ANNUAL REPORT

1993

Refuse Hideaway Landfill
Town of Middleton
Dane County, Wisconsin

Prepared by:

Wisconsin Department of Natural Resources
101 South Webster Street
Madison, Wisconsin

Prepared by:

Terra Engineering and Construction Corp.
2201 Vondron Road
Madison, Wisconsin

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TERRA
▲ ENGINEERING & CONSTRUCTION CORPORATION ▲
ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

March 15, 1994

Wisconsin Department of
Natural Resources
Environmental Response and
Repair Section
Bureau of Solid and Hazardous
Waste Management
101 South Webster Street,
GEF II, SE/3
Madison, Wisconsin 53707

Attn: Ms. Theresa Evanson

Re: Operation and Maintenance
Summary - Annual Report 1993
Landfill Gas and Leachate
Extraction System
Refuse Hideaway Landfill -
Middleton, Wisconsin
Terra Job # 468

Dear Ms. Evanson:

This report summarizes operation and maintenance (O&M) activities performed by Terra Engineering & Construction Corporation (Terra), during 1993 at the Refuse Hideaway Landfill.

Included in this report are five tables which summarize gas extraction well monitoring, gas probe monitoring, leachate head monitoring, leachate/condensate loadout volumes and monthly alarm conditions encountered. Also included are Construction Observation Report: Shallow Gas Recovery and Leachate Head Reduction System Installation, the leachate analytical results for Quarterly and Annual sampling events, analytical results from the Biennial Flare inlet sampling and a system inspection report provided by Linklater Corporation. A brief discussion of each aspect of the gas and leachate extraction system including notable highlights are presented in the following sections. Previously submitted reports can be referenced for further details.

Gas Extraction Wells

Table 1 is an annual summary of the monthly data collected from each of the thirteen (13) gas wells.

The valves on gas wells GW-1 and GW-2, which had been re-opened on January 30, 1993, were closed on March 30, 1993 due to the presence of oxygen and the low concentration of methane. These are the two "original" gas wells installed during 1989-90. Continued monthly monitoring indicated no increase in methane production from these two wells. The valves will remain closed until a noticeable increase in methane production is observed however, with the valves closed through out the year, there has been no evidence of stressed vegetation in the area of GW-1 and GW-2, suggesting that methane production has diminished.

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Modifications were made to five gas wells (GW-4, GW-5, GW-7, GW-12 and GW-13) in September 1993 to allow the permanent pumps to discharge leachate from the wells into the existing header pipe. Gas well GW-5 was also modified to allow the recently installed lateral gas wells to draw vacuum from the existing header pipe at gas well GW-5. For further details refer to the Construction Observation Report: Shallow Gas Recovery and Leachate Head Reduction System Installation which is attached as Appendix 1.

Leachate/Condensate Extraction

A permanent leachate extraction pump was installed in each of five gas wells(GW-4, GW-5, GW-7, GW-12 and GW-13) during the month of November 1993. The placement of the permanent pumps also included the installation of electrical service wire from the main control panel at the flare to each of the gas wells noted above. Pump control panels were also installed to provide automatic shut off and re-start capabilities to each pump. Details of the permanent pump installation are described in the Construction Observation Report: Shallow Gas Recovery and Leachate Head Reduction System Installation.

The existing pumps in gas wells GW-8, -9, -11 were inspected and repairs were made to each in March 1993, broken wire leads were replaced in gas well GW-8. The pump in GW-8 was later removed and cleaned. A stainless steel screen was installed over the pump to prevent material from entering and clogging the pump's impellers.

In May 1993, the electrical junction boxes at gas wells GW-8, -9, and -11 were replaced along with the above ground conduit. This was done after water was observed with in the "weather proof" boxes. The boxes had oxidized to the point were they were no longer effective against the weather.

In November 1993, the wire leads to the leachate pump in GW-9 were replaced after an inspection of the wires showed them to be frayed. The leachate head in gas well GW-9 had decreased to less than one foot, possibly due to the pumping efforts of the recently installed pumps. The pump in GW-9 has remained off as the coyote controls could not be re-set due to the decreased leachate head in the gas well.

The annual cleaning of the leachate/condensate conveyance pipe for 1993 was performed in February 1994.

Eight (8) erroneous high leachate alarms have been alerted to Terra during 1993. (see table 5). The cause for these alarms is thought to be a loose electrical connection at the leachate tank panel. These alarms do not shut down the flare, however, the power to the permanent pumps is shut off until the alarm condition is corrected and re-set.

Blower/Flare

In January 1993 the thermocouple at the flare failed. The failure was due to broken thermocouple wires. A new thermocouple was purchased and installed during the same month.

In March 1993, flare temperatures were observed to fluctuate between 1400 to 1700 degrees fahrenheit. The flare manufacturer, Linklater Corporation was contacted for assistance and a site visit by their representative, Mr. John Gwinn, was scheduled.

In May 1993, the flare controls were re-programmed and an over all inspection of the system was performed by Mr. John Gwinn. Terra submitted his report to the DNR with the June 1993 Monthly Report. A copy of this report is attached as Appendix 2. Mr. Gwinn's report indicated that the system was in "excellent" condition. His recommendations included: cleaning the U.V. sensor in the flare (performed July 1993), changing the blower belts (performed in May 1993), cleaning the flame arrestors, replace arrestor gaskets, install pressure monitoring ports on the down stream arrestor (performed May 1993) and painting the flare (performed in November 1993)

In June of 1993, Clean Air Engineering (CAE) was subcontracted by Terra to collect and analyze Biennial Flare inlet gas samples. These analytical results were submitted to the DNR and are attached as Appendix 3.

In December 1993, the second thermocouple failed. The two thermocouples, the original removed in January 1993 and the replacement, were sent to Linklater Corporation for re-building. One of the two re-buildings was performed under warrantee. Mr. John Gwinn of Linklater believes that some constituents of the landfill gas are "attacking" the thermocouple wire, causing the wire to break and the thermocouple to fail. If another thermocouple failure occurs, it will immediately be replaced with the rebuilt spare in Terra's possession, minimizing the flare down time. Prior to each thermocouple failure, frequent temperature fluctuations were observed on the temperature recorder tape. Future drastic temperature fluctuations will be noted and the thermocouple may have to be removed for inspection.

Alarm Conditions

Table 5 contains the twelve monthly alarm condition summaries previously submitted with the monthly reports.

Alarm Conditions (cont)

During 1993 the flare was down for a total of approximately 833.96 hours. A breakdown of alarm conditions and "down time" is as follows. (hours are approximate).

Flare down due to thermocouple failure:	459.50 hrs.	Down 9.5% in 1993
Flare down due to loss of vacuum:	26.88 hrs.	or Operational = 90.5%
Flare down "cause not determined:	245.83 hrs.	
Flare down due to manual shut down:	101.75 hrs.	

It is anticipated that with the spare thermocouple any future down time due to thermocouple failure will be substantially lower than that observed in 1993.

Vacuum loss alarms typically occurred during the monthly leachate head monitoring. The sensitivity of the existing vacuum switches is such that a minor change in header pressure will trip the switch and shut down the blower. Removal and inspection of the vacuum switches is anticipated. Following the inspection, replacement switches or installation of another type of alarm switch will be discussed.

Down time due to "cause not determined" may be due to vacuum loss or electrical service interruption during stormy weather.

Manual shut downs were preformed during flare inspection, flame arrestor cleaning, flare painting and during the time prior to the thermocouple failure when flare temperatures had increased dramatically.

The erroneous leachate alarms, as previously mentioned, could be due to loose electrical connections. We are currently addressing a variety of possible solutions to these alarm conditions.

Analytical Results

Appendix 4 contains the analytical results for leachate analyses performed during 1993. It is our understanding that a "turn around document" (TAD) showing all analytical results has been forwarded to your offices from the laboratory of record (Mid-State Laboratories).

Leachate samples were obtained on a quarterly basis from the 25,000 gallon underground leachate/condensate collection tank utilizing a dedicated teflon bailer.

Analytical Results (cont)

The sampling dates are as follows:

Quarterly	March 22, 1993
Quarterly	June 1, 1993
Quarterly	August 30, 1993
Annual	October 5, 1993
Quarterly	December 9, 1993

Copies of the Quarterly and Annual analytical results were forwarded to the Madison Metropolitan Sewerage District to comply with the District's Discharge Permit No. NTO-5, and the renewed permit No. NATO-5A. The renewed permit is valid until September 25, 1994. A copy of this permit is attached as Appendix 5.

General Observations and Conclusion

The installation of lateral shallow gas extraction wells appear to be minimizing the gas migration as evidenced by the monthly gas readings in gas probes GP-11s and GP-11d. As previously reported, the gas concentrations at these probes vary seasonally and continued monthly monitoring will be necessary to make true comparisons with past data.

The leachate extraction pumps appear to be the "high maintenance" item. The relative high temperatures of the leachate, frayed or broken lead wires and/or foreign material entering the pumps have been causes for past pump malfunctions. Monthly monitoring of the control panels and leachate head data will provide a good warning signal that malfunctions have occurred.

As spring approaches, Terra will be monitoring the cap for excessive erosion and looking for vegetation to appear in the areas of recent cap repair.

The cracks that have appeared in the flare foundation pad have been documented and will be inspected regularly during the weekly monitoring event. Any further changes observed in the condition of the flare foundation pad will be brought to your attention.

Terra will continue to use all the information collected, from monitoring data to information regarding the performance of this type of system to maintain and, where possible, improve the existing gas and leachate extraction system.

If you have any questions or comments regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk Solberg,
Environmental Geologist

TABLE 1

GAS EXTRACTION WELL MONITORING SUMMARY

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-1

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-1.0	53.0	13.8	11.4	11.6	525	23.6
03/01/93	-2.0	46.0	7.3	0.4	21.7	<10	<0.45
03/30/93	+0.5	61.8	50.1	0.0	32.9	0	0
04/27/93	-0.5	55.9	7.1	14.1	6.8	0	0
05/18/93	0.0	78.6	7.0	15.2	6.2	<10	<0.45
06/28/93	0.0	67.6	16.2	13.1	11.1	<100	<4.5
07/27/93	0.0	70.0	17.1	12.4	10.5	<100	<4.5
08/30/93	0.0	70.3	0.3	20.3	0.0	<100	<4.5
09/28/93	-1.0	55.5	8.3	12.6	9.3	<100	<4.5
10/29/93	-1.0	37.0	5.0	20.0	4.1	<100	<4.5
12/03/93	-1.0	36.0	5.0	20.0	4.3	<100	<4.5
12/29/93(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made. No monthly adjustments were made for December.

REFUSE\refuse93.tbl

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-2

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%CO2)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-2.0	53.3	0.0	20.4	0.1	475	21.4
03/01/93	-4.0	52.0	16.8	0.3	25.5	<10	<.45
03/30/93	0	61.3	49.4	0.0	31.5	0	0
04/27/93	-1.0	54.3	0.0	20.0	0.0	0	0.
05/18/93	-1.0	78.6	0.0	21.7	0.0	<10	<0.45
06/28/93	0.0	67.6	21.1	0.0	26.1	<100	<4.5
07/27/93	0.0	70.0	20.0	0.0	28.7	<100	<4.5
08/30/93	0.0	76.1	0.8	20.1	0.0	<100	<4.5
09/28/93	-2.0	55.5	11.8	0.0	13.3	<100	<4.5
10/29/93	-1.0	37.0	5.0	20.0	3.9	<100	<4.5
12/03/93	-1.0	37.0	5.0	20.0	4.4	<100	<4.5
12/29/93 (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made. No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-3

DATE	VACUUM (IN.OF H2O)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%O2)	CARBON DIOXIDE (%CO2)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	N/A	57.0	46.9	0.5	37.7	2200	99.0
03/01/93	-7.0	60.0	41.3	0.3	35.1	2300	103.5
03/30/93	0.0	61.3	57.6	0.0	40.7	1600	72.0
04/27/93	-3.5	59.3	51.1	0.0	37.2	1400	63.0
05/18/93	-4.5	67.2	41.4	0.0	35.6	1400	63.0
06/28/93	-6.5	65.3	48.4	0.0	37.4	1400	63.0
07/27/93	-8.0	64.7	38.8	0.0	33.2	2000	90.0
08/30/93	-7.0	69.0	40.5	0.0	33.3	2600	117.0
09/28/93	-8.5	64.0	42.1	0.0	32.3	1700	76.5
10/29/93	-7.5	62.6	54.0	0.0	39.1	2300	103.5
12/03/93	-7.0	66.0	45.0	0.0	35.0	2450	110.3
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

REFUSE\refuse93.tbl

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-4

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	N/A	62.0	46.8	0.5	36.6	750	33.8
03/01/93	-11.5	63.0	45.4	0.6	35.6	1600	72.0
03/30/93	-16.0	62.2	50.8	0.0	36.9	950	42.8
04/27/93	-7.0	61.0	52.0	0.0	37.4	450	20.3
05/18/93	-8.5	69.0	40.8	0.0	34.4	1250	56.3
06/28/93	-10.0	68.0	49.9	0.0	37.8	750	33.8
07/27/93	-15.0	69.9	43.9	0.0	35.1	750	33.8
08/30/93	-14.0	77.1	42.2	0.0	34.0	1200	54.0
09/28/93	-13.0	62.2	44.8	0.0	34.0	750	33.8
10/29/93	-13.0	73.0	48.2	0.0	38.0	1500	67.5
12/03/93	-14.0	68.7	45.2	0.0	34.3	1300	58.5
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-5

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-11.5	74.6	56.3	0.4	41.7	800	36.0
03/01/93	-11.5	80.0	56.3	0.5	43.1	800	36.0
03/30/93	-16.0	78.4	56.7	0.0	43.2	850	38.3
04/27/93	-7.0	77.0	56.8	0.0	42.2	500	22.5
05/18/93	-9.0	80.2	53.7	0.0	43.9	700	31.5
06/28/93	-16.5	81.1	55.7	0.0	43.1	420	18.9
07/27/93	-17.0	82.5	55.4	0.0	42.9	750	33.8
08/30/93	-16.0	83.8	55.7	0.0	42.6	1000	45.0
09/28/93	-14.5	80.7	49.5	0.0	33.4	600	27.0
10/29/93	-13.0	77.0	41.0	7.2	31.0	800	36.0
12/03/93	-14.0	67.0	57.0	0.9	37.0	900	40.5
12/29/93 (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-6

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-13.5	66.0	34.0	0.2	33.1	700	31.5
03/01/93	-4.0	63.0	19.7	0.4	26.7	950	42.8
03/30/93	-2.0	70.0	44.2	0.0	33.9	1100	49.5
04/27/93	-3.0	68.3	28.2	0.0	28.1	1450	65.3
05/18/93	-4.0	71.0	20.5	0.0	27.3	200	9.0
06/28/93	-3.0	75.0	30.5	0.0	30.3	700	31.5
07/27/93	-4.0	73.0	18.4	0.0	25.9	800	36.0
08/30/93	-1.5	84.0	37.4	0.0	33.6	1200	54.0
09/28/93	-1.5	57.5	0.4	19.8	0.0	<100	<4.5
10/29/93	-2.0	32.1	13.9	15.5	10.5	<100	<4.5
12/03/93	-1.0	72.0	44.4	0.0	35.6	900	40.5
12/29/93(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made. No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-7

DATE	VACUUM (IN.OF H2O)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%O2)	CARBON DIOXIDE (%CO2)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-8.5	87.4	53.1	0.2	38.3	1250	56.3
03/01/93	-13.0	87.0	52.8	0.3	39.8	1000	45.0
03/30/93	-15.0	87.2	55.3	0.0	39.7	1150	51.8
04/27/93	-15.0	86.1	56.4	0.0	38.4	1750	78.8
05/18/93	-21.0	88.8	49.9	0.0	39.7	1300	58.5
06/28/93	-19.0	86.0	54.8	0.0	40.2	1550	69.8
07/27/93	-20.0	83.5	51.2	0.0	38.3	1100	49.5
08/30/93	-21.0	87.0	51.5	0.0	38.6	1550	69.8
09/28/93	-22.5	84.5	55.6	0.0	38.2	750	33.8
10/29/93	-22.0	84.0	55.0	0.0	41.6	1300	58.5
12/03/93	-23.0	82.0	55.6	0.0	37.0	800	36.0
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-8

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-13.0	91.2	56.5	0.1	41.5	625	28.1
03/01/93	-13.5	91.0	56.7	0.5	42.1	950	42.8
03/30/93	-16.0	92.0	56.6	0.0	43.6	1020	45.9
04/27/93	-16.0	95.0	58.3	0.0	41.4	1400	63.0
05/18/93	-28.0	97.1	51.6	0.0	42.4	1200	54.0
06/28/93	-16.0	98.2	55.3	0.0	43.1	1200	54.0
07/27/93	-21.0	104.5	56.0	0.0	41.4	700	31.5
08/30/93	-21.0	98.6	54.3	0.0	41.6	1100	49.5
09/28/93	-22.0	95.6	58.8	0.0	40.5	1150	51.8
10/29/93	-22.5	80.0	60.4	0.5	44.3	900	40.5
12/03/93	-22.0	85.0	62.4	0.0	38.6	800	36.0
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-9

DATE	VACUUM (IN.OF H2O)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%O2)	CARBON DIOXIDE (%CO2)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-13.0	104.0	56.3	0.0	41.6	600	27.0
03/01/93	-13.5	101.5	56.6	0.3	42.7	650	29.3
03/30/93	-15.0	104.3	56.6	0.0	41.4	875	39.4
04/27/93	-16.0	103.6	57.3	0.0	41.1	550	24.8
05/18/93	-24.0	104.1	52.7	0.0	43.4	700	31.5
06/28/93	-20.0	101.5	54.7	0.0	43.3	600	27.0
07/27/93	-21	104.0	55.2	0.0	41.4	700	31.5
08/30/93	-22.0	98.6	56.0	0.0	42.4	1200	54.0
09/28/93	-20.0	97.8	56.5	0.0	41.5	600	27.0
10/29/93	-22.0	99.0	62.0	0.0	46.4	500	22.5
12/03/93	0.0	96.0	68.7	0.0	42.4	400	18.0
12/29/93(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made. No monthly adjustments were made for December.

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REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-10

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	-4.0	90.3	36.8	0.0	32.4	850	38.3
03/01/93	-4.0	88.0	37.2	0.3	32.5	1050	47.3
03/30/93	+0.25	85.1	59.1	0.0	43.1	975	43.9
04/27/93	-3.5	88.0	35.4	0.0	31.0	600	27.0
05/18/93	-10.0	94.4	29.4	0.0	30.0	1700	76.5
06/28/93	-4.0	93.3	34.0	0.0	32.8	1000	45.0
07/27/93	-4.0	90.5	33.6	0.0	31.1	750	33.8
08/30/93	-4.5	96.2	35.1	0.0	32.2	1150	51.8
09/28/93	-2.0	91.0	35.6	0.0	30.2	900	40.5
10/29/93	-4.0	93.0	51.1	0.0	42.6	650	29.3
12/03/93	-11.5	103.0	34.7	0.0	31.5	2000	90.0
12/29/93(1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made. No monthly adjustments were made for December.

REFUSE\refuse93.tbl

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-11

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	N/A	101.5	56.8	0.0	40.5	375	16.9
03/01/93	-9.0	94.0	57.2	0.5	41.6	600	27.0
03/30/93	-14.0	100.7	58.1	0.0	42.8	750	33.8
04/27/93	-13.0	100.0	58.8	0.0	40.8	700	31.5
05/18/93	-23.0	107.0	53.1	0.0	32.8	600	27.0
06/28/93	-18.0	101.1	56.3	0.0	42.1	600	27.0
07/27/93	-16.0	90.5	57.3	0.0	41.5	400	18.0
08/30/93	-18.5	99.6	57.2	0.0	41.2	1950	87.8
09/28/93	-21.0	89.4	55.5	0.0	32.8	600	27.0
10/29/93	-16.0	94.0	64.1	0.0	42.5	600	27.0
12/03/93	-16.0	77.3	68.5	0.0	40.0	450	20.3
12/29/93 [(1)]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

(1) Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

REFUSE\refuse93.tbl

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-12

DATE	VACUUM (IN.OF H20)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%02)	CARBON DIOXIDE (%C02)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	N/A	98.3	45.0	0.8	34.4	1900	85.5
03/01/93	-7.0	96.0	42.5	0.3	33.5	1450	65.3
03/30/93	-10.5	95.3	44.3	0.0	33.8	1600	72.0
04/27/93	-10.0	77.0	45.6	0.0	34.1	1700	76.5
05/18/93	-13.0	89.7	41.0	0.0	35.0	2500	112.5
06/28/93	-10.0	83.1	45.1	0.0	36.4	2450	110.3
07/27/93	-14.0	95.1	44.3	0.0	35.0	2150	96.8
08/30/93	-15.0	98.6	42.3	0.0	35.1	2550	114.8
09/28/93	-17.5	99.5	48.5	0.0	33.6	900	40.5
10/29/93	-14.5	101.0	45.6	0.0	38.3	1400	63.0
12/03/93	-14.0	102.0	41.7	0.0	33.7	2500	112.5
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

[1] Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

REFUSE\refuse93.tbl

REFUSE HIDEAWAY LANDFILL GAS EXTRACTION SYSTEM-WELL HEAD MONITORING SUMMARY

WELL NUMBER: GW-13

DATE	VACUUM (IN.OF H2O)	TEMP. (F)	METHANE (%CH4)	OXYGEN (%O2)	CARBON DIOXIDE (%CO2)	AIR VELOCITY (FT/MIN)	CALCULATED FLOW (CFM)
01/30/93	N/A	82.0	N/A	N/A	N/A	950	42.8
03/01/93	-8.5	76.0	51.4	0.4	39.9	700	31.5
03/30/93	-13.0	84.5	48.1	0.0	38.2	1300	58.5
04/27/93	-12.0	82.2	49.6	0.0	37.5	950	42.8
05/18/93	-17.0	77.9	49.6	0.0	40.2	1500	67.5
06/28/93	-18.5	85.0	50.5	0.0	40.1	1250	56.3
07/27/93	-18.0	81.5	49.5	0.0	38.6	1100	49.5
08/30/93	-18.0	84.3	51.2	0.0	39.8	1450	65.3
09/28/93	-21.0	80.4	57.3	0.0	38.5	900	40.5
10/29/93	-16.0	76.6	64.4	0.0	44.7	500	22.5
12/03/93	-16.0	82.0	62.1	0.0	38.7	800	36.0
12/29/93[1]	N/A	N/A	N/A	N/A	N/A	N/A	N/A

NA: Not Available

[1] Thermocouple failure has blower/flare shutdown until repairs can be made.
No monthly adjustments were made for December.

