Laidlaw8	Laidlaw9	Laidlaw10	Laidlaw11	Laidlaw12
Status	Active	Active	Active	Active	Active
1	Landfill Name	SAN MARCOS	SANTA CRUZ	KAPAA	ORANGE COUNTY
2	Facility Name	<i>San Marcos</i>	Santa Clara County Gas Recovery	Kappa Gas Recovery	Orange County Gas Recovery
3	Location - State	CA	CA	H	NY
4	Location - City	San Marcos	Santa Clara Co.	Kailua	Goshen
5	Ownership-Public/private	Public/Private	Public	Private	Public
6	LF Ownership - Owner #1	San Diego County	City of Santa Cruz	City of Honolulu	Orange County
7	LF Ownership - Owner #2	Herzog Contracting		HKL Casile Trust	
8	LF Contact Name & Phone #				
9	Energy Facility Developer	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
10	Energy Facility Owner	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
11	Contact for Energy Facility	George Jansen	George Jansen	George Jansen	George Jansen
12	Phone # of Energy Facility Contact	510 656-8327	510 656-8327	510 656-8327	510 656-8327
13	Energy Facility O&M Co.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
14	Energy Facility O&M Contact	George Jansen	George Jansen	George Jansen	George Jansen
15	Phone # of O&M Contact	510 656-8327	510 656-8327	510 656-8327	510 656-8327
16	LFG Extr. Owner	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
17	Contact Person & Phone # for LFG Extr. Owner	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327
18	LFG Extr. O&M Co.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.	Laidlaw Gas Rec. Sys.
19	Contact & Phone # for LFG Extr. O&M Co.	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327	George Jansen (510) 656-8327
20	Energy Customer #1	San Diego G&E	Pacific G&E	HEC American H&B Cement	Rockwell Utilities, Inc.
21	Contact for Energy Cust. #1				Orange Utility

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

22	Phone # of Energy Customer #1						
23	Energy Cust. #2						
24	Contact for Energy Cust. #2						
25	Phone # of Energy Cust. #2						
SECTION 2. LANDFILL DATA		NO	<i>Data on Landfills available since they are owned by 3rd parties</i>				
1	Date LF data collected						
2	Year Landfill Opened						
3	Year Landfill Closed (e)	1979	1929	1928	1982	1973	
4	Tons in Place (x10E6)	1993			1986	1991	
5	Tons in Place at Closure (x10E6)	3.8	3.5	4.5	1.3	4.0	
6	Fill Rate, Last 3 Operating Years (mmt/yr)					4.0	
7	Fill Rate, Current (mmt/yr)						
8	Filled Area (acres)						
9	Design Area, LF (acres)	95	115	100	42	70	
10	Design Depth max., LF (ft)					70	
11	LFG containment, Base						
12	LFG Containment, Sides						
13	LFG Containment, Top						
14	Annual Rainfall, (in.)	15	14	29	61	42	
15	Wet/Dry LF?						
16	Liquid Additions?						
17	Typical MSW: yes/no?						
17	% of Incoming Waste that is Construction & Demolition Debris?						
18	Landfill Type? (1-Mound, 2-Canyon, 3-Quarry Fill, 4-Excavate&Fill, 5-Other?)						

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

SECTION 3. LANDFILL GAS EXTRACTION SYSTEM									
1	Date Extr. Data Collected								
2	Reason for Gas Extraction System - Env. Compliance/ Energy Recovery/ Other?								
3	Date Extr. Start-up								
4	Amount of Waste Influenced by Extraction System, (10E6tons)								
5	Area Influenced by Extraction System, (Acres)	95	80	30	42	70			
6	Range(or Avg) of Depth for Welled Refuse, (ft)								
7	Number of Vertical Wells				89				
8	Range of Well Depth, (ft)				70-80				
9	Pipe Material	PVC	PVC & HDPE	PVC	PVC	HDPE			
10	Range of Well Spacing, (ft)								
11	Hor. Trenches, (number)								
12	Trenches - Range of Hor. Spacing, (ft)								
13	Trenches - Range of Vert. Spacing, (ft)								
14	Trenches, Lineal Feet (ft)								
15	Header System: above/ below	Below	Below	Below	Below	Below			
16	Header Pipe Material	PVC	PVC & HDPE	PVC	HDPE	HDPE			
17	Est. of Efficiency Coll. System, (%)								
18	Range of CH4 Conc., (vol.%)	45	45	50	50	50			
19	Extraction Rate, (MCFD or scfm)	833	750	417	1458	1485			
20	Extraction Rate, (10E6 scfy)								
21	Flare Mfg								
22	Flare Model								
23	Flare Design Cap., (cfm)								

