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PILOT TEST FOR
LANDFILL GAS EXTRACTION SYSTEM
FF/NN LANDFILL
RIPON, WISCONSIN

June 29, 2005

Prepared for:

FF/NN Landfill Group

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Project No. 1011.002

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1.0 EXECUTIVE SUMMARY

As part of the Focused Feasibility Study (FFS) for the FF/NN Landfill, modification of the current passive landfill gas control system is being considered as a remedial alternative to prevent off-site migration of methane and vinyl chloride. To evaluate this source control alternative, an active gas extraction pilot test was conducted on May 10-11, 2005 at the landfill. The specific objectives of this pilot test were to determine: 1) whether the existing passive gas vent collection piping could be effectively used as part of an active gas extraction system; and 2) whether the leachate head wells either alone or in combination with the passive gas collection piping can function as part of an active gas extraction system.

The significant conclusions of the pilot test are as follows:

1. Active gas extraction from the existing landfill gas venting system is capable of reducing methane concentrations at the gas probes located off-site. Therefore, additional gas extraction wells do not need to be installed.
2. Assuming an active gas extraction system operating at 100 cfm, the concentration of vinyl chloride in the landfill gas would result in an estimated annual emission of about 17.5 pounds of vinyl chloride, which is far below the threshold of 300 pounds per year that requires air pollution control. Therefore a flare would not be required.
3. The methane concentration observed during the pilot testing was less than 35%, which is the minimum required to sustain a flame in a flare or to operate a microturbine. Therefore, energy recovery with a microturbine is not practical at this site.

It is recommended that an interim gas extraction system be installed to evaluate the longer-term effect of active gas extraction on groundwater quality. Information on water quality impacts can also be used to determine the need for and the possible design of a more permanent system.

2.0 INTRODUCTION

2.1 Background

Methane has been measured at gas probes and monitor wells around the FF/NN Landfill at concentrations that exceed 25% of its lower explosive limit (LEL) at several locations outside of the limits of the landfill. In addition, recent analysis of landfill gas samples has indicated that vinyl chloride is present in several landfill gas samples, which may serve as the source of vinyl chloride detected in groundwater at the site. For these reasons, the FF/NN Landfill PRP Group is considering the feasibility of an active landfill gas extraction at the site.

A composite cap (clay and HDPE plastic membrane) was constructed on the landfill in 1996, and a passive landfill gas system was constructed beneath the cap at that time. The passive gas system consists of slotted piping within one-foot deep stone-filled trenches in a grid pattern across the surface of the landfill. Twelve vertical gas vents emit landfill gas from the trenches to the atmosphere; each of these vents is located at the intersection of collection piping. The layout of the passive gas system, as well as the location of gas probes and monitor wells near the site, is provided on Figure 2. Construction details of the passive vents are provided on Figure 2.

A "Pilot Test Work Plan, Landfill Gas Extraction System, FF/NN Landfill, Ripon, Wisconsin" was prepared by GeoTrans, Inc. on March 23, 2005. The WDNR and US EPA submitted questions to GeoTrans regarding the Work Plan, and these questions were answered in an April 7, 2005 memo. The Work Plan was subsequently approved by the WDNR in a letter dated April 20, 2005. The approval letter and answers to questions about the Work Plan are provided in Appendix A.

2.2 Pilot Test Objectives

The overall objective of the pilot test was to determine the feasibility of active methane extraction. The specific objectives of this pilot test were to determine whether: 1) the existing passive gas collection piping can be effectively used as part of an active gas extraction system; 2) the leachate head wells either alone or in combination with the passive gas collection piping can function as part of an active gas extraction system; and 3) evaluate whether additional vertical gas extraction wells would be needed if a gas extraction system is needed and feasible. The specific tasks included:

- Determining whether each of the extraction system configurations is capable of inducing a partial vacuum throughout the landfill and at gas probes outside of the landfill;
- Determining methane concentrations in exhaust gases to evaluate whether a flare would be self-sustaining, or whether energy recovery using a microturbine is feasible (at least 35% methane is needed for either alternative); and
- Determining VOC and vinyl chloride concentrations in exhaust gases to estimate annual emissions that would be expected from an active gas extraction system.

3.0 PILOT TEST EQUIPMENT AND PROCEDURES

3.1 Equipment Specifications

The pilot test was carried out using a skid mounted rental unit provided by Schrader Environmental Services of Ithica, Michigan. The unit consisted of the following:

- Duroflow 3006 positive displacement blower;
- 3 horsepower, single phase, 230 volt, 60 hertz, explosion-proof motor;
- Inlet particulate filter and exhaust silencer;
- Moisture knockout tank, approximately 20 gallon capacity;
- High level shutdown switch for knockout tank;
- 1-inch diameter manual drain valve for the knock-out tank;
- Control panel with on-off switch, motor starter and overload;
- Vacuum gauge on inlet;
- ERDCO direct reading air flow meter; and
- Dilution air valve (after flow meter).

The skid mounted unit was transported to the site on an open trailer on May 9, 2005. The blower motor was powered by a Caterpillar 30 KW Olympian diesel generator, provided by Fabco Rents of Appleton, Wisconsin.