REFUSE\refuse93.tbl

TABLE 2

GAS PROBE MONITORING SUMMARY

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-1S

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	19.4
03/01/93	0.0	0.0	0.0	20.4
03/30/93	0.0	0.1	2.0	20.2
04/27/93	0.0	0.0	0.0	20.0
05/18/93	0.0	0.0	0.0	20.8
06/28/93	0.0	0.0	0.0	20.9
07/27/93	0.0	0.0	0.0	20.5
08/30/93	0.0	0.0	0.0	16.5
09/28/93	0.0	0.2	4.0	19.6
10/26/93	0.0	0.0	0.0	20.4
12/03/93	0.0	0.0	0.0	20.5
12/29/93	0.0	0.0	0.0	21.5

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-1D

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	19.4
03/01/93	0.0	0.0	0.0	20.4
03/30/93	0.0	0.0	0.0	20.4
04/27/93	0.0	0.0	0.0	20.1
05/18/93	0.0	0.0	0.0	20.7
06/28/93	0.0	0.1	2.0	20.8
07/27/93	0.0	0.0	0.0	20.4
08/30/93	0.0	0.0	0.0	18.4
09/28/93	Slight Neg	0.1	2.0	19.9
10/26/93	0.0	0.0	0.0	20.4
12/03/93	0.0	0.0	0.0	20.5
12/29/93	0.0	0.0	0.0	21.6

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-6

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	19.4
03/01/93	0.0	0.0	0.0	20.6
03/30/93	0.0	0.1	2.0	20.9
04/27/93	0.0	0.0	0.0	20.0
05/18/93	0.0	0.0	0.0	21.0
06/28/93	0.0	0.0	0.0	21.2
07/27/93	0.0	2.6	52	0.0
08/30/93	0.0	0.0	0.0	20.5
09/28/93	0.0	0.2	4.0	20.4
10/26/93	0.0	0.0	0.0	20.5
12/03/93	0.0	0.0	0.0	20.6
12/29/93	0.0	0.0	0.0	21.1

[1] Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-8

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	19.8
03/01/93	0.0	0.0	0.0	20.1
03/30/93	0.0	0.0	0.0	20.8
04/27/93	0.0	0.0	0.0	19.9
05/18/93	0.0	0.0	0.0	20.5
06/28/93	0.0	0.0	0.0	20.9
07/27/93	0.0	0.0	0.0	20.3
08/30/93	0.0	0.0	0.0	20.8
09/28/93	0.0	0.0	0.0	20.2
10/26/93	0.0	0.0	0.0	20.5
12/03/93	0.0	0.0	0.0	20.2
12/29/93	N/A	N/A	N/A	N/A

N/A: Not Available

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-9

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%O2)
01/30/93	0.0	0.0	0.0	18.6
03/01/93	0.0	0.0	0.0	16.9
03/30/93	0.0	0.1	2.0	20.7
04/27/93	0.0	0.0	0.0	18.9
05/18/93	0.0	0.0	0.0	20.8
06/28/93	0.0	0.0	0.0	20.4
07/27/93	0.0	0.0	0.0	20.9
08/30/93	0.0	0.0	0.0	20.5
09/28/93	0.0	0.0	0.0	20.4
10/26/93	0.0	0.0	0.0	20.9
12/03/93	0.0	0.0	0.0	20.1
12/29/93	N/A	N/A	N/A	N/A

N/A: Not Available

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH_4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE G-10

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	+1.0	0.0	0.0	19.9
03/01/93	+0.5	0.0	0.0	20.5
03/30/93	0.0	0.1	2.0	18.5
04/27/93	+0.5	0.0	0.0	20.2
05/18/93	Slight Neg	0.0	0.0	21.0
06/28/93	-0.5	0.0	0.0	21.0
07/27/93	0.0	0.0	0.0	20.4
08/30/93	-0.5	0.0	0.0	20.6
09/28/93	0.0	0.0	0.0	20.4
10/26/93	Slight Neg	0.0	0.0	20.6
12/03/93	Slight Neg	0.0	0.0	20.6
12/29/93	N/A	N/A	N/A	N/A

N/A: Not Available

[1] Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE GP-11S

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	19.8
03/01/93	0.0	0.0	0.0	20.6
03/30/93	0.0	0.0	0.0	20.2
04/27/93	0.0	0.0	0.0	19.4
05/18/93	0.0	0.0	0.0	21.3
06/28/93	0.0	40.0	>100	0.0
07/27/93	0.0	42.3	>100	0.0
08/30/93	0.0	28.1	>100	0.0
09/28/93	0.0	0.1	2.0	19.5
10/26/93	0.0	0.0	0.0	18.3
12/03/93	0.0	0.0	0.0	20.4
12/29/93	0.0	N/A	N/A	21.3

N/A: Not Available

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE GP-11D

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%O2)
01/30/93	-0.5	0.0	0.0	19.8
03/01/93	0.0	0.0	0.0	20.7
03/30/93	0.0	0.0	0.0	21.2
04/27/93	0.0	0.0	0.0	19.1
05/18/93	0.0	0.0	0.0	21.3
06/28/93	0.0	58.5	>100	0.0
07/27/93	0.0	53.1	>100	0.0
08/30/93	0.0	24.0	>100	0.0
09/28/93	0.0	2.5	50.0	17.2
10/26/93	0.0	3.4	68.0	15.6
12/03/93	0.0	0.0	0.0	20.4
12/29/93	0.0	N/A	N/A	21.0

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE GPW-1S

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	0.0	0.0	0.0	17.7
03/01/93	0.0	0.0	0.0	17.7
03/30/93	0.0	0.0	0.0	17.2
04/27/93	0.0	0.0	0.0	18.1
05/18/93	0.0	0.0	0.0	19.0
06/28/93	0.0	0.0	0.0	19.6
07/27/93	0.0	0.0	0.0	18.1
08/30/93	0.0	0.0	0.0	17.9
09/28/93	0.0	0.0	0.0	16.6
10/26/93	0.0	0.0	0.0	18.6
12/03/93	0.0	0.0	0.0	18.5
12/29/93	0.0	0.0	0.0	18.2

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE GPW-1M

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	+1.5	0.0	0.0	18.0
03/01/93	+0.5	0.0	0.0	17.7
03/30/93	+0.25	0.1	0.0	17.8
04/27/93	+0.25	0.0	0.0	19.1
05/18/93	0.0	0.0	0.0	20.7
06/28/93	-0.5	0.1	2.0	21.0
07/27/93	0.0	0.0	0.0	20.7
08/30/93	-0.5	0.0	0.0	19.2
09/28/93	0.0	0.0	0.0	20.8
10/26/93	SLIGHT NEG	0.0	0.0	20.6
12/03/93	SLIGHT NEG	0.0	0.0	20.9
12/29/93	0.0	N/A	N/A	17.7

N/A: Not Available

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

GAS PROBE GPW-1D

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	+1.5	0.0	0.0	17.7
03/01/93	+0.5	0.0	0.0	17.7
03/30/93	+0.5	0.0	0.0	17.8
04/27/93	+0.25	0.0	0.0	17.8
05/18/93	0.0	0.0	0.0	18.6
06/28/93	-0.5	0.0	0.0	20.9
07/27/93	0.0	0.0	0.0	18.0
08/30/93	-0.5	0.0	0.0	17.1
09/28/93	0.0	0.0	0.0	17.9
10/26/93	SLIGHT NEG	0.0	0.0	20.9
12/03/93	SLIGHT NEG	0.0	0.0	20.9
12/29/93	0.0	0.0	0.0	17.4

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

SPEEDWAY SCALE HOUSE

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	N/A	N/A	N/A	N/A
03/01/93	N/A	0.0	0.0	20.6
03/30/93	N/A	0.0	0.0	20.6
04/27/93	N/A	0.0	0.0	20.0
05/18/93	N/A	0.0	0.0	20.7
06/28/93	N/A	0.0	0.0	20.9
07/27/93	N/A	0.0	0.0	20.4
08/30/93	N/A	0.0	0.0	20.9
09/28/93	N/A	0.0	0.0	20.2
10/26/93	N/A	0.0	0.0	20.4
12/03/93	N/A	0.0	0.0	20.5
12/29/93	N/A	0.0	0.0	22.1

N/A: Not Available, Not Applicable

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

REFUSE HIDEAWAY LANDFILL
GAS PROBE MONITORING SUMMARY 1993

SPEEDWAY BUILDING
MECHANICS SHOP

DATE	PRESSURE (in. WC)	METHANE (%CH4)	METHANE (%LEL)[1]	OXYGEN (%02)
01/30/93	N/A	N/A	N/A	N/A
03/01/93	N/A	0.0	0.0	20.6
03/30/93	N/A	0.0	0.0	20.6
04/27/93	N/A	0.0	0.0	20.0
05/18/93	N/A	0.0	0.0	20.7
06/28/93	N/A	0.0	0.0	20.9
07/27/93	N/A	0.0	0.0	20.4
08/30/93	N/A	0.0	0.0	21.0
09/28/93	N/A	0.0	0.0	20.2
10/26/93	N/A	0.0	0.0	20.4
12/03/93	N/A	0.0	0.0	20.5
12/29/93	N/A	0.0	0.0	21.0

N/A: Not Available, Not Applicable

(1) Percent of lower explosive limit of Methane (100% LEL = 5% CH4 by volume)

REFUSE\gaspro93.tbl

TABLE 3

LEACHATE HEAD SUMMARY

REFUSE HIDEWAY LANDFILL
LEACHATE HEAD MONITORING
SUMMARY 1993

pumps added in 10/93

DATE	LEACHATE HEAD (FEET)												
	GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	GW-7	GW-8 *	GW-9 *	GW-10	GW-11 *	GW-12	GW-13
01-28-93	2.5	5.2	1.0	11.2	10.7	0.0	6.0	17.0	18.5	5.0	16.4	15.6	7.8
03-01-93	2.7	4.8	7.0	10.5	10.3	0.0	4.6	23.2	0.0	4.8	0.0	23.8	7.7
03-30-93	2.7	4.5	0.7	10.8	10.0	0.0	5.8	9.9	20.6	4.9	10.0	17.0	8.0
04-26-93	3.0	4.5	0.7	8.7	0.6	0.1	5.9	12.5	0.0	4.8	10.5	18.0	8.8
05-18-93	3.5	4.8	0.7	12.7	11.9	0.4	6.6	4.5	0.0	4.3	2.3	19.0	9.4
06-28-93	4.1	5.2	0.8	12.0	12.4	0.3	5.9	23.7	20.3	5.1	2.3	20.1	9.3
07-30-93	3.9	5.0	0.7	12.2	12.2	0.5	7.4	12.7	0.0	4.8	0.0	21.2	9.7
08-30-93	3.6	5.5	1.1	12.5	19.8	0.1	7.9	N/A	0.0	5.3	2.5	6.0	11.1
09-28-93	3.8	4.9	0.8	12.2	13.1	0.0	7.7	16.0	N/A	5.5	18.3	21.4	10.0
10-27-93	3.9	5.1	0.9	6.7	13.0	0.0	9.8	13.8	22.2	4.3	2.4	22.5	11.8
12-03-93	4.2	5.5	0.2	0.0	18.3	0.0	2.5	0.0	0.0	4.7	0.0	20.8	6.1
12-23-93	2.4	4.7	0.5	10.5	33.7	1.0	6.7	30.0	0.0	6.7	6.2	22.0	6.5

N/A: Not Available

REFUSE\kaj02

TABLE 4

LEACHATE / CONDENSATE

LOAD OUT SUMMARY

REFUSE HIDEAWAY LANDFILL
LEACHATE LOADOUT SUMMARY FOR 1993

DATE	GALLONS	MONTHLY TOTAL (Gals)	
JANUARY 4, 1993	2767		
JANUARY 19, 1993	1887	JANUARY	4654
FEBRUARY 1, 1993	2815		
FEBRUARY 12, 1993	4580		
FEBRUARY. 19, 1993	4532	FEBRUARY	11927
MARCH 11, 1993	4246		
MARCH 25, 1993	4214	MARCH	8460
APRIL 16, 1993	4536		
APRIL 17, 1993	6888		
APRIL 20, 1993	4387	APRIL	15811
MAY 8, 1993	4429		
MAY 20, 1993	4473	MAY	8902
JUNE 12, 1993	3905		
JUNE 18, 1993	2622	JUNE	6527
JULY 7, 1993	2383		
JULY 14, 1993	15311 (3.5 LOADS)	JULY	17694
AUGUST 13, 1993	2633		
AUGUST 23, 1993	2461		
AUGUST 24, 1993	4791		
AUGUST 26, 1993	5032	AUGUST	14917
SEPTEMBER 16, 1993	4848		
SEPTEMBER 24, 1993	2658	SEPTEMBER	7506
OCTOBER 20, 1993	4695	OCTOBER	4695
NOVEMBER 10, 1993	5140		
NOVEMBER 11, 1993	4889		
NOVEMBER 23, 1993	4878	NOVEMBER	14907
DECEMBER 3, 1993	5123		
DECEMBER 4, 1993	5139		
DECEMBER 10, 1993	4887		
DECEMBER 10, 1993	2114		
DECEMBER 16, 1993	5020		
DECEMBER 23, 1993	3062		
DECEMBER 31, 1993	3243	DECEMBER	28588
	TOTAL = 144588		

TABLE 5

ALARM CONDITION

SUMMARY

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
January 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
1/4/93	Unknown, no alarm received from Verbatim system. Low battery indicated, but power still on to system. When power was switched off, Verbatim indicated alarm condition.	Restarted (17hrs)
1/11/93	Thermocoupler malfunction.	Troubleshoot flare and thermocoupler. Order replacement from Linklater and replace thermocoupler on 1/23/93. (312 hours)

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
February 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
2/14/93	Unknown, no alarm received from Verbatim system. Low temperature alarm disengaged on flare.	Restarted (37 hrs)
2/25/93	Flame out. Possibly due to high winds.	Restarted (4 hrs)

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
March 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
3-20-93	Cause Could Not Be Determined	Flare Down for Approximately 2 hours.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: April 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
APRIL 12, 1993	GENERAL ALARM CONDITION	RE-START FLARE. FLARE DOWN FOR 8 HOURS.
APRIL 20, 1993	GENERAL ALARM CONDITION DUE TO ELECTRICAL OUTAGE	RE-START FLARE FLARE DOWN FOR 3 HOURS.

ECRS\Refuse\forms1.bjh/KJS/ak'd BJH
6/4/93

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: June 9, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
May 8, 1993	General Alarm condition due to Thunderstorms in the area.	Re-start Flare later the same day. Flare was down for 8.5 hours.
May 18, 1993	Flame Failure while ECRS personnel on site.	Re-start Flare the same day. Flare was down for 15 minutes.
May 29, 1993	Flame Failure, possibly due to low flow.	Re-start Flare on June 1, 1993 and adjust value to increase flow. Flare down 73 hours.

ECRS\Refuse\forms1.bjh

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: July 22, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
06/07/93	General alarm condition possibly due to thunder storms in the area..	Re-start flare. Flare was down for 3.25 hrs.
06/12/93	Flame failure alarm - cause not determined	Re-start flare. Flare was down for 23.25 hrs.
06/14/93	General alarm condition due to Erroneous High Leachate alarm. Flare did not shut down.	Re-set alarm on leachate tank control panel.
06/17/93 06/17/93	General alarm condition due to false High Leachate alarm. Flame failure - cause not determined.	Re-start flare, re-set High Leachate Level alarm. Flare was down 19.5 hrs.
06/25/93	No alarm condition alerted. Cause for flare shut down and absence of alarm not determined.	Re-start flare. Flare was down approximately 21.0 hrs.
06/28/93	Flame failure three times this date. Cause not determined.	Re-start flare. Flare was down approximately 0.5 hrs.
06/30/93 06/30/93	Flame failure - cause not determined. General alarm and flame failure likely due to high winds and lightning in area.	Re-start flare. Flare was down approximately 0.25 hrs. Re-start flare, flare was down approximately 5.0 hrs.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: AUGUST 5, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
July 5, 1993	General alarm. "False" high leachate alarm	Attempted to re-set leachate tank alarm on 7/5/93, but it would not reset. Able to re-set alarm on 7/7/93.* Flare did not shut down.
July 6, 1993	Flame failure possibly due to U.V. Sensor or due to time relay switch which shuts system down if leachate tank alarm is not re-set after a certain period of time,	Re-acknowledge leachate tank alarm, re-start flare on 7/6/93. Flare was down for 9 hours.
July 7, 1993*	No alarm. Able to re-set high leachate alarm	N/A
July 15, 1993	Flame failure possibly due to a dirty U.V. Sensor at the flare.	Clean U.V. Sensor. Re-start Flare. Flare was down for 4.5 hours.
July 28, 1993	General alarm, possibly due to U.V. Sensor	Re-start flare. Flare was down for 4.0 hours.
July 30, 193	Flare went down while KJS on sight due to possible U.V. Sensor.	Re-start flare. Flare was down for 1.0 hours.

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: September 14, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
08/10/93	Flame failure possibly due to a sensitive vacuum switch.	Flare went down while gas wells were being monitored. Restart flare. (Time down: 20 minutes).
08/14/93	Flame failure possibly due to a sensitive vacuum switch.	Re-start flare on August 15, 1993. (Time down: 21 hours 50 minutes).
08/30/93	Flame failure possibly due to a sensitive vacuum switch.	Flare went down while gas wells were being monitored. Restart flare. (Time down: 1 hour).

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: October 18, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
09/13/93	Low temperature alarm due to damper over switch was in the "off" position.	Re-start flare, switch damper override switch to "auto" position.(Flare down 1.25 hours).
09/13/93	General alarm condition due to false high leachate alarm.	Re-set alarm. Flare does not shut down due to high leachate alarm. Electricity to pumps is shut down during a high leachate alarm condition.
09/28/93	Two general alarms due to flare failure likely caused by sensitive vacuum switch.	Re-start flare. Terra personnel on-site during shut downs. (Flare down .25 hours).

Refuse\forms1.bjh

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: November 11, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
10/17/93	General alarm erroneous high leachate alarm	Re-set alarm at leachate tank panel. Flare did not shut down.
10/20/93	General alarm - flame failure	Re-start flare, cause for shut down not (2 hrs)
10/21/93	General alarm erroneous high leachate alarm	Re-set alarm after tightening electrical connections. Flare did not shut down.
10/22/93	Manual shut down of flare due to flame exiting the top of the flare.	Re-start flare (76 hrs.)

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: December 4, 1993

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
11/08/93	Flame Failure likely due to vacuum switch.	Terra personnel on-site. Re-start Flare. (Flare down 0.5 hrs.)
11/09/93	Flame Failure likely due to low Flow to Flare.	Re-start flare. (Flare down 1.25 hrs.)
11/09/93	Flame Failure likely due to low Flow to Flare.	Re-start flare. (Flare down 0.33 hrs.)
11/10/93	Manual shut down for Flare painting.	Re-start flare after painting. (Flare down 24.5 hrs.)
12/03/93	Flare shut down four (4) times due to vacuum switches which are occassionally activated during well monitoring.	Re-start flare. (Flare was down for a total of 0.25 hrs.)

Refuse\forms1.bjh

TABLE 5

REFUSE HIDEAWAY LANDFILL
MONTHLY SUMMARY OF SYSTEM ALARM LOG
Date: January 17, 1994

Alarm Dates	Alarm Cause	Solution (hours flare not operational)
12/23/1993	Flame failure likely due to vacuum switch sensing change in header pressure while obtaining leachate head measurements.	Re-start flare after obtaining leachate head measurements. (Flare down 1 hour)
12/25/1993	Low Temperature alarm condition alerted at 12:15 am.	Flare operational re-set alarm.
12/25/1993	High Temperature alarm condition at 8:25 pm.	Flare shut down. Thermocouple failure. Replace thermocouple (pending).

APPENDIX 1

CONSTRUCTION OBSERVATION REPORT:

SHALLOW GAS RECOVERY AND LEACHATE HEAD REDUCTION SYSTEM INSTALLATION

TERRA

▲ ENGINEERING & CONSTRUCTION CORPORATION ▲

ENVIRONMENTAL REMEDIATION
MUNICIPAL & UTILITY CONSTRUCTION
SPECIALTY EARTHWORK

CONSTRUCTION OBSERVATION REPORT

Shallow Gas Recovery and
Leachate Head Reduction System Installation

Refuse Hideaway Landfill
Town of Middleton
Dane County, Wisconsin

Prepared for:

Wisconsin Department of Natural Resources
101 South Webster Street
Madison, Wisconsin

Prepared by:

Terra Engineering and Construction Corp.
2201 Vondron Road
Madison, Wisconsin

February 11, 1994

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MADISON, WI 53704-6795
608/221-3501 PHONE
608/221-4075 FAX

TABLE OF CONTENTS

CONSTRUCTION ACTIVITIES OBSERVED

ATTACHMENTS

CONSTRUCTION OBSERVATION REPORT

Shallow Gas Recovery and Leachate Head Reduction
System Installation

Refuse Hideaway Landfill
Town of Middleton
Dane County, Wisconsin

INTRODUCTION

This report describes construction activities performed during the installation of two (2) shallow lateral gas recovery wells as well as the placement of five (5) permanent leachate pumps. Restoration of the clay cap and cover is also addressed in this report.

SITE DESCRIPTION

The Refuse Hideaway Landfill is located in the NW 1/4 of Sec 8 T7N-R8E in Dane County and is currently closed.

There are thirteen (13) existing landfill gas extraction wells located on the site. The wells were installed in 1991 in order to control off-site migration of landfill gas. Vacuum to the wells is provided by a blower located in the Blower House. The landfill gas is piped via a 6" HDPE header pipe, to an enclosed flare where it is burned.

There are permanent leachate head reduction pumps located in three gas wells (GW-8, GW-9 and GW-11). The submersible pumps are outfitted with hour meters, Coyote pump controls and Franklin starters. The leachate is discharged from the wells, into a leachate conveyance system which consists of approximately 800 lineal feet of piping. The leachate is collected in a buried 25,000 gallon collection tank. The conveyance piping also transports condensate which accumulates within the active header piping. The condensate is transferred to the conveyance pipe through 4 drip legs located along the header piping.

BACKGROUND

Observations made during monthly activities dating back to July of 1993 showed the following:

- Elevated landfill gas concentrations at the facility property line in gas probe GP-11
- Stressed vegetation in the area of gas well GW-5
- Landfill gas emanating from the landfill surface in the vicinity of gas well GW-5
- Elevated leachate levels in five gas wells, GW-4, 5, 7, 12 and 13

PURPOSE AND SCOPE

In an effort to remediate the above mentioned conditions and to comply with the regulatory requirement of maintaining less than 1.25% methane by volume in air at the property line, it was decided that two shallow gas lateral wells should be installed, as well as installing permanent leachate head reduction pumps in those wells which showed elevated leachate levels.

The lateral wells would be placed in the areas adjacent to Gas Well GW-5. The enhanced gas recovery in this area would lead to decreased migration and healthier vegetation as gas would not be emanating through the cap and harming the existing vegetation. The elevated leachate heads would be decreased by installing five (5) permanent pumps into the gas wells showing the greatest head. Decreasing the leachate head would improve the gas extraction system by opening more screen in each well.

In order to facilitate the upgrade of the existing gas and leachate extraction systems, five (5) gas wells heads (GW-4, 5, 7, 12, 13) were retrofitted.