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

24	Collected Condensate, (gal/d) (Provide as range)	300 - 500	300	-	300	-
25	Cond Disposal Cost, \$/gal	70	70	-	25	-
SECTION 4. LANDFILL GAS ENERGY EQUIPMENT						
1	Energy Prdt? (Elec, PQG, direct gas sales, other)	Electricity	Electricity	Electricity	Electricity	Electricity
2	Energy Customer?	San Diego Gas & Electric Co.	Pacific Gas & Electric Co.	Pacific Gas & Electric Co.	Hawaiian Electric Co.	Rockland Electric Co.
3	Start-Up Date for Energy Equip.	Dec-88	Apr-84	Nov-88	May-89	Dec-88
4	Boiler Mfg					
5	Boiler Model					
6	Boiler LFG Use rate, (%)					
7	Engine Mfg		<i>Copier Superior Waukegan</i>			
8	Engine Model					
9	Engine Cap., rated (kW)		185 2.5			
10	Engine Cap., net (kW)		185 2.2			
11	Gas Turbine Mfg	Solar		Solar	Solar	Solar
12	Gas Turbine, Model	Saturn		Saturn	Centaur	Centaur
13	Gas Turb Cap, rated/net, (kW)	1.72		0.86	3.3	3.3
14	Steam Turbine Mfg					
15	Steam Turbine Model					
16	Steam Turbine Cap, rated/net, (kW)					
17	Number of Units	2	4	1	1	1
18	Generator Mfg					
19	Current On-line Time, (%)	80%	75%	100%	85	50%
20	General Average On-line Time (last 5 yrs), (%)	~ 80%	75%	88%	~ 75%	~ 75%
21	Gross Heat Rate, HHV, (BTU/KW)	~ 14,000	12,000	14,000	14,000	14,000

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

22	Heat Rate, LHV, (BTU/KW)						
23	Parasitic Drag, (%)	15%	5%	15%	15%	15%	
24	Energy Conversion Constraints?						
SECTION 5. COST & ECONOMICS							
1	Are Prdtn Tax Credits Used? By Who?	Yes	No	Yes	yes	Yes	
2	Capital Equipment Cost (Millions)	2.0	3.0	1.0	4.0	3.5	
3	Equip O&M Costs, (\$/kwh)	All projects cost in range of 2.2 to 2.5 \$/kwh					
4	Extraction System Costs, (\$/kwh)	(Included in #2 above)	(Included in #2 above)	(Included in #2 above)	(Included in #2 above)	(Included in #2 above)	
5	Length of Depreciation (years)	10	10	10	10	10	
6	Are Royalty Payments Made? To Who?	Herzog Corp	Grudalope Rebbish	City Santa Cruz	City of Honolulu HKL Castle Trist	Orange Co	
7	Royalty Payments, (%)	12%	12.5	10	10	10	
8	Other Major Costs?						
9	Is extraction systems taxed?, yes/no	yes	yes	yes	yes	yes	
10	Is Energy system taxed?, yes/no	yes	yes	yes	yes	yes	
11	Rental Cost						
12	Lease Cost						
13	LFG Sales Value(\$/10E6 Btu)						
14	Energy Sales Value, (\$/net KW)	Std oil #4	Std oil #4	Std oil #4	Std oil #4	6.5	
15	Electrical Capacity Value, (\$/kw), or?	1.5	1.5	1.5	-	-	
16	Facility Shutdown?	No	No	No	No	No	
17	# of Full Time Employ.	1	1	1	2	2	
18	Remarks				Royalties split 50/50 among owners		

NA = Not Applicable

Please verify the above information and provide data where blanks are found.

LFG To Energy Projects for Laidlaw Gas Recovery Systems

SECTION 6. Other Information Related to Energy Projects				
1	Please provide any information you feel is impt. in evaluating data for this project.			
2	Please identify any technical barriers impacting the success of this project.			
3	Please identify any nontechnical barriers impacting the success of this project.			
4	Please identify any issues with obtaining permits for energy projects or that limit the amount of gas being utilized for energy recovery.			
5	Please identify any issues with obtaining energy contract for project.			

Disposal of condensate is affecting all projects.

NA = Not Applicable
Please verify the above information and provide data where blanks are found.