The purpose of the retrofit to the five (5) gas wells is to allow the leachate pumped from each gas well to be discharged into the existing vacuum header pipe, which transports the leachate to the collection tank via gravity flow.

A retro-fit of the header pipe at gas well GW-5 was also performed in order to use the existing vacuum from the header pipe for use in the two (2) lateral gas wells installed in the area of gas well GW-5. Drawings of the header pipe retro-fit and the typical well head retro-fit are attached.

Construction Activities Observed

GAS EXTRACTION

Excavation for the installation of the shallow gas lateral wells in the area of gas well GW-5 began the week of September 6, 1993. The lateral wells extend from gas well GW-5, one in a Northwesterly direction for 155 feet, the other trends in a East Northeast direction for 95 feet. A plan of the area of the lateral gas wells is attached.

GAS EXTRACTION (CON'T)

The lateral wells are constructed of 4-inch perforated High Density Polyethylene (HDPE) which are fused onto 2-inch solid HDPE pipe. The 2-inch solid HDPE pipe are connected to the existing vacuum header riser at gas well GW-5. A drawing of the lateral gas well detailed is attached.

Trenching for the lateral gas wells extended down into the refuse. The depth of the trenches varied from 5 to 15 feet below ground surface. Prior to the placement of the perforated HDPE extraction pipe into the trench, a 6 inch layer of gravel bedding was spread across the base of the trench. After placement, the perforated pipe was then covered with approximately 6 inches of the same bedding material. The gravel bedding is used to prevent the perforations from becoming blocked by refuse or soil. The trenches were backfilled with the previously excavated refuse to with-in approximately 2.5 feet of the surface. The remaining 2.5 feet was backfilled with the previously excavated cap material, compacted with a sheepfoot compactor and covered with topsoil. Prior to placement of cover soil, eight (8) field density test were conducted on the compacted clay, results of the density tests are tabulated in this report. The test results show that the clay was recompacted to at least 90% of the maximum density of the clay cap material. A maximum density of 118 pounds per cubic foot (pcf) was used based on previous moisture-density tests performed on the clay cap material. Refer to Construction Observation Reports for Clay Cap Restoration (Dames and Moore 1992) and Partial Gas and Leachate Extraction System Interim Remedial Measures (Warzyn, November 1990). Copies of the three (3) moisture density curves are attached.

In order to increase the efficiency of the lateral gas wells, each trench contained a length of 4-inch perforated HDPE pipe adjacent to a 4-inch HDPE solid pipe extending from gas well GW-5 for half the length of the trench. The perforated HDPE extracts landfill gas from the first half of the trench. The solid HDPE extends the vacuum header pipe to the second half of the trench where a length of perforated HDPE extracts landfill gas from the remaining length of the trench. In doing this, a consistent vacuum is maintained through out the length of the trench.

At the end of each lateral trench, a one-inch polyvinyl chloride (PVC) riser was installed for future pressure and gas monitoring. The vacuum header retro-fit at GW-5 also included a ball valve on each lateral header pipe, which may be adjusted to increase or decrease the vacuum to the lateral system. A photo of the well head retrofit is attached.

CLAY CAP REPAIR

The area of cap repair included areas larger than the lateral gas well trenches. These were areas of stressed vegetation and erosion where landfill gas had been emanating through the cap.

The irregular shaped areas adjacent to the trenches are shown on an attached plan. The cap repair in these areas entailed removal of approximately 18 inches of root zone material, scarifying and recompacting the existing clay cap material, re-establishing the root zone and placing approximately 6 inches of topsoil over the areas. Density test performed in these areas indicated compaction of the clay cap material met or exceeded 90% compaction. Refer to the tabulated density test results. Density tests were performed using Troxler nuclear density testing equipment (ASTM D2922).

CLAY CAP REPAIR (CON'T)

Following backfill and compaction of the clay cap, the repaired areas received approximately 4-inches of topsoil, seed and mulch. The seed is a "Quick-2-GRO Lawn Seed Mixture" composed of 24.5% creeping red fescue, 24.5% perennial rye grass, 24.23% annual rye grass and 21.25% Kentucky Bluegrass with the remainder containing inert matter, other crop seed and weed seed.

LEACHATE EXTRACTION

In an effort to reduce elevated leachate heads in gas wells GW-4, 5, 7, 12 and 13, a permanent submersible pump was installed in each of these gas wells.

Electrical power for the new pumps is provided from the existing electrical panel located adjacent to the Blower/Flare Control Panel. Town and Country Electric of Madison was subcontracted to install all wiring for the permanent pumps. A layout of the trenching for the electrical conduit to the five (5) gas wells is attached.

At each gas well out-fitted with a permanent pump, a pump panel was installed. The weatherproof panel contains pump controls which include a fuse box, Franklin pump starter, Coyote Control, GFI electrical outlet and a pump hour meter.

The Coyote Control is used as an automatic on-off switch for the pump. Once started, the Coyote Control senses the amperage required to pump leachate from the gas well. A change in amperage occurs when the pump "spins free" i.e. reduces the leachate head past the pump intake, or if there is blockage in the discharge hose. In the former case, an underload condition is indicated on the controls, an overload condition occurs in the latter case. If either condition occurs, the power to the pump is shut off. The power to the pump remains off for a set period of time. During this "down" time the well recharges and once power is restored, leachate can once again be pumped from the well. The pump hour meters run only when the pump runs. The meters are used to not only estimate a pumping volume, but also as a diagnostic as to weather or not the pump is pumping too often, or not enough. A photo of a typical control panel is included in this report.

Trenching for electrical conduit installation from the existing electrical panel to the individual gas wells began on October 7, 1993. The trenches were typically 18-inches deep and were backfilled with the same excavated material. Compaction of the shallow trenches was performed with rubber tired equipment.

Once the wires were pulled through the 1/2-inch conduit, the pump panels located at each well were wired. The electrical wires are run through a 1/2 inch conduit from the panel to the gas well riser. A junction box is strapped to the gas well head. The submersible pump wire leads are routed through the gas well riser into the junction box where the power connection is made. The conduit from the pump panel to the junction box includes a "seal off" to prevent methane from entering the pump panel through the conduit.

LEACHATE EXTRACTION (CON'T)

The pumps were installed by Terra personnel on October 25 and 27, 1993. The pumps were set at a depth to remain approximately 1 to 2 feet above the bottom of the well. The pumps are supported by 1/4-inch stainless steel cable that is attached to the well head flange through an eye bolt. Leachate is discharged through a 1-inch reinforced flexible hose. The flexible hose is connected to a stainless steel stab fitting and a nipple which is threaded through the gas well flange. A ball valve was installed to control discharge flow. A 1-inch true union connects the ball valve to the 1-inch coated steel to HDPE transition fitting. The transition fitting was then fused to the vacuum header riser. The exposed HDPE was then insulated, taped and painted with a ultra violet protection paint.Leachate pumped from the gas wells and discharged into the vacuum header pipe is eventually discharged into to 25,000 gallon buried collection tank through the leachate/condensate conveyance line via existing driplegs located along the vacuum header pipe. A drawing of the typical Gas/Leachate Extraction Well retrofit is attached.

SYSTEM START-UP

Monthly monitoring of the permanent pumps in gas wells GW-4, 5, 7, 12 and 13 began in October, 1993. Based on early pump hour meter readings, problems were discovered in gas wells GW-5 and GW-13. The problem in GW-5 was a blown fuse which was corrected. The problem in GW-13 appeared to be a malfunctioning pump. The pump was removed, bench tested and returned to the supplier. A replacement pump was installed on November 9, 1993.

GENERAL NOTES

The installation of the five (5) permanent pumps had an immediate effect on the volume of leachate hauled off-site. The increase in leachate volume removed is not expected to continue as the recharge time for the gas wells has increased compared to the recharge time experienced when pumping began. The leachate heads have been reduced in some wells. Further pumping will be necessary before a more noticeable decrease in leachate head is observed.

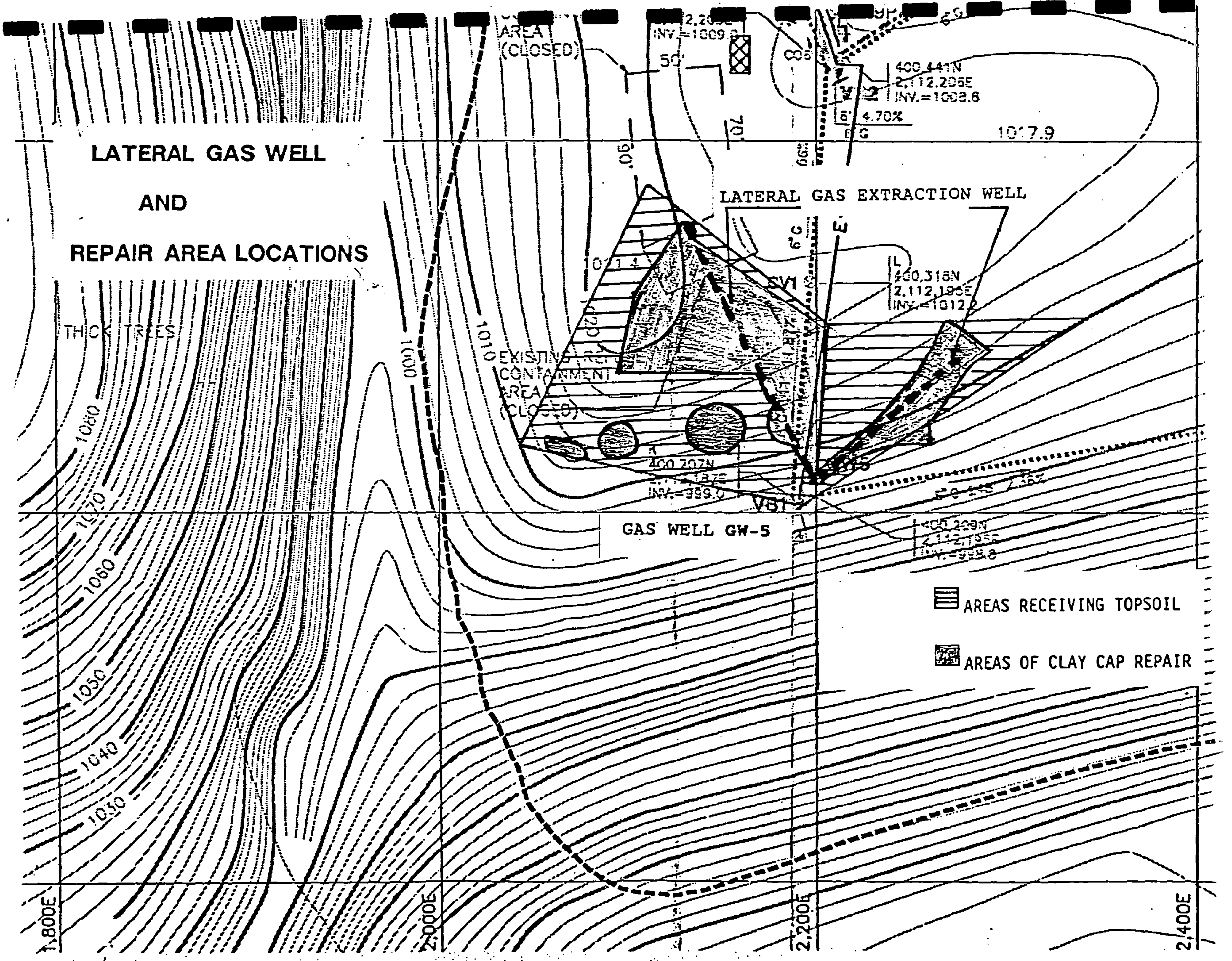
The effects of the lateral gas wells on the stressed vegetation around gas well GW-5 may take some time to notice as the seed had not sprouted prior to snow covering the area. There was a noticeable decrease in the percent of methane observed in gas probes 11 - shallow and deep. Historical data of this site suggests that there is a drop in migration due to the seasonal change. Continued monthly monitoring and comparisons with past data will be needed before determining the effects of the lateral gas extraction wells.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,
TERRA ENGINEERING & CONSTRUCTION CORP.

Kirk Solberg

Kirk J. Solberg
Environmental Geologist



LATERAL GAS WELL
AND
REPAIR AREA LOCATIONS
LATERAL GAS EXTRACTION WELL
GAS WELL GW-5
AREAS RECEIVING TOPSOIL
AREAS OF CLAY CAP REPAIR
THICK TREES
EXISTING
CONTAINMENT
AREA
(CLOSED)
1017.9
400,441N
2,112,206E
INV.=1008.6
4.70%
400,316N
2,112,195E
400,207N
INV.=999.0
400,209N
1,800E
2,000E
2,200E
2,400E
1080
1070
1060
1050
1040
1030
1010
1000

TABLE 1

DENSITY TEST RESULTS

TEST #	SOIL TEST	LOCATION	ELEVATION	MAX DENSITY (PCF)	WET DENSITY (PCF)	% MOISTURE	DRY DENSITY (PCF)	% PROCTOR
1	BROWN CLAY	45 FT NE OF GW-5	1.5 BELOW GROUND SURFACE	118	131.6	20.6	109.1	92.5
2	BROWN CLAY	90 FT NE OF GW-5	1.5 BELOW GROUND SURFACE	118	130.4	20.8	108.0	91.5
3	BROWN CLAY	40 FT NE OF GW-5	0.5 FT BELOW GROUND SURFACE	118	132.0	20.8	109.2	92.5
4	BROWN CLAY	85 FT NE OF GW-5	0.5 FT BELOW GROUND SURFACE	118	129.6	21.5	106.6	90.4
5	BROWN CLAY	70 FT WEST OF GW-5	1.5 FT BELOW GROUND SURFACE	118	130.3	21.9	106.8	90.5
6	BROWN CLAY	120 FT WEST OF GW-5	1.5 FT BELOW GROUND SURFACE	118	132.5	21.4	109.2	92.5
7	BROWN CLAY	75 FT WEST OF GW-5	0.5 FT BELOW GROUND SURFACE	118	130.4	22.0	106.9	90.6
8	BROWN CLAY	115 FT WEST OF GW-5	0.5 FT BELOW GROUND SURFACE	118	132.9	21.0	109.8	93.1

REFUSE\kaj01.tab

WARZYN

MOISTURE - DENSITY CURVE

PROJECT: REFUSE HIDEAWAY

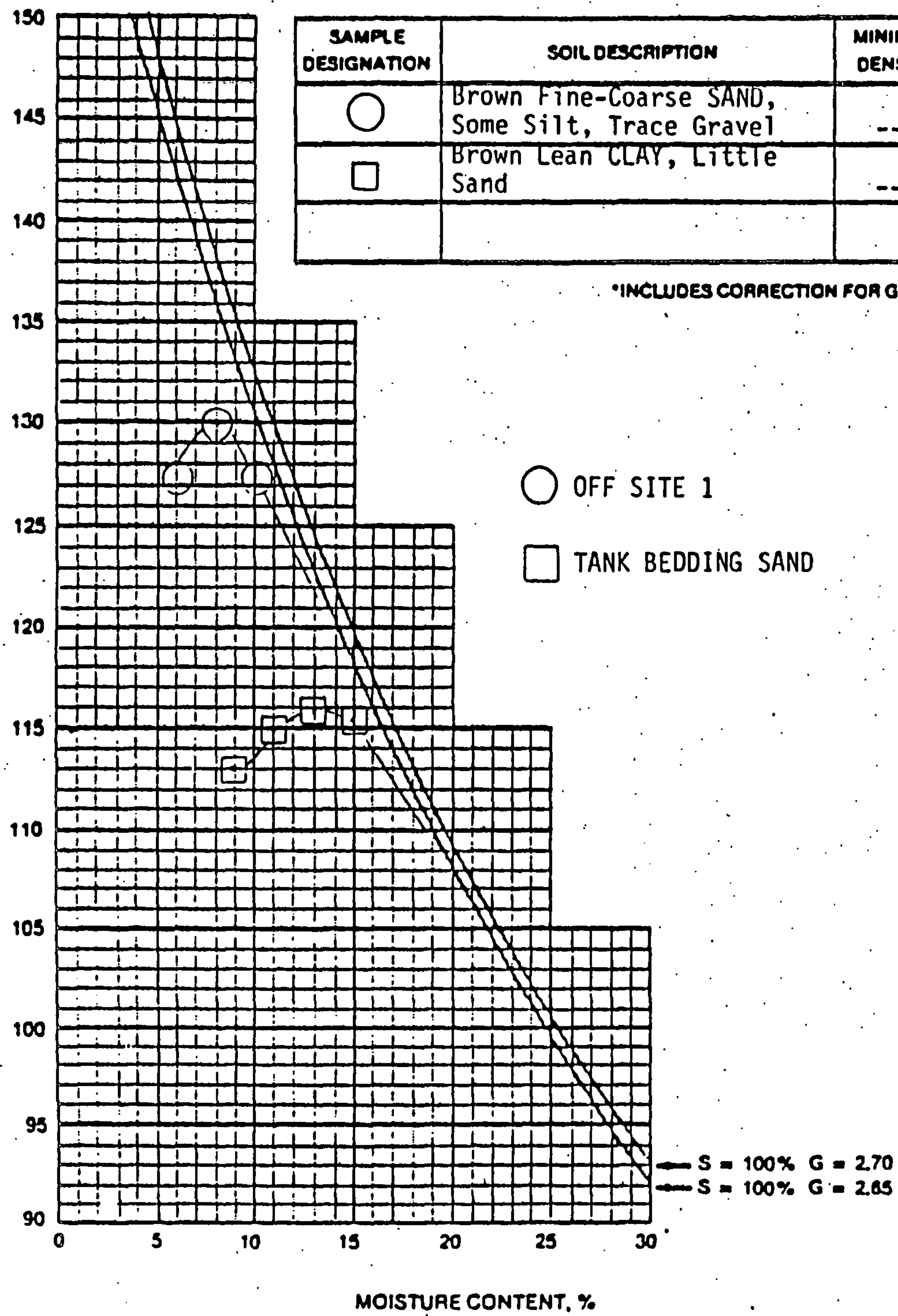
LOCATION: TOWN OF MIDDLETON

FDT Report No. ____
Job No. 13928.45
Date 5/9/90
Sheet 1 of 1

WARZYN ENGINEERING INC. • ONE SCIENCE COURT • UNIVERSITY RESEARCH PARK • P.O. BOX 5385 • MADISON, WISCONSIN 53705

SAMPLE DESIGNATION	SOIL DESCRIPTION	MINIMUM DENSITY	MAXIMUM DENSITY	OPTIMUM MOISTURE
○	Brown Fine-Coarse SAND, Some Silt, Trace Gravel	--	130 pcf	8 %
□	Brown Lean CLAY, Little Sand	--	116 pcf	13 %

*INCLUDES CORRECTION FOR GRAVEL RETAINED ON 3/4 IN. SIEVE



TEST METHOD: ☒ MODIFIED PROCTOR
☐ STANDARD PROCTOR

FM. NO 30-03.

WARZYN

MOISTURE · DENSITY CURVE

PROJECT: REFUSE HIDEAWAY

LOCATION: TOWN OF MIDDLETON

FDT Report No. ______

Job No. 13928.45

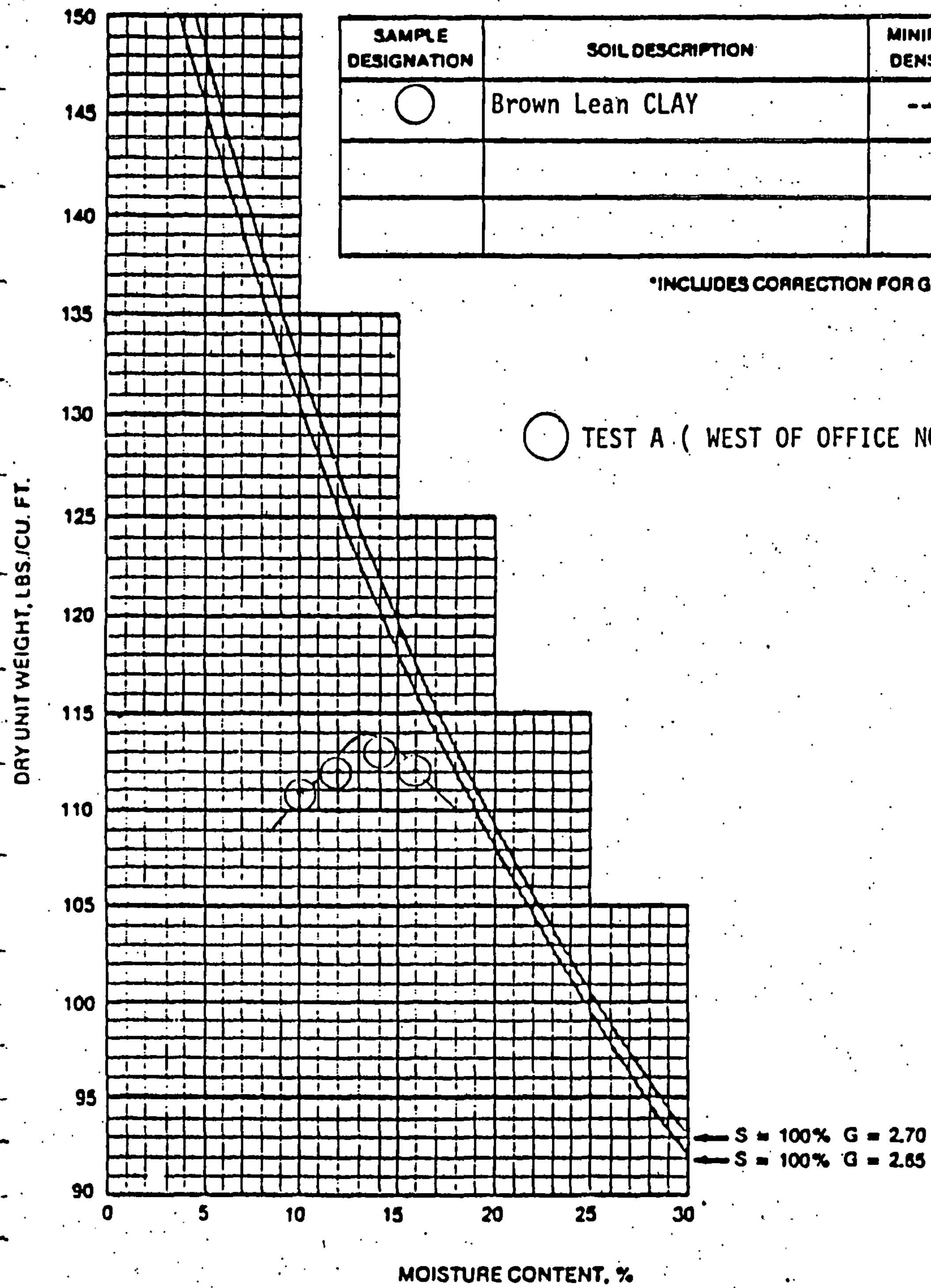
Date 5/9/90

Sheet ______ of ______

WARZYN ENGINEERING INC. • ONE SCIENCE COURT • UNIVERSITY RESEARCH PARK • P.O. BOX 5385 • MADISON, WISCONSIN 53705

SAMPLE DESIGNATION	SOIL DESCRIPTION	MINIMUM DENSITY	MAXIMUM DENSITY	OPTIMUM MOISTURE
○	Brown Lean CLAY	--	114 pcf	15 %

*INCLUDES CORRECTION FOR GRAVEL RETAINED ON 3/4 IN. SIEVE



TEST METHOD: ☒ MODIFIED PROCTOR ☐ STANDARD PROCTOR

FORM. NO 30-03

SAMPLE NO. Bulk DEPTH ______ ELEVATION ______

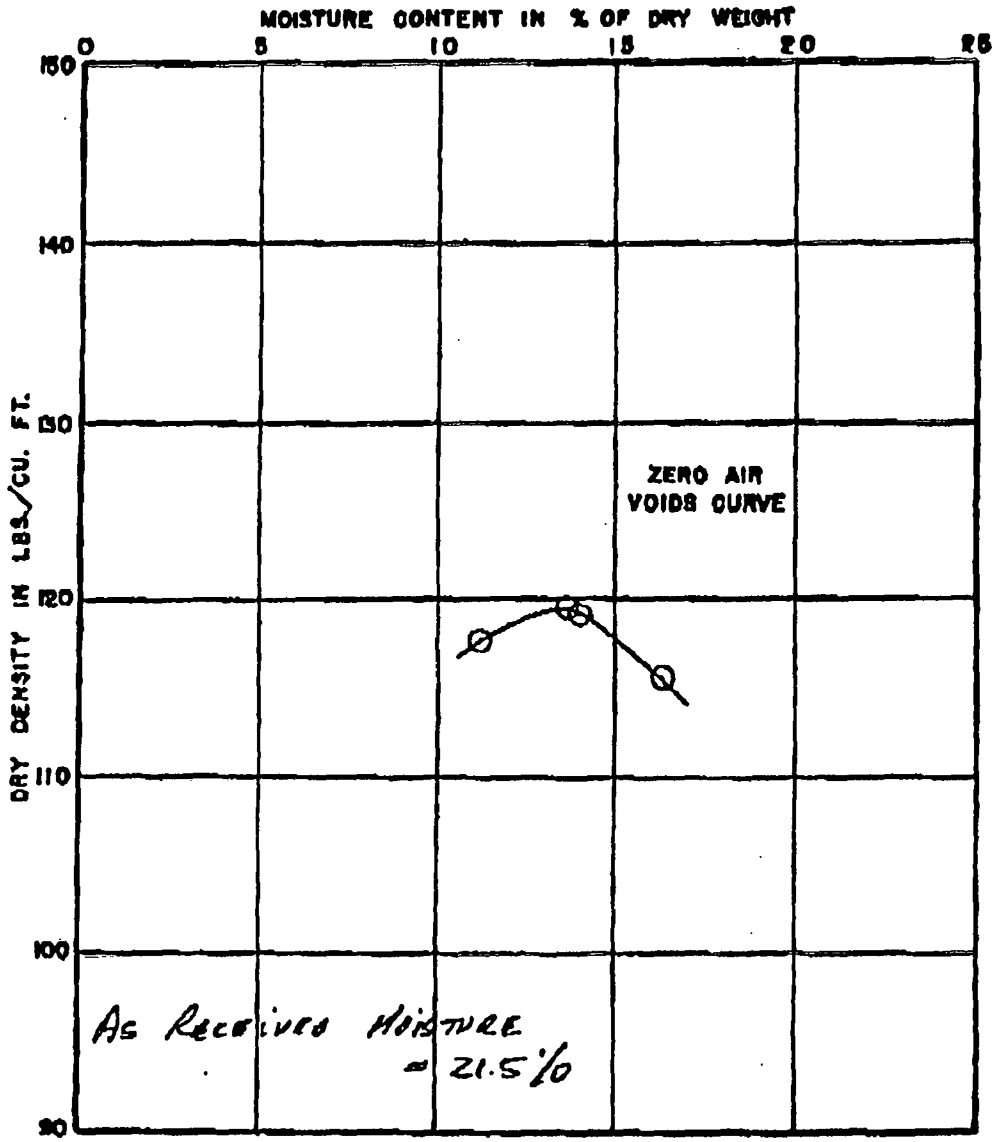
SOIL CL Clay Cap

LOCATION Hideaway Landfill Middleton, WI.

OPTIMUM MOISTURE CONTENT 13.7 %

MAXIMUM DRY DENSITY 119.3 pcf

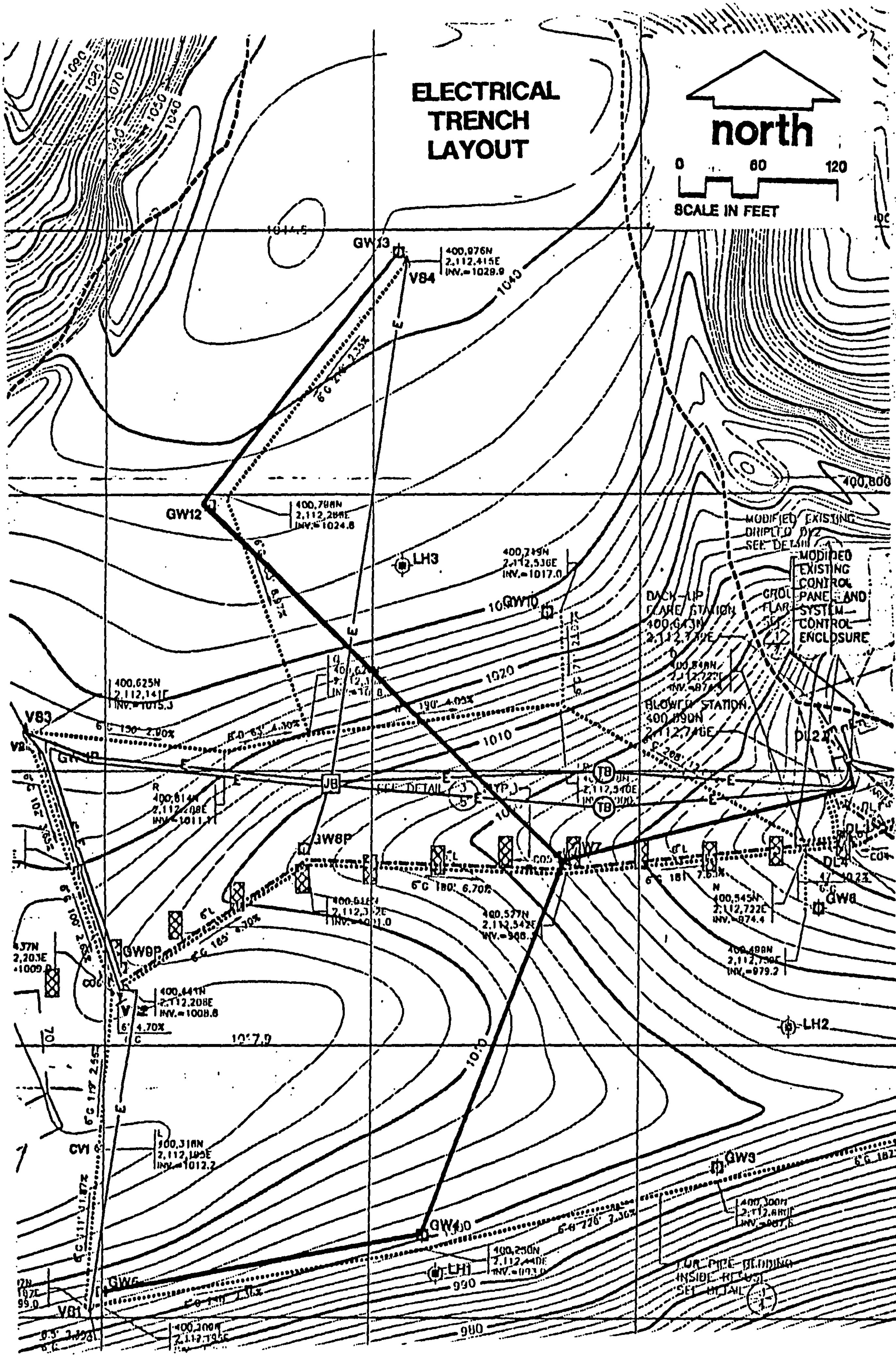
METHOD OF COMPACTION ASTM D1557 Procedure A



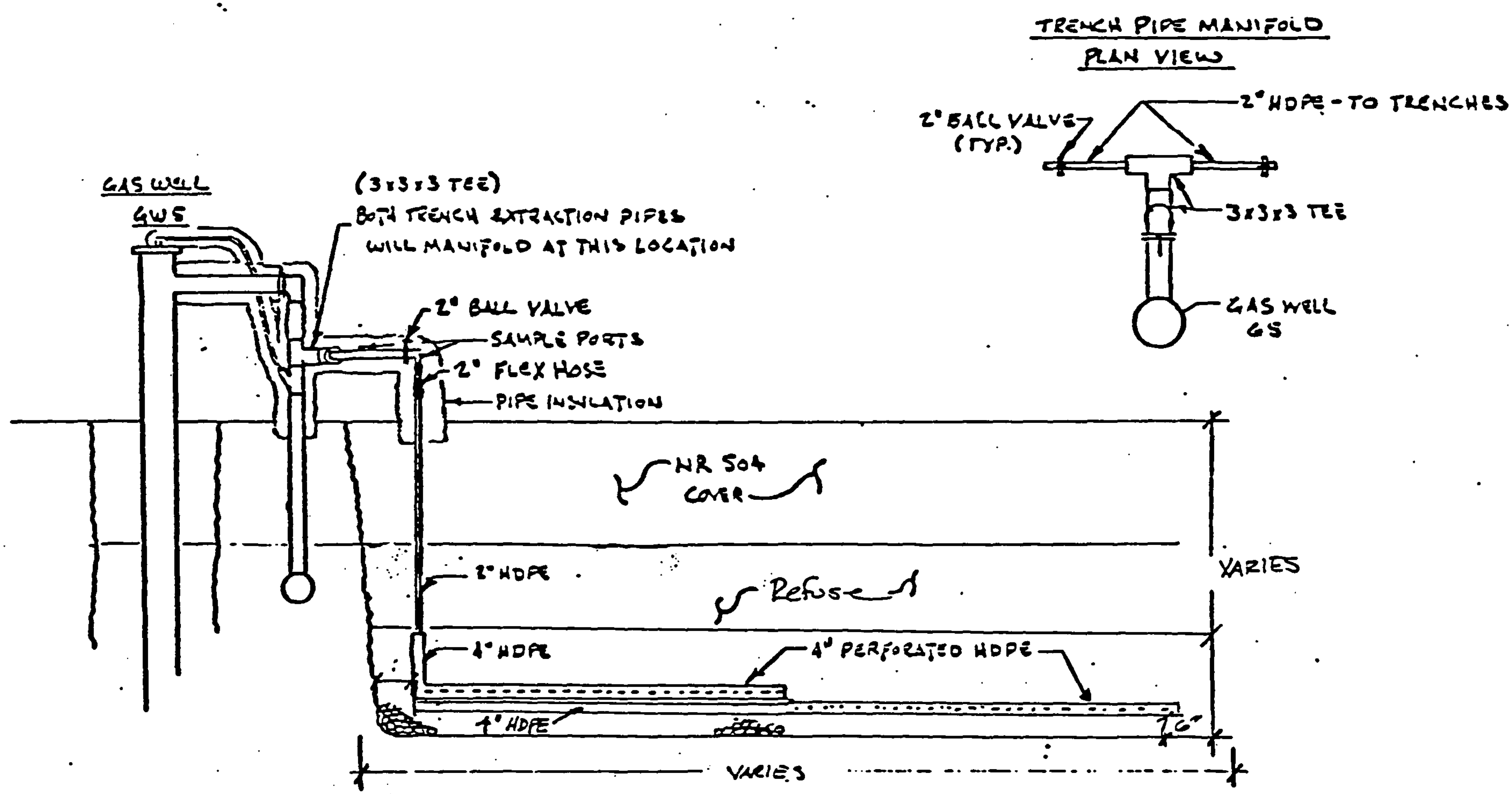
COMPACTION TEST DATA

FILE 17655-005 BY [illegible] DATE 7/14 CHECKED BY ______ DATE ______

Dames & Moore



ELECTRICAL
TRENCH
LAYOUT
north
0
60
120
SCALE IN FEET
GW13
400,876N
2,112,415E
INV.=1029.9
V84
1040
GW12
400,788N
2,112,288E
INV.=1024.8
LH3
400,749N
2,112,536E
INV.=1017.0
GW10
400,800
MODIFIED
EXISTING
CONTROL
PANEL AND
SYSTEM
CONTROL
ENCLOSURE
1020
400,625N
2,112,141E
INV.=1015.3
BLOWER STATION
V83
6"C 130' 2.00%
1010
JB
TB
DL2
GW8P
GW7
DL4
6"G 180' 6.70%
GW8
400,545N
2,112,722E
INV.=974.4
400,498N
2,112,730E
INV.=979.2
GW9P
400,641N
2,112,208E
INV.=1008.8
6" 4.70%
LH2
CV1
400,318N
2,112,195E
INV.=1012.2
GW3
GW4
LH1
GW5
V81
990
980



GAS WELL GW-5 RETRO-FIT

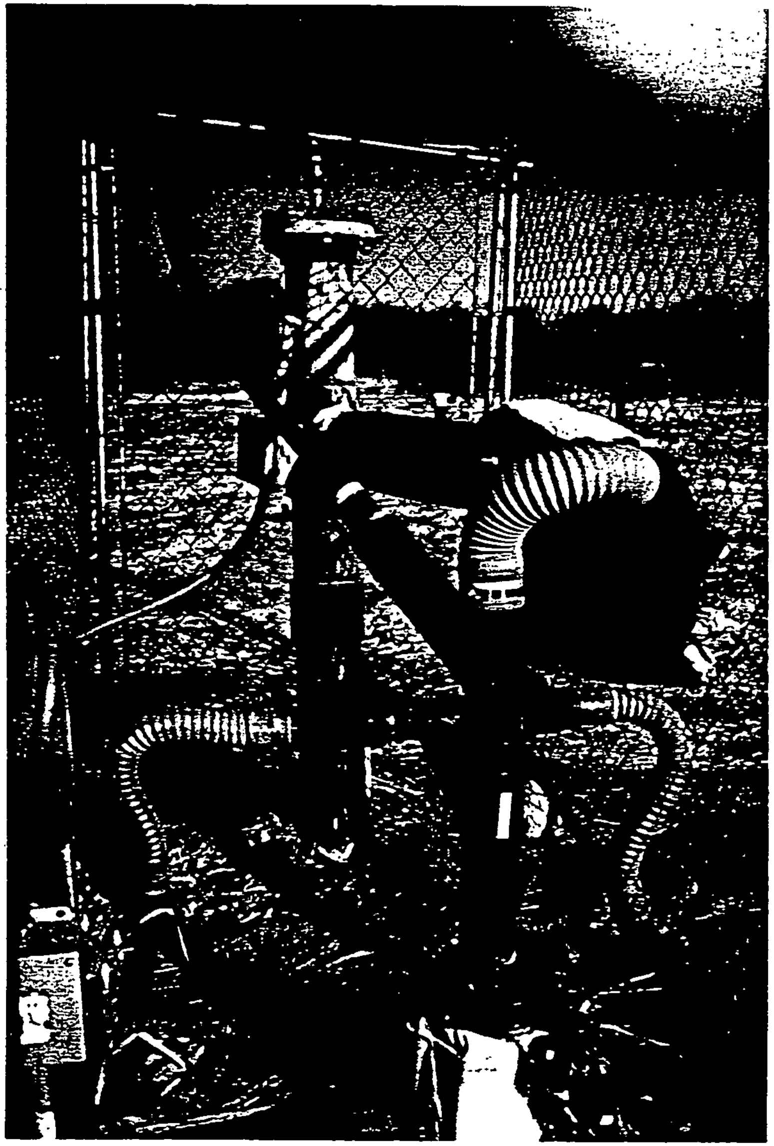
AND

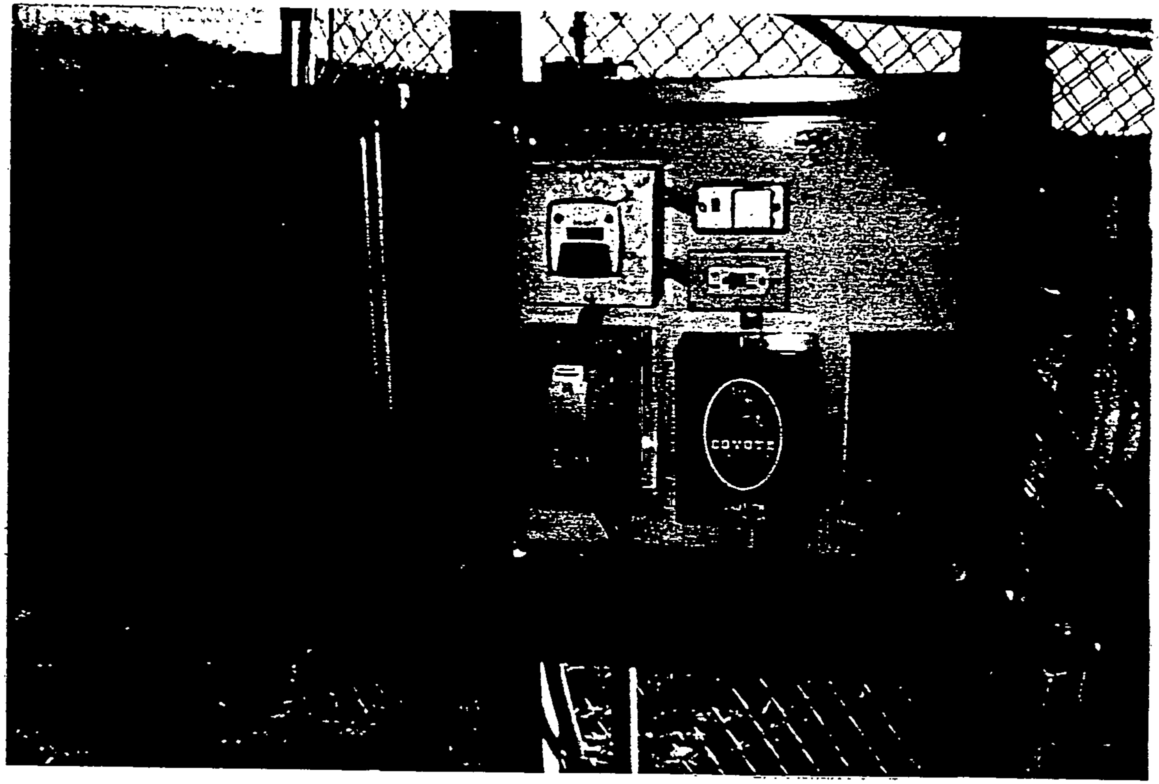
LATERAL GAS WELL DETAIL

NOT TO SCALE

GAS WELL GW-5

WELL HEAD RETROFIT



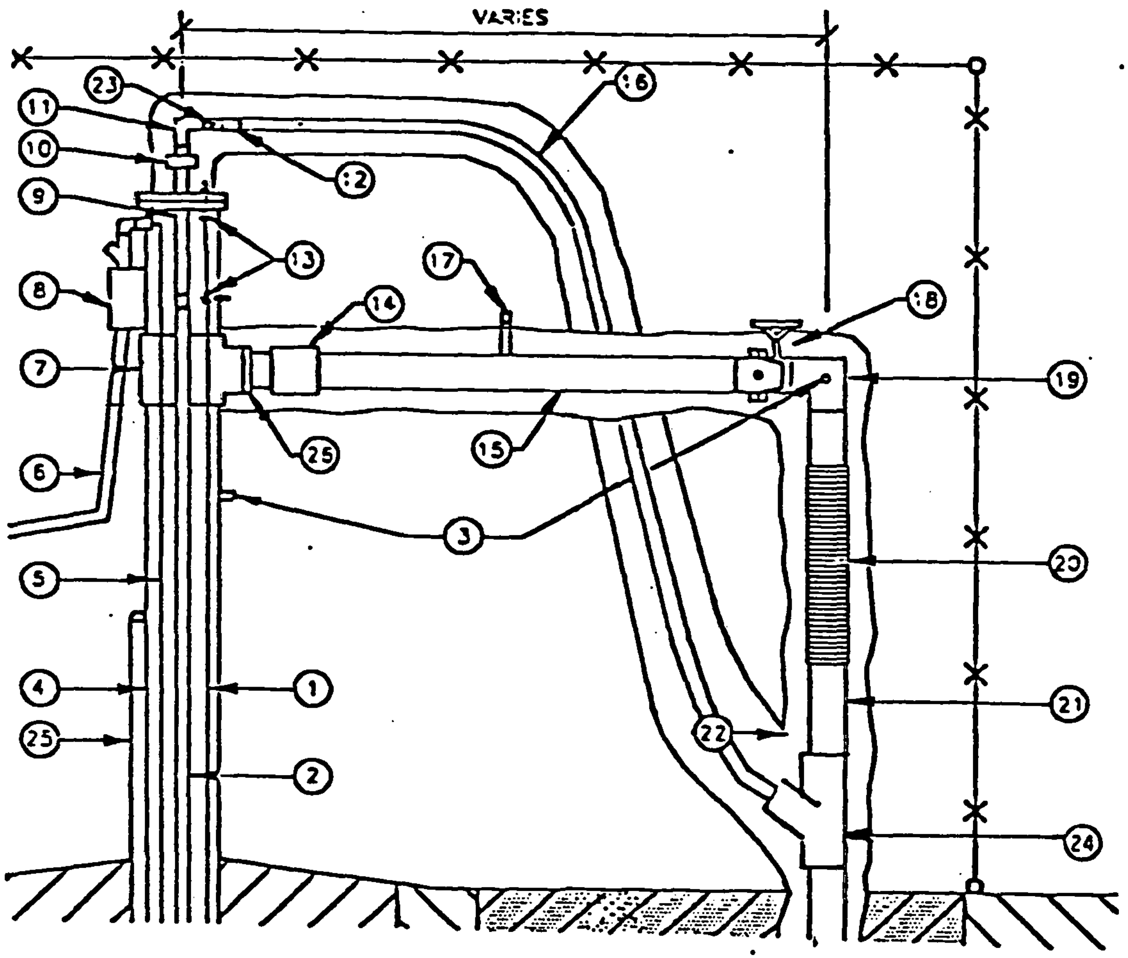


TYPICAL PUMP

CONTROL PANEL

TYPICAL GAS/LEACHATE EXTRACTION WELL RETRO-FIT DETAIL

Not to Scale



KEY

1. 1/4" DIA 304 STAINLESS STEEL PULLOUT CABLE
2. 1" DIA FLEXIBLE DISCHARGE HOSE
3. 1/4" PVC LABCOCK VALVE
4. 6" DIA SCH. 80 PVC GAS WELL PIPE
5. ELECTRICAL WIRING FOR PUMP
6. ELECTRICAL CONDUIT AND WIRING FOR PUMP
7. 6" x 4" SCH. 80 PVC TEE
8. WELL CASING PENETRATION WITH SEALED CONDUIT TO ELECTRICAL JUNCTION BOX STRAPPED TO WELL CASING
9. 1" DIA STAINLESS STEEL NIPPLE THREADED THROUGH BLIND FLANGE
10. 1" DIA STEEL UNION FLANGE
11. 1" DIA STEEL 90° ELL
12. 1" DIA COATED STEEL TO HDPE TRANSITION FITTING
13. 1/4" STAINLESS STEEL EYEBOLT WITH WASHERS AND NUT
14. 3" DIA PVC COUPLING
15. 3" DIA SCH. 80 PVC PIPE
16. 1" DIA HDPE LEACHATE DISCHARGE PIPE
17. 3/4" x 1/2" SCH. 80 PVC REDUCING BUSHING WITH 1/2" DIA SCH. 80 PVC NIPPLE AND CAP (MONITORING PORT)
18. 3" DIA GEAR OPERATED BUTTERFLY VALVE
19. 3" DIA SCH. 80 PVC 90° ELL
20. 3" DIA FLEXIBLE TUBING WITH CLAMPS
21. 3" DIA HDPE PIPE
22. PIPE INSULATION WITH WATERPROOF COVER INSTALLED TO APPROXIMATELY 24" BELOW FINAL GRADE
23. 1" BALL VALVE
24. 3" HDPE WYE WITH BUSHING
25. TWO-1" DIA RIGID SCH. 80 PVC PIPES STRAPPED TO WELL PIPE SLIP CAP AT TOP
26. 4" x 3" REDUCING COUPLING WITH 3" MALE ADAPTER

Notes:

This Detail Revised from Drawing 15292-D3, Extraction Well Details, Construction Observation Report, Gas and Leachate Extraction System. Refuse Hideaway Landfill, Dated November 04, 1991

TERRA ENGINEERING & CONSTRUCTION CORP. 2201 Vondron Road, Madison, Wis. 53704 Phone: 608-221-3501 Fax: 608-221-4075		
REFUSE HIDEWAY LANDFILL		
WELL HEAD DETAIL		
DR. DATE: 7/16/93	PROJECT NO. 7468	DWG. NO. 1 OF 3

APPENDIX 2

BLOWER FLARE INSPECTION REPORT

RECEIVED
JUL 5 - 1993
TERRA ENGINEERS

ECRS
2201 VONDRON RD.
MADISON, WI. 73704-6795

6-29-93

ATTN:KIRK SOLBERG
REFUGE HIDEAWAY LANDFILL FLARE
SERVICE CALL

DEAR BRIAN:

I AM VERY PLEASED WITH WHAT WE WERE ABLE TO ACCOMPLISH MONDAY ON SITE WITH THE FLARE. I DO APPRECIATE THE COURTESY AND HELP YOU AND BRIAN HEGGE EXTENDED TO ME WHILE I WAS THERE.

ENCLOSED PLEASE FIND THE FOLLOWING:

MY TRIP REPORT INCLUDING FLARE CONDITION AND SUGGESTED SPARE PARTS LIST.

PAINTING SPECIFICATION AND DATA SHEET FOR SHERWIN WILLIAMS RUST INHIBITIVE, HEAT RESISTANT PAINT.

OUR INVOICE FOR THE SERVICE CALL.

1 - SET OF KEYS FOR REFUSE HIDEAWAY WHICH I FAILED TO RETURN TO YOU ON MONDAY.

AS PER OUR CONVERSATION ON MONDAY I AM VERY INTERESTED IN A COPY OF THE GAS TEST REPORT THAT THE DNR IS CONDUCTING AND THE QUANTITY OF H_2S IN THE GAS.

I WOULD LIKE A COPY OF 24 HR. SECTION OF THE TEMPERATURE RECORDER CHART AFTER YOUR NEXT GOOD STORM. THIS WILL ALLOW ME TO ANALYZE HOW WELL THE TEMPERATURE CONTROLLER IS RESPONDING TO SEVERE CHANGES.

AS IN THE PAST, PLEASE IF YOU HAVE ANY QUESTIONS, OR IF WE CAN BE OF SERVICE IN THE FUTURE DO NOT HESITATE TO CONTACT US.

BEST REGARDS,

JOHN W GWINN
MGR. OF TECHNICAL SERVICE

ENCLS:

SERVICE REPORT

REFUSE HIDEAWAY LANDFILL SITE

5-2-93 I ARRIVED MADISON WI. 9:30 P.M. AND MET KIRK AT THE HAMPTON INN ABOUT 10:30 P.M. WE WENT TO THE REFUSE HIDEAWAY LANDFILL SITE AND STARTED THE FLARE. IT STARTED OK THE PILOT WAS A LITTLE HESITANT ON THE FIRST ATTEMPT TO LIGHT BUT IGNITED OK ON THE SECOND ATTEMPT.

THE BURNER LIT OFF AS QUIET AND SMOOTH AS EVER, WITH A VERY INTENSE, SHORT, BLUE FLAME. THERE WAS A SMALL AMOUNT OF YELLOW/ORANGE TINGE TO THE ENDS OF THE FLAME INTERMITTENTLY WHEN IT FIRST IGNITED AND REMAINED FOR ABOUT 2-4 MINUTES. AS SOON AS THE BURNER BLOCKS & STACK WARMED UP, THESE YELLOW/ORANGE FLAME TAILS DISAPPEARED COMPLETELY.

WE OBSERVED THE OPERATION FOR ABOUT ONE HALF HOUR, AND THE TEMPERATURE CONTROLLER WAS NOT HOLDING TEMPERATURE WELL.

WE SHUT-DOWN THE FLARE AND CLOSED THE PANEL AND RETURNED TO THE HOTEL.

WE WILL START AGAIN AT 7:00 A.M. TOMORROW.

5-3-93 I ARRIVED ON SITE AT REFUSE HIDEAWAY LANDFILL AT 7:00 A.M. WE OPENED THE HIGH FIRE DAMPER AND INSPECTED THE INSIDE OF THE FLARE, OUR FINDINGS WERE AS FOLLOWS:

1. CERAMIC FIBER LINING IS IN EXCELLENT CONDITION SOME DISCOLORATION AT AND ABOVE THE BURNER LEVEL.

2. NO VISIBLE SIGNS OF MISSING OR DAMAGED LINING, OR HOT SPOTS ON THE EXTERIOR OF THE STACK.

3. THE BURNER TILES ARE ALSO IN EXCELLENT CONDITION. THERE IS ONLY ONE OUTER TILE CRACKED. THE CRACKED TILE HAS NOT MOVED AND IS SECURELY HELD IN PLACE BY THE RETAINING CLIPS.

4. THE ORIFICES ON THE BURNER SPUDS ARE ALL CLEAR AND SHOW NO SIGN OF CLOGGING, EXCESSIVE DISCOLORATION FROM EXCESSIVE TEMPERATURE OR EROSION.

5. THE PILOT CAN & ORIFICE ALSO ARE CLEAN AND CLEAR. THE IGNITOR ROD WAS WARPED AND OUT OF ADJUSTMENT.

6. THERE IS SOME MATERIAL, ASH & REFRACTORY MORTAR (VERY SMALL AMOUNT) ON THE FLOOR OF THE FLARE. THIS MATERIAL IS OF NO CONSEQUENCE.

THEN WE INSPECTED THE FLARE EXTERIOR AND OUR FINDINGS WERE AS FOLLOWS:

1. THE FLARE IS RUSTING IN SOME AREAS MAINLY AROUND THE TEST PORTS AND PILOT HOUSING, WHICH ARE EXPOSED TO HIGHER HEAT. THERE ARE SEVERAL OTHER AREAS THAT ARE SHOWING SIGNS OF WEAR BUT NO SIGNS OF SERIOUS CORROSION.

2. THE HIGH FIRE DAMPER MOTOR ACTUATION ARM WAS BENT. I DISCONNECTED THE LINKAGE AND STRAIGHTENED THE CRANK ARM AND RE-ADJUSTED THE DAMPER FOR PROPER OPERATION.

3. THE PILOT ASSEMBLY WAS DISCONNECTED AND REMOVED. WE RE-ADJUSTED THE SPARK ROD GAP AND ALIGNMENT AND RE-ASSEMBLED THE PILOT. WE THEN TESTED THE PILOT AND THE UV SYSTEM. ALL OF THE PILOT SYSTEM WORKS VERY WELL.

NEXT WE CHECKED THE BLOWER AND RE-TENSIONED THE BELTS. THE FINDINGS WERE:

1. ONE OF THE TWO BELTS IS STRETCHED AND THEY WILL NOT TIGHTEN EQUALLY . THIS LEAVES ONE BELT CARRYING MOST OF THE LOAD.

2. I LATER CHECKED THE BEARINGS, AND THEY DO NOT SEEM TO BE RUNNING HOT AND ARE OPERATING QUIETLY. THE BLOWER ALSO SEEMS TO BE IN GOOD RUNNING ORDER.

WE THEN STARTED THE FLARE AND WITH THE FOLLOWING RESULTS:

THE PILOT LIT AND MAINTAINED U.V. SIGNAL ON THE FIRST ATTEMPT.

I THEN TURNED THE OPERATE SWITCH TO AUTOMATIC AND THE BLOWER STARTED AND THE BURNER IGNITED VERY WELL, LIGHT BLUE FLAME WITH A VERY INTERMITTENT YELLOW/ORANGE TIPS. AS SOON AS THE FLARE WARMED UP THE YELLOW/ORANGE COLORATION LEFT.

WE CHECKED THE PRESSURE ON THE BURNER, AND IT WAS 2.5" W.C. THE PRESSURE AT THE BLOWER WAS OVER 4.5" LEAVING A 2" W.C. DROP ACROSS THE PIPING AND THE FLAME ARRESTOR.

I BELIEVE THAT THE FLAME ARRESTOR IS GETTING DIRTY AND NEEDS TO BE CLEANED.

WITH THE FLARE WELL WARMED UP, I STARTED RE-TUNING THE CONTROLLER. IT HAD BEEN OPERATING WITH A 75 DEGREE F TO 200 DEGREE F TEMPERATURE SWING. I FINALLY SET THE CONTROLLER AND IT IS HOLDING ABOUT A 50 DEGREE TO 75 DEGREE TOTAL SWING WITH A VERY FAST RECOVERY (LESS THAN 4 MINUTES).

DURING THE TUNING PROCESS I CHANGED THE MANUAL GAS VALVE SETTING TO CAUSE A TEMPERATURE UPSET TO WATCH THE CONTROLLERS RESPONSE.

DURING THESE VALVE CHANGES THE FOLLOWING OBSERVATIONS WERE MADE.

MAXIMUM BURNER PRESSURE 3.5 W.C. AT THE BURNER. THE BURNER OPERATION VERY STABLE LIGHT BLUE IN COLOR AND NO YELLOW OR ORANGE TAILS.

BURNER PRESSURE REDUCED TO 1.0" W.C. BURNER REMAINED VERY STABLE AND WITH GOOD COLOR (NO YELLOW FLARE TAILS)

BURNER PRESSURE REDUCED TO 0.5" W.C. AND STILL STABLE LIGHT BLUE IN COLOR WITH VERY INTERMITTENT YELLOW/ORANGE FLAME TAILS BUY VERY SPORADIC.

BURNER PRESSURE REDUCED TO LESS THAN 0.5" W.C. WITH STILL GOOD BURNER COMBUSTION, BUT NOT AS STABLE AS BEFORE, STILL A GOOD CLEAN FLAME.

PRESSURE REDUCED TO 0.25" W.C. AND FLAME BECAME UN-STABLE WITH SOME CIRCULAR SWIRLING AND YELLOW FLAME TAILS. THE FLARE DID NOT HOLD TEMPERATURE AT THIS LOW FLOW RATE, AND WHEN THE DAMPERS WENT COMPLETELY CLOSED, THE FLAME RAISED UP OFF OF THE BURNER AND OUT OF THE LINE OF SIGHT OF THE U.V. SENSOR THE U.V. LOST SIGHT OF THE FLAME AND SHUT THE SYSTEM DOWN.

I RE-SET THE FLAME SAFEGUARD AND RE-SET THE GAS FLOW TO ABOUT 0.50" W.C. AND STARTED THE FLARE AGAIN. IT IGNITED WITHOUT A PROBLEM AND WOULD MAINTAIN TEMPERATURE AT 0.50" W.C..

IF THE NEED EVER ARISES TO OPERATE THE FLARE ON A CONTINUAL BASIS AT A FLOW RATE LESS THAN THAT OF 0.5" W.C., IT WILL BE NECESSARY TO RE-ADJUST THE LOW FIRE DAMPER. AT THIS LOWER FLOW THE FLARE MAY NOT MAINTAIN MINIMUM OPERATING TEMPERATURE OF 1400 DEGREE F.

IF THE METHANE CONTENT DROPS TO BELOW 42% IT WILL BE NECESSARY TO RE-ADJUST THE SHUTTERS ON THE BURNER. IF THIS DOES OCCUR CONTACT LINKLATER CORPORATION/CUSTOM COMBUSTION ENGINEERING FOR THE PROPER SETTING.

FROM MY OBSERVATION AT THIS SITE, HAVING INSUFFICIENT GAS SUPPLY TO OPERATE PROPERLY IS A LONG WAY OFF, THERE SEEMS TO BE AN ABUNDANCE OF GAS AS THE FIELD GOES POSITIVE IN A VERY SHORT TIME WHEN THE FLARE IS SHUT DOWN.

I WAS VERY PLEASED WITH THE CONDITIONS OF THE FLARE AND ITS OPERATIONS, ESPECIALLY FOR BEING IN SERVICE FOR 2 YEARS. THE FLARE AND CONTROLS ARE IN EXCELLENT CONDITION.

WE HAVE THE FOLLOWING SUGGESTIONS:

1. PURCHASE 2 SETS OF GASKETS (4 TOTAL) FOR EACH OF THE TWO FLAME ARRESTORS. AFTER THE NEW GASKETS HAVE ARRIVED, DISASSEMBLE THE FLAME ARRESTORS AND STEAM CLEAN THE CENTER FLAME BANK AND INSPECT. THE CELLS SHOULD ALL BE CLEAR AFTER CLEANING.
   AFTER CLEANING, RE-ASSEMBLE USING NEW GASKETS AND CAREFULLY RE-TIGHTEN THE BOLTS. THE BOLTS ARE MUCH LARGER THAN NEEDED AND OVER TORQUING WILL CAUSE DAMAGE TO THE FLAME ARRESTOR HOUSING.

2. RETURN THE OLD THERMOCOUPLE TO LINKLATER CORPORATION/CUSTOM COMBUSTION ENGINEERING TO BE RE-BUILT. THIS WILL SERVE AS A SPARE AND RE-BUILDING WILL BE MUCH CHEAPER THAN A NEW THERMOCOUPLE.

3. RE-PAINT THE EXTERIOR OF THE FLARE, OR AT LEAST TOUCH UP THE RUSTED AREAS. PAINT THE PILOT GAS SUPPLY LINE SAFETY YELLOW.

WE RECOMMEND THAT THE FOLLOWING PARTS BE KEPT ON HAND AS SPARES:

1 - SPARE DUAL ELEMENT THERMOCOUPLE

1 - U.V. SENSOR REPLACEMENT TUBE

1 - SET OF "V" BELTS FOR THE BLOWER DRIVE

2 - REPLACEMENT SWIVEL JOINT FOR THE DAMPER ACTUATOR RODS

1 - SET (2) GASKETS FOR EACH FLAME ARRESTOR

10 - CONTROL PANEL REPLACEMENT LAMPS

1- IGNITER ELECTRODE AND INSULATOR ASSEMBLY

APPENDIX 3

BIENNIAL FLARE INLET
GAS ANALYTICAL RESULTS

Clean Air Engineering

500 W. Wood St. • Palatine, IL 60067 • 708-991-3300

Mr. Kirk J. Solberg
Technical Manager
Environmental Construction & Remediation Services, Inc.
2201 Vondron Road
Madison, Wisconsin 53704-6795

REPORT ON COMPLIANCE TESTING

Conducted at:
ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
FLARE INLET
MIDDLETON, WISCONSIN

Environmental Construction & Remediation Services, Inc. P.O. No: C6024
CAE Project No: 6671
July 28, 1993

ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
CAE Project No: 6671

CONTENTS

SUMMARY

INTRODUCTION

Clean Air Engineering was contracted by Environmental Construction & Remediation Services, Inc. to determine the levels of benzene, vinyl chloride and total gaseous nonmethane organics (TGNMO) emissions at their facility, located in Middleton, Wisconsin, for compliance purposes.

The testing took place at the Flare Inlet on June 8, 1993. Coordinating the field testing were:

B. Hegge - Environmental Construction & Remediation Services, Inc.
K. Wepprecht - Clean Air Engineering

The test conditions and results of analysis are presented in Table 1 on page 1-2.

To the best of our knowledge, the data presented in this report are accurate and complete.

Respectfully submitted,

Kristin von Schmidt Pauli

Kristin von Schmidt-Pauli
Project Manager
(708)991-6200 ext. 2005

Reviewed by,

Patrick Clark, P.E.
Manager, VOC Services

ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
CAE Project No: 6671

SUMMARY OF TEST RESULTS - Table 1

EPA Methods 3C, 18 and 25C
Oxygen, Carbon Dioxide, Benzene, Vinyl Chloride and TGNMO
Flare Inlet

Run No.		1	2	3	Average
Date (1993)		June 8	June 8	June 8	
Start Time (approx.)		09:25	10:55	12:23	
Stop Time (approx.)		10:25	11:55	13:33	
Gas Conditions					
T_s	Temperature (°F)	94	93	93	**93**
B_{wo}	Moisture (volume %)	1.86	2.19	1.69	**1.91**
O_2	Oxygen (dry volume %)	2.6	1.9	1.7	**2.0**
CO_2	Carbon dioxide (dry volume %)	32.6	34.9	35.0	**34.2**
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	317	315	319	**317**
Q_{std}	Standard conditions (dscfm)	290	287	293	**290**
Volatile Organics					
Benzene					
C	Concentration (ppm)	2.32	2.16	2.12	**2.20**
E	Emission rate (lb/hr)	8.20E-03	7.54E-03	7.56E-03	**7.76E-03**
Vinyl Chloride					
C	Concentration (ppm)	<0.022	<0.024	<0.025	**<0.023**
E	Emission rate (lb/hr)	<6.13E-05	<6.67E-05	<7.04E-05	**<6.61E-05**
TGNMO as carbon					
C	Concentration (ppm)	1,207.2	1,558.3	1,271.1	**1,345.5**
E	Emission rate (lb/hr)	0.655	0.837	0.696	**0.729**

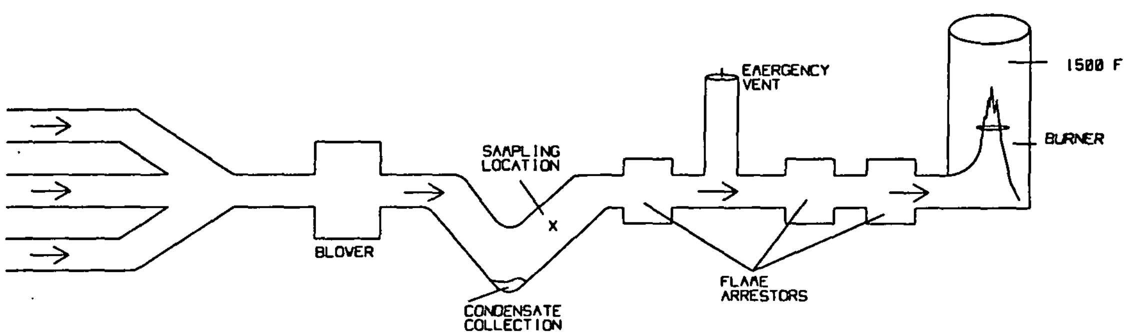
< Indicates below detection limit.

DESCRIPTION OF INSTALLATION

Environmental Construction & Remediation Services, Inc. operates a landfill with a flare being used to control emissions. The flare inlet line, or landfill gas supply line, is fed with landfill gas from 13 total wells from three different sections of the landfill. The three lines from the different landfill sections are ducted to a common supply. The flow is generated by a blower located after the three supply lines combine, but before the test ports.

The testing reported in this document was performed at the Flare Inlet.

A schematic of the process is shown below.



SUMMARY OF PROCEDURES

SAMPLING PROCEDURES

The sampling followed procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3C, 4 and 18. These methods are titled:

- Method 1 — "Sample and Velocity Traverses for Stationary Sources;"
- Method 2 — "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube);"
- Method 3C — "Determination of Oxygen, Carbon Dioxide, Nitrogen and Methane from Stationary Sources;"
- Method 4 — "Determination of Moisture Content in Stack Gases;"
- Method 18 — "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography."

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

In addition to the previous methods, Proposed Method 25C was also referenced. This method is titled:

- Proposed Method 25C — "Determination of Nonmethane Organic Compounds (NMOC) in Landfill Gases."

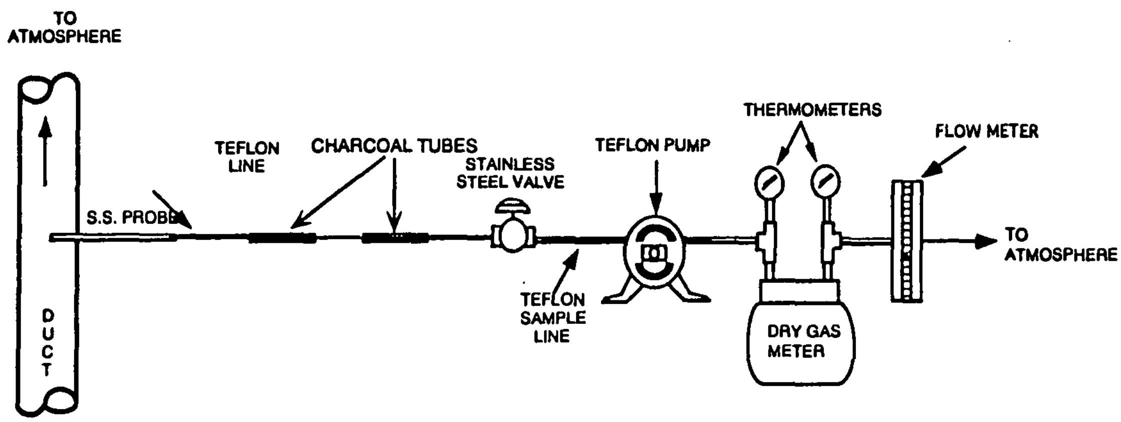
The sampling apparatus are shown in Figures 1 and 2 on pages 3-2 and 3-3, respectively. All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site.

Sampling Locations

The Flare Inlet has two ports. For velocity determination, six points were traversed per port for Run 1. For Runs 2 and 3, eight points were traversed per port. For moisture determination and benzene, vinyl chloride and TGNMO testing, a single point was sampled for 60 minutes. The traverse point locations are shown in Figures 3 and 4 on pages 3-4 and 3-5, respectively.

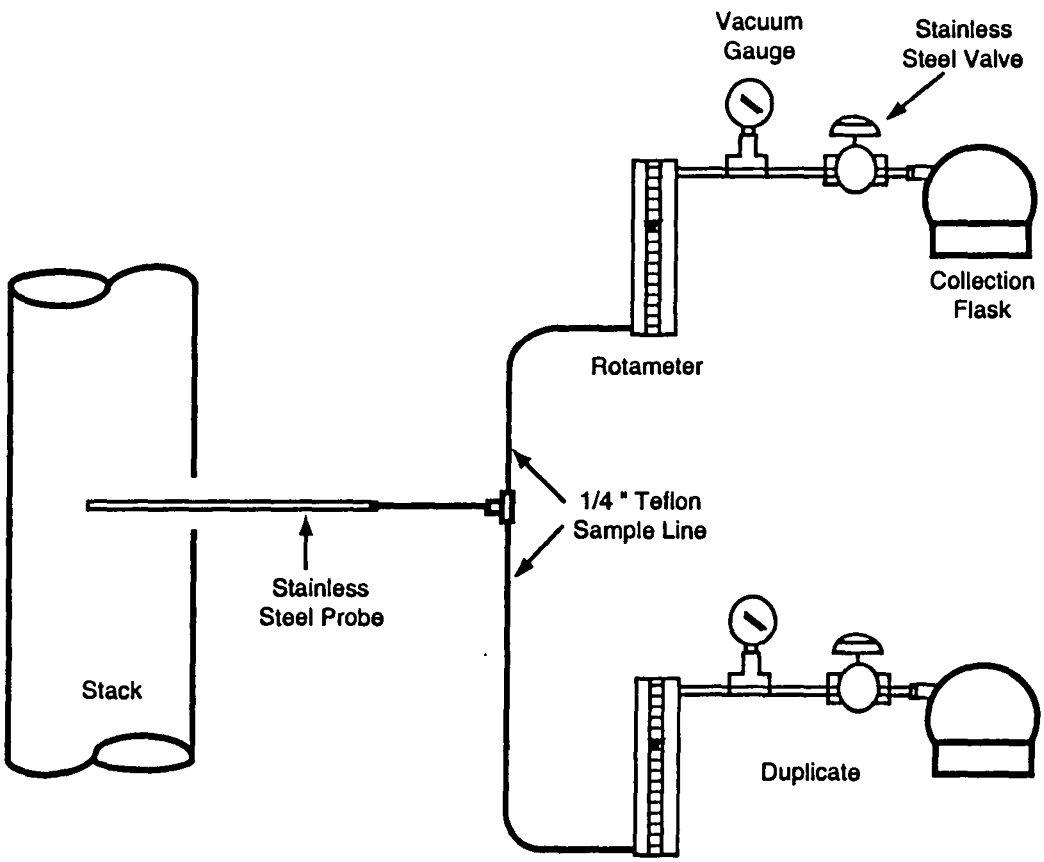
SUMMARY OF PROCEDURES - Figure 1

The EPA Method 18 sampling apparatus is shown.



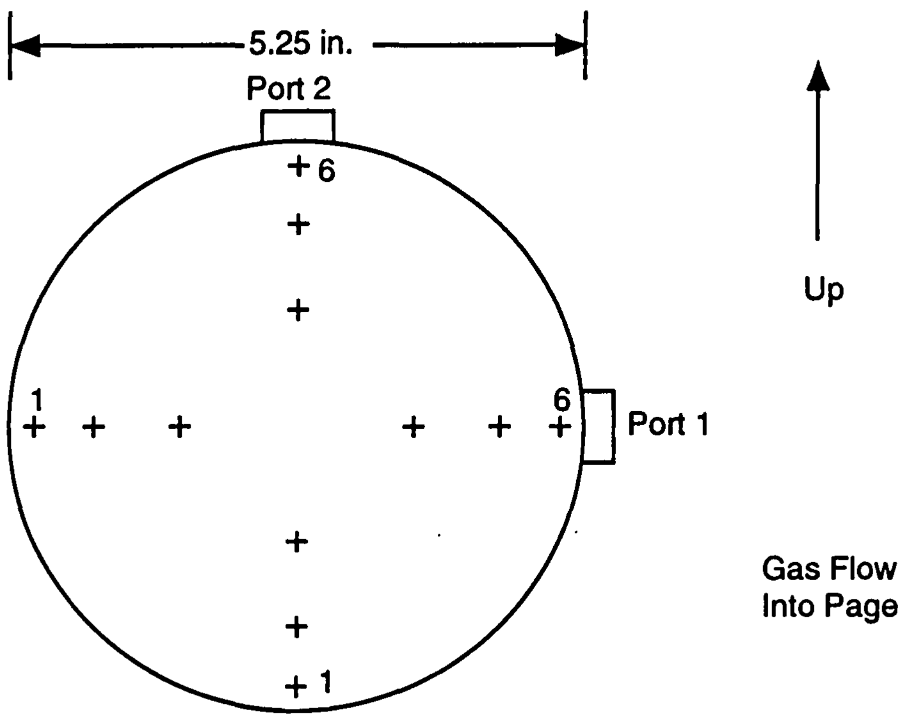
SUMMARY OF PROCEDURES - Figure 2

The EPA Methods 3C and 25C sampling apparatus is shown.



SUMMARY OF PROCEDURES - Figure 3

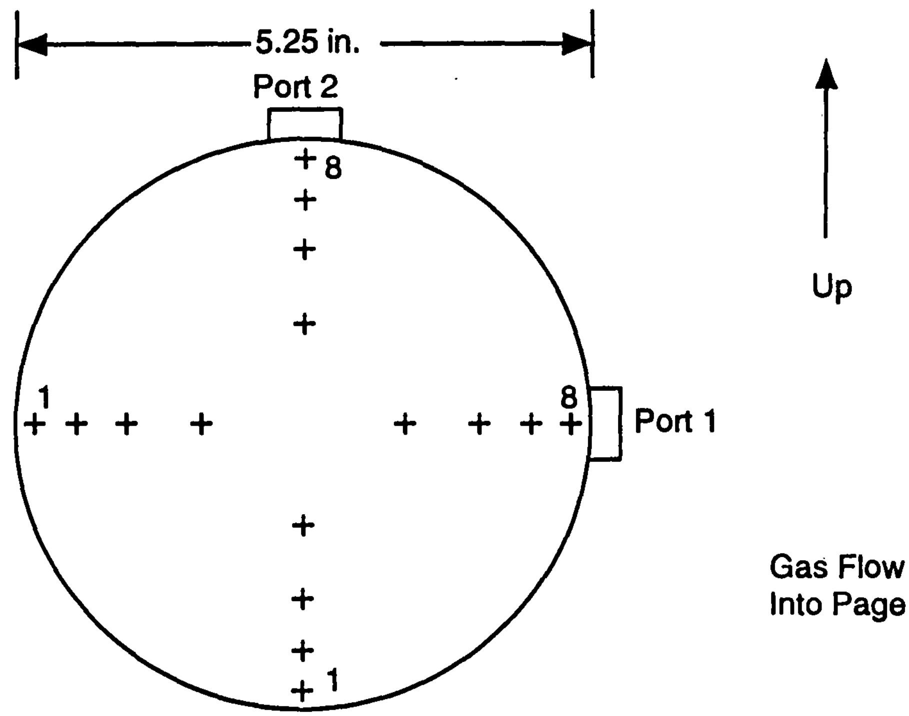
The cross section of the Flare Inlet shows traverse point locations.



TRAVERSE POINT	PORT TO POINT DISTANCE (IN)
1	4.8
2	4.5
3	3.7
4	1.6
5	0.8
6	0.5

SUMMARY OF PROCEDURES - Figure 4

The cross section of the Flare Inlet shows traverse point locations.



TRAVERSE POINT	PORT TO POINT DISTANCE (IN)
1	4.8
2	4.7
3	4.2
4	3.6
5	1.7
6	1.0
7	0.6
8	0.5

SUMMARY OF PROCEDURES

ANALYTICAL PROCEDURES

Oxygen, Carbon Dioxide and Nitrogen

The oxygen, carbon dioxide and nitrogen concentrations were determined following procedures described in EPA Method 3C. A portion of the collected gas sample was injected into a gas chromatograph (GC) and the oxygen, carbon dioxide and nitrogen concentrations were determined using a thermal conductivity detector (TCD). The gas analyzer was calibrated and monitored for detector linearity over the range of sample concentrations.

Benzene and Vinyl Chloride

The benzene and vinyl chloride concentrations were determined following procedures detailed in the EPA Method 18. Collected charcoal tubes were desorbed with 2 ml of carbon disulfide. A portion of the carbon disulfide was analyzed using a gas chromatograph equipped with a flame ionization detector. The results of the field blanks are included in the Laboratory Data section of the Appendix.

Nonmethane Organic Compounds (NMOC)

The NMOC emissions were determined following procedures detailed in Proposed EPA Method 25C. The NMOC content of the collected tank samples was determined by injecting a portion of the sample into a gas chromatographic column and separating the NMOC from carbon monoxide, methane and carbon dioxide. Prior to sampling, the probe and sample line were purged with the stack gas. The emission sample was withdrawn at a constant rate through a chilled condensate trap by means of an evacuated sample tank. At the conclusion of testing, the sample tank was pressurized further to prepare it for analysis. For analysis, a portion of the sample gas was injected into the GC columns via a pneumatic gas sample valve (GSV). The columns separated the NMOC from carbon monoxide, carbon dioxide and methane. The NMOC was oxidized to carbon dioxide, reduced to methane and measured using a flame ionization detector.

The gas analyzer was calibrated and monitored for catalyst efficiency and system linearity with: 20 ppm, 200 ppm and 3,000 ppm propane; and 50 ppm, 500 ppm and 1% carbon dioxide.

SUMMARY OF PROCEDURES

QUALITY CONTROL PROCEDURES

Quality control procedures for all aspects of field sampling; sample preservation and holding time; reagent quality; analytical method; analyst training and safety; and instrument cleaning, calibration and safety were followed. These procedures are generally consistent with EPA guidelines documented in "Quality Assurance Manuals for Air Pollution Measurement Systems," Vol 3, "Stationary Source Specific Methods" (EPA-600/4-77-027b).

COMMENTS

No deviations from standard U.S. EPA testing procedures were noted.

APPENDIX

NOMENCLATURE

A	-	absorbance
A_n	-	cross sectional area of nozzle (ft^2)
APD	-	aerodynamic particle diameter (μm)
$area_i$	-	total area of jets per stage
A_s	-	cross sectional area of stack (ft^2)
B_{mix}	-	proportion of water vapor in the mixed gas stream by volume
B_{wo}	-	proportion of water vapor in the gas stream by volume
B_{ws}	-	proportion of water vapor in the gas stream by volume at saturated conditions
C	-	measured concentration in the gas stream
C_{gas}	-	concentration calibrated for drift as per Eq. 6C-1 of EPA Method 6C
C_j	-	Cunningham's slip factor
C_{ma}	-	actual concentration of the upscale calibration gas
C_{mf}	-	final system calibration bias check response for the upscale calibration gas
C_{mi}	-	initial system calibration bias check response for the upscale calibration gas
C_{of}	-	final system calibration bias check response for the zero gas
C_{oi}	-	initial system calibration bias check response for the zero gas
C_p	-	pitot tube coefficient (dimensionless)
D_{eq}	-	equivalent diameter (cm)
D_f	-	dilution factor
D_s	-	jet diameter (cm)
D_{50}	-	aerodynamic particle diameter at 50% cut point (μm)
E	-	emission rate
F_d	-	ratio of the volume of dry effluent gas to the gross calorific value of the fuel (dscf/MBtu)
F_c	-	ratio of the volume of carbon dioxide produced to the gross calorific value of the fuel (dscf/MBtu)
GCV	-	gross calorific value of fuel consistent with the ultimate analysis (Btu/lb)
GMD	-	geometric mean diameter (μm)
i	-	stage number
%I	-	percent of isokinetic sampling (acceptable: $90 \leq \%I \leq 110\%$)
j	-	iteration number
K_c	-	spectrophotometer calibration factor
K_n	-	Knudson's number (dimensionless)

NOMENCLATURE (Continued)

K_p	-	pitot tube constant: 85.49 (ft/sec) $\sqrt{\frac{(lb/lb\text{-}mole)(in.\ Hg)}{(°R)(in.\ H_2O)}}$
KsRT	-	stage constant
LFE	-	laminar flow element
M_d	-	dry molecular weight of stack gas (lb/lb-mole)
MMD	-	mass median diameter (μm)
m_n	-	total amount of particulate matter collected (g)
M_s	-	molecular weight of stack gas, wet basis (lb/lb-mole)
M_{wm}	-	molecular weight of mixed gas, wet basis (lb/lb-mole)
N	-	normality of titrant (meq/ml)
O_{pa}	-	average actual opacity calculated over the averaging interval (%)
P_1-P_{atm}	-	total pressure differential (in. H_2O)
P_1-P_2	-	velocity pressure differential (in. H_2O)
P_4-P_5	-	pitch angle pressure differential (in. H_2O)
P_a total	-	absolute pressure down stream of impactor (in. Hg)
P_b	-	barometric pressure (in. Hg)
P_f	-	final absolute pressure of flask (in. Hg)
P_i	-	initial absolute pressure of flask (in. Hg)
P_{lfe}	-	absolute pressure at LFE inlet (in. Hg)
PR	-	recycle ratio at stack condition (%)
P_s	-	absolute stack gas pressure (in. Hg)
PS_i	-	local pressure downstream of each stage (in. Hg)
P_v	-	Vapor pressure, actual (in. Hg)
Q_a	-	volumetric flow rate at actual conditions (acfm)
Q_{cm}	-	flow rate through the impactor (cm^3/s)
Q_r	-	recycle flow rate at sampler conditions (acfm)
$Q_{r_{std}}$	-	recycle flow rate at standard conditions (dscfm)
Q_s	-	flow rate through the sampler at sampler conditions (acfm)
$Q_{s_{std}}$	-	sample flow rate at standard conditions (dscfm)
Q_{std}	-	volumetric flow rate at standard conditions, dry basis (dscfm)
Q_t	-	total (mixed) cyclone flow rate at sampler conditions (acfm)
$Q_{t_{std}}$	-	total flow rate through sampler at standard conditions (dscfm)
R	-	resultant angle (°)

NOMENCLATURE (Continued)

R^2	-	coefficient of regression
Re	-	Reynolds number (dimensionless)
RhoG	-	density of gas (lb/ft^3 and g/cm^3)
RhoP	-	density of particulate (lb/ft^3 and g/cm^3)
S_r	-	recycle flow, LFE calibration constant
S_t	-	total flow, LFE calibration constant
std	-	standard conditions, 29.92 in. Hg, 68 °F
T_b	-	filter temperature (°F)
T_c	-	conditioner temperature (°F)
T_f	-	final absolute temperature of flask (°R)
T_{lfe}	-	average LFE temperature (°F)
T_m	-	average dry gas meter temperature (°F)
T_r	-	average recycle temperature (°F)
T_s	-	average stack temperature (°F)
T_{sc}	-	average stack temperature (°C)
T_{std}	-	absolute temperature, standard conditions (528 °R)
Vac.	-	pump vacuum (in. Hg)
V_a	-	volume of aliquot (ml)
V_f	-	volume of flask (ml)
V_{lc}	-	total volume of liquid collected in impingers and silica gel (ml)
V_m	-	volume of gas sample through the dry gas meter at meter conditions (ft^3 or liters)
V_{mstd}	-	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_{sc}	-	volume of flask sample, standard conditions (ml)
V_{soln}	-	total volume of solution (ml)
V_t	-	volume of titrant used to titrate aliquot (ml)
V_{tb}	-	volume of titrant used to titrate blank (ml)
V_{wstd}	-	volume of water collected at standard conditions (ft^3)
V_s	-	stack gas velocity (ft/sec)
W_r	-	recycle flow, LFE calibration constant
W_t	-	total flow, LFE calibration constant
X_s	-	number of jets per stage
Y_d	-	gas meter correction factor (dimensionless)
α	-	relative standard deviation of polydispersity

NOMENCLATURE (Continued)

$\overline{\Delta H}$	-	average pressure drop across meter box orifice (in. H_2O)
$\Delta H@$	-	meter orifice calibration coefficient (in. H_2O)
ΔP	-	pressure drop across impactor (in. Hg)
$\overline{\sqrt{\Delta P}}$	-	average square roots of velocity heads of stack gas $\left(\sqrt{\text{in. } H_2O}\right)$
ΔP_r	-	pressure drop across the recycle flow LFE (in. H_2O)
ΔP_t	-	pressure drop across the total flow LFE (in. H_2O)
μ_{gas}	-	viscosity of stack gas (μpoise)
μ_{lfe}	-	gas viscosity at LFE conditions
μ_m	-	gas viscosity of the mixed gas
λ	-	gas mean free path (cm)
ρ	-	gas density (lb/ft^3)
σ_g	-	geometric standard deviation
Θ	-	total sampling time (min)
χ	-	intermediate angle used to calculate the pitch angle (°)

ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
CAE Project No: 6671
Flare Inlet

VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (1993)		June 8	June 8	June 8
Start Time (approx.)		09:22	10:55	12:23
Stop Time (approx.)		10:22	11:55	13:33
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9865	0.9865	0.9865
C_p	Pitot tube coefficient	0.99	0.99	0.99
	Static pressure (in. H_2O)	6.4	6.6	6.5
A_s	Sample location area (ft^2)	0.15	0.15	0.15
P_b	Barometric pressure (in. Hg)	28.76	28.76	28.76
O_2	Oxygen (dry volume %)	2.56	1.86	1.65
CO_2	Carbon dioxide (dry volume %)	32.6	34.9	35.0
V_{lc}	Liquid collected (ml)	18.0	21.0	16.0
V_m	Volume metered, meter conditions (ft^3)	48.83	48.47	48.04
T_m	Dry gas meter temperature (°F)	91	92	91
T_s	Stack temperature (°F)	94	93	93
ΔH	Meter box orifice pressure drop (in. H_2O)	2.00	2.00	2.00
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	0.85	0.99	0.75
V_{mstd}	Volume metered, standard (ft^3)	44.60	44.15	43.89
P_s	Sample gas pressure, absolute (in. Hg)	29.23	29.25	29.24
P_v	Vapor pressure, actual (in. Hg)	1.58	1.55	1.54
B_{wo}	Moisture in sample (% by volume)	1.86	2.19	1.69
B_{ws}	Saturated moisture (% by volume)	5.42	5.32	5.26
$\sqrt{\Delta P}$	Velocity head ($\sqrt{\text{in. } H_2O}$)	0.550	0.549	0.557
M_d	MW of sample gas, dry (lb/lb-mole)	33.32	33.66	33.67
M_s	MW of sample gas, wet (lb/lb-mole)	33.03	33.32	33.40
V_s	Velocity of sample (ft/sec)	35.2	35.0	35.5
Q_a	Volumetric flow rate, actual (acfm)	317	315	319
Q_{std}	Volumetric flow rate, standard (dscfm)	290	287	293

ENVIRONMENTAL CONSTRUCTION & REMEDIATION SERVICES, INC.
CAE Project No: 6671
Flare Inlet

VOLATILE ORGANICS PARAMETERS

Run No.			1	2	3
Date (1993)			June 8	June 8	June 8
Start Time (approx.)			09:25	10:55	12:23
Stop Time (approx.)			10:25	11:55	13:33
Sampling Locations					
P_b	Barometric pressure (in. Hg)		28.76	28.76	28.76
V_m	Volume metered, meter conditions (liter)		56.38	51.85	49.73
V_m	Volume metered, meter conditions (ft^3)		1.991	1.831	1.756
ΔH	Meter box orifice pressure drop (in. H_2O)		1.0	0.8	0.8
Y_d	Dry gas meter correction factor		0.9991	0.9991	0.9991
T_m	Dry gas meter temperature (°F)		79	84	81
Calculated Results					
V_{mstd}	Volume metered, standard (ft^3)		1.877	1.710	1.649
Flow Results from Velocity and Moisture Parameters					
Q_s	Volumetric flow rate, actual (acfm)		317	315	319
Q_{std}	Volumetric flow rate, standard (dscfm)		290	287	293
Benzene		Blank			
	mg	<0.002	0.401	0.339	0.322
C	Concentration (ppm)		2.32	2.16	2.12
E	Emission rate (lb/hr)		8.20E-03	7.54E-03	7.56E-03
Vinyl Chloride					
	mg	<0.003	<0.003	<0.003	<0.003
C	Concentration (ppm)		<0.022	<0.024	<0.025
E	Emission rate (lb/hr)		<6.13E-05	<6.67E-05	<7.04E-05

< Indicates below detection limit.

POST TEST CALIBRATION CHECK

Client/Owner: COSTM # 11247

Project Number:

Operator: M. KUBERA

Date: 6-30-93

Meter Box No.: 71-V7	Meter Box Vacuum: 1	Meter Box Yd: 0.9991	Barometric Press.: 29.2

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vd Net	In	Out	Tds Avg	In	Out	Td Avg	Time θ	Yd	ΔH@
0.046	3.0	-2.0	1.0000	0	1.002	1.002	0	27.73	0.9793	76	76	76	88	-	88	20.77	1.0330	N/A
0.046	3.0	-2.0	1.0000	0	1.035	1.035	0	28.61	1.0103	76	76	76	88	-	88	21.32	1.0342	N/A
.046	3.0	-2.0	1.0000	0	1.063	1.063	0	29.37	1.0372	76	76	76	89	-	89	21.74	1.0366	N/A

Nomenclature

Pb	Barometric Pressure
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential ("H_2O)
ΔP	Inlet Pressure Differential ("H_2O)
Vd	Volume Dry Gas Meter (ft^3)
Vds	Volume Dry Standard (ft^3)
Yd	Meter Correction Factor (unitless)
Yds	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential that gave 0.75 cfm of air at 70° F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb\,(Td + 460)}\left[\frac{(Tds + 460)\,\theta}{(Vds)\,(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)\,(Pb)}{(Tds + 460)\,\theta}$$

METER BOX FULL TEST CALIBRATION

...te: 7·16·92 Operator: M. KUBERA

...ter Box No.: 71·V7	Meter Box ΔH@: N/A	Meter Box Yd: .9991	Barometric Pressure: 29.18

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
[illegible]	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vds Net	In	Out	Tds Avg	In	Out	Tds Avg	Time θ	Yd	ΔH@
[illegible]	1.8	-2.3	1.0000	0	1.000	1.000	0	28.13	.9934	80	80	80	81	81	81	28.40	.9981	N/A
[illegible]	1.9	-2.3	1.0000	0	1.001	1.001	0	28.14	.9937	80	80	80	82	82	82	28.06	1.0004	N/A
[illegible]	1.9	-2.3	1.0000	0	1.034	1.034	0	29.11	1.0280	80	80	80	82	82	82	29.06	.9989	N/A

Nomenclature

- Barometric Pressure
- Flow Rate (cfm)
- Orifice Pressure Differential ("H_2O)
- Inlet Pressure Differential ("H_2O)
- Volume Dry Gas Meter (ft^3)
- Volume Dry Standard (ft^3)
- Meter Correction Factor (unitless)
- ...s Standard Meter Correction Factor (unitless)
- ...@ Orifice Pressure Differential that gave 0.75 cfm of air at 70°F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb(Td + 460)}\left[\frac{(Tds + 460)\theta}{(Vds)(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)(Pb)}{(Tds + 460)\theta}$$

Vacuum Gauge Calibration

Standard ("Hg)	Vacuum Gauge
5.2	5
10.4	10
15.2	15
20.2	20
23.9	MAX

Thermometer Calibration

Standard	Inlet	Outlet
40	40	40
60	60	60
70	70	70
110	110	110
120	120	120
140	140	140

Date: 1-29-93 | Operator: K Petersen

Meter Box No.: 61-5	Meter Box ΔH@: 1.7682	Meter Box Yd: .9865	Barometric Pressure: 29.80

				Standard Meter Gas Volume ft³			Meter Box Gas Volume ft³			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vds Net	In	Out	Tds Avg	In	Out	Tds Avg	Time θ	Yd	ΔH@
.75	3.0	-4.0	1.0000	0	10.005	10.005	380.589	390.506	9.917	65	65	65	74	62	68	10.5	.9972	1.8348
.75	3.0	-4.0	1.0000	0	10.000	10.000	400.597	410.540	9.943	65	65	65	75	63	69	10.53	.9960	1.8436
.40	0.5	-2.6	1.0000	0	5.003	5.003	424.244	429.335	5.091	65	65	65	71	66	68	12.35	.9807	1.6915
.40	0.5	-2.6	1.0000	0	5.002	5.002	429.335	434.425	5.09	65	65	65	71	66	68	12.33	.9807	1.6918
.68	1.5	-3.0	1.0000	0	10.125	10.125	440.122	450.402	10.279	65	65	65	75	67	71	14.79	.9833	1.7740
.68	1.5	-3.0	1.000	0	10.005	10.005	450.402	460.582	10.18	65	65	65	74	67	70	14.58	.9811	1.7622

Nomenclature

- Pb: Barometric Pressure
- Q: Flow Rate (cfm)
- ΔH: Orifice Pressure Differential ("H_2O)
- ΔP: Inlet Pressure Differential ("H_2O)
- Vd: Volume Dry Gas Meter (ft³)
- Vds: Volume Dry Standard (ft³)
- Yd: Meter Correction Factor (unitless)
- Yds: Standard Meter Correction Factor (unitless)
- ΔH@: Orifice Pressure Differential that gave 0.75 cfm of air at 70°F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb(Td + 460)}\left[\frac{(Tds + 460)\theta}{(Vds)(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)(Pb)}{(Tds + 460)\theta}$$

Vacuum Gauge Calibration

Standard ("Hg)	Vacuum Gauge
5.1	5
10	10
14.6	15
19.5	20
24.4	25
27.1	max

Thermometer Calibration

Standard	Inlet	Outlet
40	40	40
45	45	45
50	50	50
65	65	65
85	85	85
100	100	100

POST TEST CALIBRATION CHECK

Client/Owner: ECKS Project Number: 6671

Operator: M. KUBERA Date: 6·21·93

Meter Box No.: 61-5	Meter Box Vacuum: 3	Meter Box Yd: .9865	Barometric Press.: 29.26

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vd Net	In	Out	Tds Avg	In	Out	Td Avg	Time θ	Yd	ΔH@
66	1.5	-3.2	1.0000	0	10.002	10.002	139.615	149.450	9.835	76	76	76	92	83	87	14.44	1.0256	1.7790
6	1.5	-3.2	1.0000	0	10.037	10.037	149.450	159.379	9.929	76	76	76	93	87	90	14.54	1.0250	1.7814
6	1.5	-3.2	1.0000	0	10.000	10.000	159.379	169.332	9.953	76	76	76	9·	90	93	14.52	1.0243	1.7799

Nomenclature

)	Barometric Pressure
	Flow Rate (cfm)
I	Orifice Pressure Differential ("H_2O)
	Inlet Pressure Differential ("H_2O)
I	Volume Dry Gas Meter (ft^3)
s	Volume Dry Standard (ft^3)
	Meter Correction Factor (unitless)
s	Standard Meter Correction Factor (unitless)
@	Orifice Pressure Differential that gave 0.75 cfm of air at 70° F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb\,(Td + 460)}\left[\frac{(Tds + 460)\,\theta}{(Vds)\,(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)\,(Pb)}{(Tds + 460)\,\theta}$$

Location: FLARE INLET

Velocity Determination Field Data Sheet

Form 66-VEL DS

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/93	Inlet/Outlet/Stack
Pyrometer Number MAZ 61-5	Pitot Cp .94
Pitot Number	Ambient Temperature 80
Pitot Leak Check ✓ Before	✓ After

Cross-Section of Test Location

20 34" TOP

SIDE

First point all the way	(IN)	OUT
Area (ft²) .601	Port Len (in) 34	Gas Flow IN OUT

Barometric Pressure	974 "Hg / mbar
Duct Diameters Upstream	3
Duct Diameters Downstream	8
Data Recorder	PO
Probe Operator	KW
Source of Moisture Data	M4 TRAIN
Source of Molecular Weight Data	ORSAT

Run	1	Run	2	Run	3	Run	
Static Pres ("H_2O)	+6.4	Static Pres ("H_2O)	+6.6	Static Pres ("H_2O)	+6.5	Static Pres ("H_2O)	
Start Time	10:26	Start Time	12:10	Start Time	1:28	Start Time	
Stop Time	10:35	Stop Time	12:18	Stop Time	1:38	Stop Time	

Traverse Point Number	Velocity Head ΔP's	Stack Temp (°F)	Notes	Traverse Point Number	Velocity Head ΔP's	Stack Temp (°F)	Notes	Traverse Point Number	Velocity Head ΔP's	Stack Temp (°F)	Notes	Traverse Point Number	Velocity Head ΔP's	Stack Temp (°F)	Notes
1-1	.20	94		1-1	.20	93		1-1	.17	91					
2	.31	93		2	.18	92		2	.30						
3	.35	94		3	.25	94		3	.35	93					
4	.34	94		4	.31	93		4	.26						
5	.33	94		5	.33	92		5	.31	93					
6	.27	94		6	.34	93		6	.35						
2-1	.24	93		7	.34	92		7	.37	93					
2	.32	93		8	.30	93		8	.37						
3	.33	93		2-1	.21	92		2-1	.17	92					
4	.32	93		2	.35	93		2	.31						
5	.32	94		3	.36	94		3	.34	93					
6	.32	94		4	.37	93		4	.35						
				5	.37	94		5	.34	93					
				6	.35	94		6	.35						
				7	.32	93		7	.36	93					
				8	.29	93		8	.32						
Total															
Average	.5499	94			.5401	93			.5189	93					

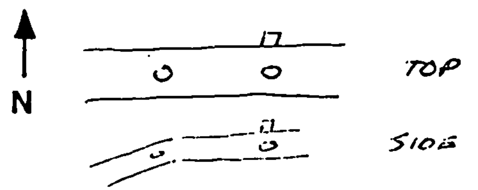
Moisture Determination Field Data Sheet

Location: FLARE INLET   Run: 1

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/93	Inlet/Outlet/Stack
Meter Operator PO	
Meter Box Number 61-5	
Meter ΔH@ 1.7862 Yd .9865	

Leak Rate Before	.001 cf/m @	25	"Hg
Leak Rate After	.001 cf/m @	25	"Hg

Cross-Section of Test Location



Area (ft³)	Port Len (in.)	Gas Flow IN OUT
.601	3½	

Ambient Temp. (°F) 80	
Bar. Press. 974 (in. Hg / mbar)	
Probe Length N/A	
Probe Material N/A	
IGS Bag ID No. N/A	
H_2O (ml) 4	Silica Gel (gm) 14
Total Vlc 18	
Start Time: 9:22 AM/PM	Stop Time: 10:22 AM/PM

Traverse Point Number	Min/pt / Clock Time	Pump Vacuum (in. Hg)	Impinger Outlet Temp. (°F)	Orifice Setting (in H_2O)	Initial Volume 967.14 / Gas Sample Volume V_m (ft³/L)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\ in}$ (°F)	Outlet $T_{m\ out}$ (°F)	Notes
N/A	5	0		2.0	971.15	86	77	
	10	0		2.0	975.16	92	78	
	15	0		2.0	979.15	95	81	
	20	0		2.0	983.18	96	82	
	25	0		2.0	987.21	98	84	
	30	0		2.0	991.36	98	85	
	35	0		2.0	995.33	99	87	
	40	0		2.0	999.46	99	87	
	45	0		2.0	003.45	100	88	
	50	0		2.0	007.51	100	89	
	55	0		2.0	011.61	101	90	
	60	0		2.0	015.97	99	89	
Total					48.83			
Average				2.0		91		

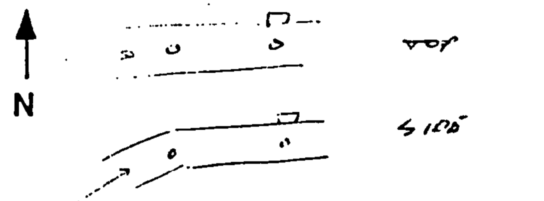
Moisture Determination Field Data Sheet

Location: FLARE INLET   Run: 2   Page 1 of 1

Client ECKS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/10/93	Inlet/Outlet/Stack
Meter Operator PO	
Meter Box Number 61-5	
Meter ΔH@ 1.7862	Yd .9865

Leak Rate Before .001 cf/m @ 25 "Hg	
Leak Rate After .001 cf/m @ 25 "Hg	

Cross-Section of Test Location



Area (ft^3)	Port Len (in.)	Gas Flow
.601	3'4"	IN / OUT (IN circled)

Ambient Temp. (°F) 80	
Bar. Press. 974 (in. Hg / mbar)	
Probe Length N/A	
Probe Material N/A	
IGS Bag ID No. N/A	
H_2O (ml) 9	Silica Gel (gm) 12
Total Vlc 21	
Start Time: 1055 AM/PM	Stop Time: 1155 AM/PM

Traverse Point Number	Min/pt Clock Time	Pump Vacuum (in. Hg)	Impinger Outlet Temp. (°F)	Orifice Setting (in H_2O)	Initial Volume 015.725 Gas Sample Volume V_m (ft^3/L)	Gas Sample Temperature at Dry Gas Meter Inlet $T_{m\,in}$ (°F)	Outlet $T_{m\,out}$ (°F)	Notes
N/A	5	0		2.0	020.34	97	90	
	10	0		2.0	024.34	98	90	
	15	0		2.0	028.45	96	90	
	20	0		2.0	032.37	96	89	
	25	0		2.0	036.48	97	89	
	30	0		2.0	040.26	97	89	
	35	0		2.0	044.35	98	89	
	40	0		2.0	048.32	98	89	
	45	0		2.0	052.31	97	89	
	50	0		2.0	056.27	93	87	
	55	0		2.0	060.04	92	85	
	60	0		2.0	064.19	92	87	
Total					48.47			
Average				2.0		92		

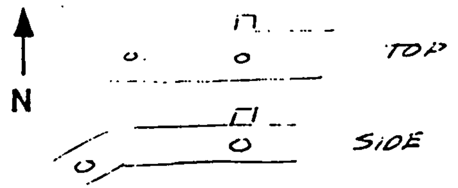
Moisture Determination Field Data Sheet

Location: FLARE INLET Run: 3 Page 1 of 1

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/93	(Inlet)/Outlet/Stack
Meter Operator FO	
Meter Box Number 61-5	
Meter ΔH@ 1.7862	Yd .9865

Leak Rate Before .001 cf/m @	4	"Hg
Leak Rate After .001 cf/m @	15	"Hg

Cross-Section of Test Location



Area (ft^3)	Port Len (in.)	Gas Flow IN OUT
.601	3/4	

Ambient Temp. (°F) 80	
Bar. Press. 974 (in. Hg / mbar)	
Probe Length N/A	
Probe Material N/A	
IGS Bag ID No. N/A	
H_2O (ml) 2	Silica Gel (gm) 14
Total Vlc 16	
Start Time: 12[23] AM/PM	Stop Time: 1[33] AM/PM

Traverse Point Number	Min/pt / Clock Time	Pump Vacuum (in. Hg)	Impinger Outlet Temp. (°F)	Orifice Setting (in H_2O)	Initial Volume 064.225 / Gas Sample Volume V_m (ft^3/L)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\,in}$ (°F)	Outlet $T_{m\,out}$ (°F)	Notes
N/A	5	0		2.0	068.24	92	86	
	10	0		2.0	072.24	96	86	
	15	0		2.0	076.41	96	87	
	20	0		2.0	080.21	95	87	
	25	0		2.0	084.20	95	87	
	30	0		2.0	088.36	95	87	
	35	0		2.0	092.19	95	86	
	40	0		2.0	096.20	95	85	
	45	0		2.0	100.18	95	86	
	50	0		2.0	104.18	96	85	
	55	0		2.0	108.26	96	86	
	60	0		2.0	112.26	94	85	
Total					48.04			
Average				2.0		91		

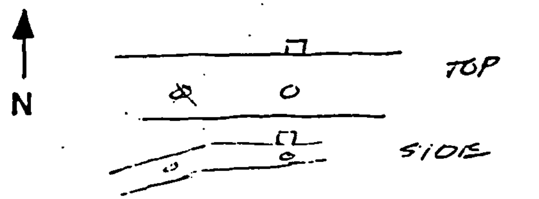
Method 18 - Adsorbing Tubes
Field Data Sheet

Location: FLARE INLET Run: 1 Page 1 of 1

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/23	Inlet/Outlet/Stack
Meter Operator PO	
Meter Box Number 71-17	
Id	

Leak Rate Before .01	cf/m @	10	"Hg
Leak Rate After .00	cf/m @	10	"Hg

Cross-Section of Test Location



Area (ft³)	Port Len (in.)	Gas Flow
.601	3/4	IN (circled) OUT

Ambient Temp. (°F)	80
Bar. Press. (in. Hg / mbar)	974
Probe Length	2'
Probe Material	Teflon
IGS Bag ID No.	

Tube No: 1	Type: CHARCOAL
Tube No: 2	Type: CHARCOAL
Tube No: 3	Type: CHARCOAL

Start Time: 9:25 AM/PM Stop Time: AM/PM

Min/pt Clock Time	Pump Vacuum (in. Hg)	Orifice Setting (In H_2O)	Flow Rate L/m	Initial Volume 532.84 / Gas Sample Volume V_m (L)	Gas Sample Temperature at Dry Gas Meter T_m (°F)	Bath Temp °F	Notes
5	0	2.8	1.0	537.14	73	N/A	
10	0	2.8	1.0	541.55	74	N/A	
15	0	2.8	1.0	546.35	75	N/A	
20	0	2.8	1.0	551.22	77	N/A	
25	0	2.8	1.0	556.00	78	N/A	
30	0	2.8	1.0	560.80	79	N/A	
35	0	2.8	1.0	565.60	80	N/A	
40	0	2.8	1.0	571.30	81	N/A	
45	0	2.8	1.0	575.42	82	N/A	
50	0	2.8	1.0	580.00	83	N/A	
55	0	2.8	1.0	584.50	83	N/A	
60	0	2.6	1.0	589.22	83	N/A	
Total				~~57.22~~			
Average		2.8	1.0	56.38	79		

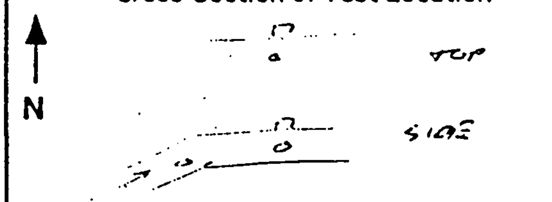
Method 18 - Adsorbing Tubes
Field Data Sheet

Location: FLARE INLET   Run: 2   Page 1 of 1

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/93	Inlet/Outlet/Stack
Meter Operator PO	
Meter Box Number 71-V7	
Yd	

Leak Rate Before .01 cf/m @	10	"Hg
Leak Rate After .001 cf/m @	1	"Hg

Cross-Section of Test Location



Area (ft³)	Port Len (in.)	Gas Flow
.601	3¼	(IN) OUT

Ambient Temp. (°F) 80
Bar. Press. 974 (in. Hg / (mbar))
Probe Length 2'
Probe Material Teflon
IGS Bag ID No. —

Tube No: 1	Type: CHARCOAL
Tube No: 2	Type: CHARCOAL
Tube No: 3	Type: CHARCOAL

Start Time: 10:55 AM/PM   Stop Time: 11:55 AM/PM

Min/pt / Clock Time	Pump Vacuum (in. Hg)	Orifice Setting (in H_2O)	Flow Rate L/m	Initial Volume 0 / Gas Sample Volume V_m (L)	Gas Sample Temperature at Dry Gas Meter T_m (°F)	Bath Temp °F	Notes
5	0	2.2	.8	5.1	84	N/A	
10	0	2.3	.8	9.5	83	N/A	
15	0	2.2	.8	14.95	83	N/A	
20	0	2.2	.8	18.10	83	N/A	
25	0	2.2	.8	22.50	83	N/A	
30	0	2.4	.8	26.60	83	N/A	
35	0	2.4	.8	31.00	84	N/A	
40	0	2.4	.8	34.90	92	N/A	
45	0	2.4	.8	39.10	88	N/A	
50	0	2.4	.8	43.00	82	N/A	
55	0	2.2	.8	46.90	81	N/A	
60	0	2.2	.7	51.85	82	N/A	
Total		2.2		51.85			
Average			.8		84		

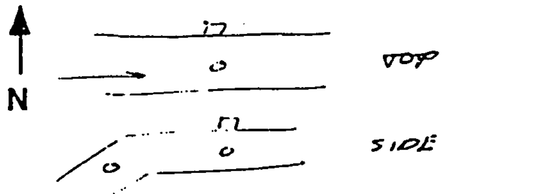
Method 18 - Adsorbing Tubes
Field Data Sheet

Location: FLARE INLET Run: 3 Page 1 of 1.

Client ECRS	Project Number 6671
Plant REFUSE LANDFILL	Unit FLARE
Date 6/8/93	Inlet/Outlet/Stack
Meter Operator PO	
Meter Box Number 71-V7	
Yd	

Leak Rate Before .001 cf/m @ 10 "Hg		
Leak Rate After .001 cf/m @ 1 "Hg		

Cross-Section of Test Location



Area (ft³)	Port Len (in.)	Gas Flow IN OUT
.601	3 1/4	

Ambient Temp. (°F) 80	
Bar. Press. 974 (in. Hg / mbar)	
Probe Length N/A	
Probe Material N/A	
IGS Bag ID No. N/A	

Tube No: 1	Type: CHARCOAL
Tube No: 2	Type: CHARCOAL
Tube No: 3	Type: CHARCOAL

Start Time: 1223 AM/PM Stop Time: 125 AM/PM

Min/pt Clock Time	Pump Vacuum (in. Hg)	Orifice Setting (In H_2O)	Flow Rate L/m	Initial Volume 0 / Gas Sample Volume V_m (L)	Gas Sample Temperature at Dry Gas Meter T_m (°F)	Bath Temp °F	Notes
5	0	2.2	.8	4.36	81		
10	0	2.4	.8	8.55	82		
15	0	2.4	.8	13.55	82		
20	0	2.2	.8	16.75	82		
25	0	2.4	.8	20.0	81		
30	0	2.4	.8	25.1	81		
35	0	2.4	.8	29.43	81		
40	0	2.4	.8	33.60	80		
45	0	2.4	.8	37.75	80		
50	0	2.4	.8	42.75	79		
55	0	2.4	.8	47.54	80		
60	0	2.2	.7	49.73	80		
Total				49.73			
Average		2.4	.8		81		

Volatile Organic Carbon by Method 25

Client: ECRS	Project #: 6671
Plant: Madison Wisc.	Sample Location: Inlet To Flare
Operator: Kurt Westprecht	Date: 6/8/93
Run Number: (1)	Sample ID: —
Tank Number: 4T154	Trap Number: —
Sampling Train ID#: 8513 B	% CO2: —
Side: Left / Right (circled)	% H2O: —
Start Time: 9:22AM	Stop Time: 10:22 AM

Pressure Readings	Tank Vacuum Manometer mm Hg / in Hg	Tank Vacuum Gauge mm Hg / in Hg	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	720	27.8	974	84.0
Post Test	196	7.0	974	84.8

Leak Rate	Tank * (in Hg) Allowable	Actual	Trap black ball reading
Pre Test		27.8	0
Post Test		7.0	0

$$\Delta P = .01 \frac{F\ Pb\ \emptyset}{Vt}$$

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C / F	Filter Temp C / F	Notes
5	26.0	45	NA	NA	
10	25.0	45	↓	↓	
15	23.5	55			
20	22.0	55			
25	20.0	55			
30	18.8	50			
35	16.8	60			
40	15.0	60			
45	13.8	60			
50	11.0	60			
55	9.0	60			
60	7.0	60			

Clean Air Engineering

Volatile Organic Carbon by Method 25

Client:	ECRS	Project #:	
Plant:	Madison	Sample Location:	Flare Inlet
Operator:	Kurt Wetrecht	Date:	6-8-93
Run Number:	2	Sample ID:	
Tank Number:	47206	Trap Number:	—
Sampling Train ID#:	B531 B	% CO2:	—
Side: Left / (Right):		% H2O:	—
Start Time:	10:55am	Stop Time:	11:55AM

Pressure Readings	Tank Vacuum Manometer (mm Hg) / in Hg	Tank Vacuum Gauge mm Hg / (in Hg)	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	712	27.2	974mb	84.0
Post Test	192	7.0	973	82.0

Leak Rate	Tank * (in Hg) Allowable	Tank * (in Hg) Actual	Trap black ball reading
Pre Test		27.8	0
Post Test		7.0	0

$$\Delta P = .01 \frac{F\ Pb\ \emptyset}{Vt}$$

973mb

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C / F	Filter Temp C / F	Notes
5	25.4	60	NA	NA	
10	23.5	60	↓	↓	
15	22.0	55			
20	20.6	55			
25	19.0	55			
30	17.4	51			
35	15.2	60			
40	13.2	60			
45	KW ~~13.0~~ 11.8	55			
50	10.0	55			
55	8.2	50			
60	7.0	50	↓	↓	

Clean Air Engineering

Volatile Organic Carbon by Method 25

Client:	ICRS	Project #:	6671
Plant:	Madison, Wisc.	Sample Location:	Flare Inlet
Operator:	Kurt Weppracht	Date:	6-8-93
Run Number:	(3)	Sample ID:	
Tank Number:	4729	Trap Number:	—
Sampling Train ID#:	8513B	% CO2:	—
Side: Left / Right (circled Right)		% H2O:	—
Start Time:	12:24 pm	Stop Time:	1:24 pm

Pressure Readings	Tank Vacuum Manometer mm Hg / in Hg (mm Hg circled)	Tank Vacuum Gauge mm Hg / in Hg (in Hg circled)	Barometric Pressure mm Hg / in Hg	Ambient Temperature C / F
Pre Test	720	27.8	974 mb	84.0
Post Test	132	5.0	972 mb	82.

Leak Rate	Tank * (in Hg) Allowable	Tank * (in Hg) Actual	Trap black ball reading
Pre Test		27.8	0
Post Test		5.0	0

$$\Delta P = .01 \frac{F\ Pb\ \emptyset}{Vt}$$

ΔP = Pressure Change (in Hg)
F = Sampling Flow Rate cc / min
Pb = Barometric Pressure (in Hg)
ø = Leak Check Time Period (min)
Vt = Sample Train Volume (cc); approx 100 cc

Clock Time	Gauge Vacuum (in Hg)	Flowmeter Setting (silver ball)	Probe Temp C / F	Filter Temp C / F	Notes
5	25.0	65	NA	NA	
10	23.0	65	↓	↓	
15	21.0	62			
20	19.0	60			
25	17.0	62			
30	15.0	60			
35	13.0	60			
40	11.0	55			
45	9.4	55			
50	8.0	55			
55	6.5	55			
60	5.0	55			

Clean Air Engineering

Page No.__

6/9/93

TANK #	BAR. (Pre)	(Temp)	(VAC.)	POST BAR	Temp	VAC
4T171	981 mb	74.6	710 mm	982	75.2 °F	2 mm
4T157	981 mb	74.6	716 mm	982	75.2 °F	0
4T113	981 mb	74.6	724 mm	982	75.2 °F	28 mm

Run #1 TANK 4T171

Run #2 TANK 4T157

Run #3 TANK 4T113

368
348
716

372
-52
24

Field Data Printout

Location: Flare Inlet
Test Run: 1
Client: ECRS
Project No: 6671
Test Date: 6/08/93
Meter ΔH@: 1.7862
Meter Y_d: 0.9865
Pitot C_p: 0.99
Static P: 6.4

Method: 1,2,4
Testing Type: Flow & Wet
Area (ft^2): 0.150

Bar. Press. (in. Hg): 28.76
Assumed Moisture (%):

Nozzle Diameter (D_n):
O_2 (dry volume %): 2.56
CO_2 (dry volume %): 32.6
Start Time (approx.): 09:22
Stop Time (approx.): 10:22
H_2O (condensate, ml): 4.0
H_2O (silica, gm): 14.0

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.\ H_2O}$)	Volume (calculated) (ft^3)
	0.0			967.14					
1-01	5.0	0.20	2.0	971.15	94	86	77	0.45	4.01
1-02	10.0	0.31	2.0	975.16	93	91	78	0.56	4.01
1-03	15.0	0.35	2.0	979.15	94	95	81	0.59	3.99
1-04	20.0	0.34	2.0	983.18	94	96	82	0.58	4.03
1-05	25.0	0.33	2.0	987.21	94	98	84	0.57	4.03
1-06	30.0	0.27	2.0	991.36	94	98	85	0.52	4.15
2-01	35.0	0.24	2.0	995.33	93	99	87	0.49	3.97
2-02	40.0	0.32	2.0	999.46	93	99	87	0.57	4.13
2-03	45.0	0.33	2.0	1003.45	93	100	88	0.57	3.99
2-04	50.0	0.32	2.0	1007.51	93	100	89	0.57	4.06
2-05	55.0	0.32	2.0	1011.61	94	101	90	0.57	4.10
2-06	60.0	0.32	2.0	1015.97	94	99	89	0.57	4.36
Final	60.0		2.0	48.83	94	91		0.55	

Field Data Printout

Location: Inlet Flare
Test Run: 2
Client: ECRS
Project No: 6671
Test Date: 6/08/93
Meter ΔH@: 1.7862
Meter Y_d: 0.9865
Pitot C_p: 0.99
Static P: 6.6

Method: 1,2,4
Testing Type: Flow & Wet
Area (ft^2): 0.150

Bar. Press. (in. Hg): 28.76
Assumed Moisture (%):
Nozzle Diameter (D_n):
O_2 (dry volume %): 1.86
CO_2 (dry volume %): 34.9
Start Time (approx.): 10:55
Stop Time (approx.): 11:55
H_2O (condensate, ml): 9.0
H_2O (silica, gm): 12.0

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.\ H_2O}$)	Volume (calculated) (ft^3)
	0.0			15.73					
1-01	5.0	0.20	2.0	20.34	93	97	90	0.45	4.62
1-02	10.0	0.18	2.0	24.34	92	98	90	0.42	4.00
1-03	15.0	0.25	2.0	28.45	94	96	90	0.50	4.11
1-04	20.0	0.31	2.0	32.37	93	96	89	0.56	3.92
1-05	25.0	0.33	2.0	36.48	92	97	89	0.57	4.11
1-06	30.0	0.34	2.0	40.26	93	97	89	0.58	3.78
1-07	35.0	0.34	2.0	44.35	92	98	89	0.58	4.09
1-08	40.0	0.30	2.0	48.32	93	98	89	0.55	3.97
2-01	45.0	0.21	2.0	52.31	92	97	89	0.46	3.99
2-02	50.0	0.35	2.0	56.27	93	93	87	0.59	3.96
2-03	55.0	0.36	2.0	60.04	94	92	85	0.60	3.77
2-04	60.0	0.37	2.0	64.19	93	92	87	0.61	4.15
2-05		0.37			94			0.61	
2-06		0.35			94			0.59	
2-07		0.32			93			0.57	
2-08		0.29			93			0.54	
Final	60.0		2.0	48.47	93	92		0.55	

Field Data Printout

Location: Flare Inlet
Test Run: 3
Client: ECRS
Project No: 6671
Test Date: 6/08/93
Meter ΔH@: 1.7862
Meter Y_d: 0.9865
Pitot C_p: 0.99
Static P: 6.5

Method: 1,2,4
Testing Type: Flow & Wet
Area (ft^2): 0.150

Bar. Press. (in. Hg): 28.76
Assumed Moisture (%):
Nozzle Diameter (D_n):
O_2 (dry volume %): 1.65
CO_2 (dry volume %): 35.0
Start Time (approx.): 12:23
Stop Time (approx.): 13:33
H_2O (condensate, ml): 2.0
H_2O (silica, gm): 14.0

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft^3)	Stack T_s (°F)	Dry Gas Meter $T_{m\ in}$ (°F)	Dry Gas Meter $T_{m\ out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{in.\ H_2O}$)	Volume (calculated) (ft^3)
	0.0			64.23					
1-01	5.0	0.17	2.0	68.24	91	92	86	0.41	4.02
1-02	10.0	0.30	2.0	72.24		96	86	0.55	4.00
1-03	15.0	0.35	2.0	76.41	93	96	87	0.59	4.17
1-04	20.0	0.26	2.0	80.21		95	87	0.51	3.80
1-05	25.0	0.31	2.0	84.20	93	95	87	0.56	3.99
1-06	30.0	0.35	2.0	88.36		95	87	0.59	4.16
1-07	35.0	0.37	2.0	92.19	93	95	86	0.61	3.83
1-08	40.0	0.37	2.0	96.20		95	85	0.61	4.01
2-01	45.0	0.17	2.0	100.18	92	95	86	0.41	3.98
2-02	50.0	0.31	2.0	104.18		96	85	0.56	4.00
2-03	55.0	0.34	2.0	108.26	93	96	86	0.58	4.08
2-04	60.0	0.35	2.0	112.26		94	85	0.59	4.00
2-05		0.34			93			0.58	
2-06		0.35						0.59	
2-07		0.36			93			0.60	
2-08		0.32						0.57	
Final	60.0		2.0	48.04	93	91		0.56	

CERTIFICATE OF ANALYSIS

CUSTOMER: ECRS

DATE RECEIVED: JUNE 8, 1993

SAMPLE TYPE: STAINLESS STEEL CANNISTERS

JOB/P.O.NUMBER: 85-6671

PARAMETERS: NITROGEN, OXYGEN & CARBON DIOXIDE

DATE REPORTED: JULY 8, 1993

MARKS: 85227-01-03

LABORATORY NUMBER	FIELD IDENTIFICATION	NITROGEN (%)	OXYGEN (%)	CARBON DIOXIDE (%)
85240-01	INLET RUN 1	20.2	2.56	32.6
85240-02	INLET RUN 2	18.6	1.86	34.9
85240-03	INLET RUN 3	17.9	1.65	35.0

Analyst: [signature]
Gary Zapel
Analytical Chemist

Reviewed by: [signature]
Patrick Clark, P.E.
Manager, VOC Services

CERTIFICATE OF ANALYSIS

CUSTOMER: ECRS

DATE RECEIVED: JULY 6, 1993

SAMPLE TYPE: CHARCOAL TUBES

JOB/P.O.NUMBER: 85-6671

PARAMETERS: VINYL CHLORIDE & BENZENE

DATE REPORTED: JULY 21, 1993

MARKS: 85248-01-12

LABORATORY NUMBER	FIELD IDENTIFICATION	VINYL CHLORIDE (Mg)	BENZENE (Mg)
85240-01,02,03	BLANK	<0.003	<0.002
85240-04,05,06	INLET RUN 1	<0.003	0.401
85240-07,08,09	INLET RUN 2	<0.003	0.339
85240-10,11,12	INLET RUN 3	<0.003	0.322

Analyst: Gary Zapel
Gary Zapel
Analytical Chemist

Reviewed by: P. Clark
Patrick Clark, P.E.
Manager, VOC Services

Method 25C Results

Client: D85 - ECRS
Landfill: Madison, WI
Date Sampled: 6/08/93

CAE Job # 6671
D85 Lab # 85234
Reported: 6/30/93

Source	Sample - Run ID #	Nonmethane Hydro-carbons (ppmv asC)
Outlets	Run-1	1207.2
	Run-2	1558.3
	Run-3	1271.1

Compiled By: Thomas C. Grossman On: 6/30/93

Approved By: [signature] On: 6/30/93

CAE Job # 6671 Landfill: Madison, WI
Client: D85 - ECRS Sample Location:
Disk/File 85180DET (In/Out) Inlet
Page No. 2 Reported: 6/30/93

Preliminary Data--

Sample Date		6/08/93	6/08/93	6/08/93
Run No.		Run-1	Run-2	Run-3
Tank No.		4T154	4T206	4T29
Tank Volume V(cc)		4035	3998	4041

Field Data--

PTI	(mm Hg)	-720	-712	-720
TTI	(F)	84	84	84
PbI	(mm Hg)	731	731	731
PT	(mm Hg)	-196	-192	-132
TT	(F)	85	82	82
Pb	(mm Hg)	731	730	729
PT - Lab	(mm Hg)	-231	-213	-158
TT - Lab	(F)	76	76	76
Pb - Lab	(mm Hg)	744	744	744
PTF	(mm Hg)	318	386	607
TTF	(F)	76	76	76
PbF	(mm Hg)	744	744	744
Vs	(cc)	2697	2662	3039
Dil. Factor		2.059	2.200	2.328

=================Analytical Results==================

Total Gaseous Nonmethane Organics (TGNMO)============

Ba	(ppmv C)	0.4	0.8	3.1
Ctm 1	(ppmv C)	566.5	702.5	533.8
Ctm 2	(ppmv C)	582.3	710.5	551.1
Ctm 3	(ppmv C)	611.0	714.6	562.1
Avg. Ctm	(ppmv C)	586.6	709.2	549.0
RSD Ctm	(%)	3.8	0.9	2.6
Ct	(ppmv C)	1207.2	1558.3	1271.1

CAE Job # 6671
Client: D85 - ECRS
Disk/File 85180DET
Page No. 3

Landfill: Madison, WI
Sample Location: Flare
(In/Out) Outlet
Reported: 6/30/93

Preliminary Data				
Sample Date		6/08/93	6/08/93	6/08/93
Run No.		Run-1	Run-2	Run-3
Tank No.		41171	41157	41113
Tank Volume V(cc)		4000	4033	4021
Field Data				
PTI	(mm Hg)	-710	-716	-724
TTI	(F)	75	75	75
PbI	(mm Hg)	736	736	736
PT	(mm Hg)	-2	0	-28
TT	(F)	75	75	75
Pb	(mm Hg)	737	737	737
PT - Lab	(mm Hg)	-7	-8	-35
TT - Lab	(F)	76	76	76
Pb - Lab	(mm Hg)	744	744	744
PTF	(mm Hg)	388	396	396
TTF	(F)	76	76	76
PbF	(mm Hg)	744	744	744
Vs	(cc)	3683	3755	3640
Dil. Factor		1.594	1.587	1.633

APPENDIX 4

LEACHATE ANALYTICAL RESULTS

MSA
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E C R S INC ANALYTICAL REPORT

ECRS
BRIAN HEGGE
2201 VONDRON ROAD
MADISON, WI 53704

Client I.D. No.:1184
Work Order No.:9303000336
Project Name:REFUSE HIDEAWAY
Project Number:C6024.01
Arrival Temperature:ON ICE

Sample I.D. #:7447 **Sample Description:**LEACHATE **Date Sampled:**03/22/93

Analyte	Result	Units
Cyanide, Total	50.8	ug/L
Lead, Total	0.02	mg/L
Mercury, Total, Low Level Elevated detection limit due to matrix interference.	<0.0002	mg/L
Metals Sample Preparation	3/26/93	
Nickel, Total	0.06	mg/L
Oil and Grease	9.0	mg/L
Selenium, Total, Low Level	<2	ug/L
pH (Lab)	7.68	
Hexavalent Chromium EXCEEDED HOLDING TIME	141	ug/L
Cadmium, Total	0.005	mg/L
Chromium, Total	0.07	mg/L
Copper, Total	0.009	mg/L
Zinc, Total	0.036	mg/L
Silver, Total	<0.5	mg/L

Submitted By: ______

Wisconsin DNR Laboratory Certification Number: 157066030
DHSS Certification Number: MW0289

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ANALYTICAL REPORT

TERRA ENGINEERING & CONSTRUCT.
KIRK SOLBERG
2201 VONDRON ROAD
MADISON, WI 53704

Client I.D. No.:1184
Work Order No.:9306000022
Project Name:REFUSE HIDEAWAY
Project Number:C6024.01
Arrival Temperature:N/A

Sample I.D. #:15551 | **Sample Description:**LEACHATE | **Date Sampled:**06/01/93

Analyte	Result	Units
Cadmium, Total	0.004	mg/L
Copper, Total	0.02	mg/L
Hexavalent Chromium	76	ug/L
Total Chromium	160	ug/L
Lead, Total	< 0.02	mg/L
Mercury, Total, Low Level	< 0.0002	mg/L
Metals Sample Preparation	6/2/93	
Nickel, Total	0.110	mg/L
Oil and Grease	< 5.0	mg/L
Zinc, Total	0.050	mg/L
pH (Lab)	8.01	
Cyanide, Total	12	ug/L
Silver, Total, Low Level	< 0.5	ug/L
Selenium, Total, Low Level	< 20	ug/L

Elevated detection limit due to matrix interference.

Submitted By: ______

Wisconsin DNR Laboratory Certification Number: 157066030
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ANALYTICAL REPORT

TERRA ENGINEERING & CONSTRUCT.
KIRK SOLBERG
2201 VONDRON ROAD
MADISON, WI 53704

Client I.D. No.:1184
Work Order No.:9308000672
Project Name:REFUSE HIDEAWAY
Project Number:468
Arrival Temperature:8.8C
Report Date: 11/30/93

Sample I.D. #:27893 **Sample Description:**REFUSE HIDEAWAY (LEACHATE) **Date Sampled:**08/30/93

Analyte	Result	Units
Cadmium, Total	<5	ug/L
Chromium, Total	170	ug/L
Copper, Total	10	ug/L
Cyanide, Total	0.078	mg/L
Hexavalent Chromium	435	ug/L
Lead, Total	<20	ug/L
Metals Sample Preparation	9/1/93	
Nickel, Total	100	ug/L
Oil and Grease	10	mg/L
Selenium, Total, Low Level Elevated detection limit due to matrix interference.	0.6	ug/L
Silver, Total, Low Level	<0.5	ug/L
Zinc, Total	27	ug/L
pH (Lab)	8.47	S.U.'s
Mercury, Total, Low Level Elevated detection limit due to matrix interference.	<0.4	ug/L

Submitted By: [signature]

Wisconsin DNR Laboratory Certification Number: 157066030
DHSS Certification Number: MW0289

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TERRA ENGINEERING & CONSTRUCT.
KIRK SOLBERG
2201 VONDRON ROAD
MADISON, WI 53704

Client I.D. No.:1184
Work Order No.:9310000133
Project Name:REFUSE HIDEAWAY
Project Number:468
Arrival Temperature:ON ICE
Report Date: 12/06/93

Sample I.D. #:33585 **Sample Description:**LEACHATE **Date Sampled:**10/05/93

Analyte	Result	Units
Arsenic, TCLP	< 0.214	mg/L
Barium, TCLP	0.18	mg/L
Cadmium, TCLP	< 0.004	mg/L
Chromium, TCLP	0.055	mg/L
Lead, TCLP	< 0.09	mg/L
Mercury, TCLP	< 0.0024	mg/L
Selenium, TCLP	< 0.186	mg/L
Silver, TCLP	< 0.012	mg/L
Chlordane, TCLP	< 0.002	mg/L
Endrin, TCLP	< 0.00008	mg/L
Heptachlor, TCLP	< 0.00004	mg/L
Heptachlor Epoxide, TCLP	< 0.00004	mg/L
Lindane, TCLP	< 0.00004	mg/L
Methoxychlor, TCLP	< 0.0001	mg/L
Toxaphene, TCLP	< 0.002	mg/L
2,4-D, TCLP	< 0.003	mg/L
2,4,5-TP, Silvex, TCLP	< 0.0003	mg/L
1,4-Dichlorobenzene, TCLP	< 0.020	mg/L
2,4-Dinitrotoluene, TCLP	< 0.050	mg/L
Hexachlorobenzene, TCLP	< 0.050	mg/L
Hexachlorobutadiene, TCLP	< 0.050	mg/L
Hexachloroethane, TCLP	< 0.050	mg/L
Nitrobenzene, TCLP	< 0.050	mg/L
Pyridine, TCLP	< 0.100	mg/L
Cresol, TCLP	< 0.050	mg/L
Pentachlorophenol, TCLP	< 0.250	mg/L
2,4,5-Trichlorophenol, TCLP	< 0.050	mg/L
2,4,6-Trichlorophenol, TCLP	< 0.050	mg/L
Benzene, TCLP	< 0.020	mg/L
Carbon Tetrachloride, TCLP	< 0.020	mg/L
Chlorobenzene, TCLP	< 0.020	mg/L
Chloroform, TCLP	< 0.020	mg/L
1,2-Dichloroethane, TCLP	< 0.020	mg/L
1,1-Dichloroethylene, TCLP	< 0.020	mg/L
Methyl Ethyl Ketone, TCLP	< 0.400	mg/L
Tetrachloroethylene, TCLP	< 0.020	mg/L
Trichloroethylene, TCLP	< 0.020	mg/L
Vinyl Chloride, TCLP	< 0.020	mg/L
TCLP ZHE Extraction	10/12/93	

Submitted By: ________

Wisconsin DNR Laboratory Certification Number: 157066030
DHSS Certification Number: MW0289

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ANALYTICAL REPORT

TERRA ENGINEERING & CONSTRUCT.
KIRK SOLBERG
2201 VONDRON ROAD
MADISON, WI 53704

Client I.D. No.:1184
Work Order No.:9312000236
Project Name:REFUSE HIDEAWAY
Project Number:QUARTERLY
Arrival Temperature:15.9C
Report Date: 01/06/94

Sample I.D. #:42536 **Sample Description:**REFUSE HIDEAWAY-LEACHATE **Date Sampled:**12/09/93

Analyte	Result	Units
Cyanide, Total	0.008	mg/L
Metals Sample Preparation	12/10/93	
Chromium, Total, Low Level (Cr6+ Confirmation)	150	ug/L
Hexavalent Chromium	246	ug/L
Oil and Grease	8	mg/L
pH (Lab)	7.95	
Cadmium, Total	8	ug/L
Chromium, Total	120	ug/L
Copper, Total	20	ug/L
Lead, Total	<20	ug/L
Mercury, Total, Low Level Elevated detection limit due to matrix interference.	<0.4	ug/L
Metals Sample Preparation	12/10/93	
Nickel, Total	110	ug/L
Zinc, Total	19	ug/L
Silver, Total, Low Level	<0.5	ug/L
Selenium, Total, Low Level Elevated detection limit due to matrix interference.	<0.2	ug/L

Submitted By: ______

Wisconsin DNR Laboratory Certification Number: 157066030
DHSS Certification Number: MW0289

APPENDIX 5

MMSD DISCHARGE PERMIT

MADISON METROPOLITAN
SEWERAGE DISTRICT

1610 Moorland Road
Madison, WI 53713-3398
Telephone (608) 222-1201
Fax (608) 222-2703

James L. Nemke
Chief Engineer & Director

mmsd

August 27, 1993

Mr. Kirk J. Solberg
Terra Engineering & Construction Corporation
2201 Vondron Road
Madison, WI 53704-6795

Dear Mr. Solberg:

In response to your letter of August 24, 1993, I have enclosed Permit No. NTO-5A for the Refuse Hideaway Landfill. This permit allows discharge of wastewater from this facility to the District's Nine Springs Wastewater Treatment Plant until September 25, 1994.

I understand your firm now has the responsibility to perform the testing specified by the permit. If you have any questions on the permit, please contact me.

Sincerely,

Paul H. Nehm

Paul H. Nehm
Director of Wastewater
Treatment Operations

Enclosure

PHN/nkb

metrogro

Permit No. NTO-5A

WASTEWATER DISCHARGE PERMIT

In compliance with the provisions of Articles 5 and 6 of the Madison Metropolitan Sewer District Sewer Use Ordinance and the District's Policy on Acceptance of Wastewater Containing Non-Typical Organic and Inorganic Constituents,

Department of Natural Resources
Post Office Box 7921
Madison, WI 53707

is hereby authorized to discharge wastewater from the Refuse Hideaway Landfill into the District sewerage system in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in this permit.

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit.

This permit shall become effective on September 26, 1993, and shall expire at midnight, September 25, 1994. Any appeals to the conditions of this permit must be made to the Chief Engineer and Director within thirty days of the signature date.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit in accordance with the requirements of Article 5 of the Madison Metropolitan Sewerage District Sewer Use Ordinance, at least thirty days prior to the expiration date.

In accordance with Articles 5 and 6 of the Madison Metropolitan Sewerage District Sewer Use Ordinance, the District reserves the right to amend this permit from time to time or to revoke the permit.

By: James L. Nemke
James L. Nemke
Chief Engineer and Director

Dated this 27th day of August, 1993.