3.2 Pilot Test Preparation

The following work was performed by GeoTrans on May 9, prior to the start of the pilot test:

- The rotating ventilators on each of the passive gas vent pipes were replaced with 4-inch diameter schedule 40 PVC end caps. End caps on select vents had a universal push type pneumatic quick coupler inserted into a drilled hole for taking vacuum and methane concentration measurements;

- The covers on the leachate head wells were replaced with 4-inch diameter PVC end caps with quick couplers; and
- A round of baseline methane measurements were taken at all pilot test monitoring points.

3.3 Pilot Test Operation

Pilot testing began on the morning of May 10, 2005, and continued through May 11, 2005. The system was run for approximately 6.5 hours each day.

During the first day, the vacuum blower was connected to two existing passive gas system vents (GV-1 and GV-3; see Figure 1). These vents were selected because they are located nearest to the off-site migration of gas, and are above the deepest part of the landfill. The test was run with a vacuum of approximately 1-inch of mercury and a flow rate of approximately 175 cubic feet per minute (cfm).

For the second day of the pilot test, the original work plan included connecting the vacuum blower to leachate head wells LC-1 and LC-3. However, the blower was unable to provide sufficient vacuum to draw exclusively from these two leachate head wells. While the blower was rated to provide 5-inches of mercury vacuum at a flow rate of about 200 cfm, the blower system overloaded and shutdown numerous times after operating five minutes at approximately 4-inches of mercury and 100 cfm when connected to the two leachate head wells. Because of the limitations of the equipment, a decision was made to conduct the second day of testing by connecting the vacuum blower to LC-3 and GV-2 and GV-4. These sample points are also located on the west side of the landfill, and are adjacent to and north of GV-1 and GV-3, respectively. Using this configuration, the second day of testing ran at a vacuum of approximately 1-inch of vacuum and 175 cfm.

The work plan indicated that a third day of testing would include drawing from gas probe GP-3, leachate head wells LC-1 and LC-3, and gas vents GV-1 and GV-3. However, because the pilot testing the previous day included gas vents and a leachate head well, and blower shutdown

occurred when drawing from the leachate head wells and one gas vent, additional testing was not pursued. Furthermore, testing on the first two days indicated that the system had influenced off-site gas probes sufficiently, making a third day of testing unnecessary.

Due to the limitations of the equipment and equipment shutdown, it was not possible to significantly vary the vacuum or the air flow rate during the pilot test. The oxygen concentrations remained within 3% of their initial concentrations during the test.

3.4 Monitoring

Monitoring was performed at the blower system and at observation points (gas vents, leachate head wells and gas probes that were not being used for extraction). The monitoring is summarized below. Field forms are provided in Appendix C.

3.4.1 Blower System Monitoring

Monitoring of the blower system consisted of the following:

- Measuring the vacuum and air flow at the inlet of the blower throughout the tests, using the vacuum gauge and air flow meter provided with the blower unit;
- Determining the methane, carbon dioxide and oxygen concentrations at the inlet to the blower for each portion of the system (i.e., GV-1 and GV-3 connected to blower) used for extraction. A Landtec Gem 500 Gas Analyzer was used to determine methane concentrations in the exhaust gas. Methane concentrations were measured and recorded at the beginning of each test, and several times throughout the tests. Exhaust gas levels of carbon dioxide and oxygen were measured and recorded at the same time as methane.
- Measuring the induced vacuum and air velocity at the inlet to the blower for each portion of the system (gas vent or leachate head well) used for extraction. The induced vacuum, identified in this report as the "partial vacuum", measures the reduction of pressure within a monitoring point relative to the atmospheric pressure. A Dwyer 36-inch slack

tube manometer was used to measure the induced vacuum, and an Airflow TA35 anenometer/thermometer was used to measure the air velocity and temperature.

The purpose in measuring the velocity of air in the pipe from each of the extraction locations was to determine the relative flow of gas from each portion of the system and to try equalizing the flow from each portion of the system. However, because of the limitations of the blower equipment shutting down, the vacuum and flow rates could not be varied for the specific extraction location. As a result, greater air flow rates were generally observed from the extraction point located closest to the blower.

A Summa canister was used to collect air emission samples at the end of each test. The Summa canister samples were analyzed for VOCs using method TO-14 by Pace Analytical in Minneapolis, Minnesota. The analytical results are provided in Appendix D.

Draeger tubes were used to analyze emission samples for vinyl chloride at the beginning, middle and end of each test. Field forms indicating Draeger tube testing results are provided in Appendix C.

3.4.2 Observation Point Monitoring

Prior to the start of each test, the methane, carbon dioxide and oxygen concentrations were measured at each of the observation point monitoring locations. These observation points included the following gas probes, leachate head wells, gas vents and water table monitor wells, as shown on Figure 1:

GP-1	GP-2	GP-3	GP-6
GP-7	GP-8	LC-1	LC-2
LC-3	GV-1	GV-2	GV-3
GV-4	GV-9	GV-12	MW-101
MW-102	MW-103	MW-104	

During each test, the partial vacuum and concentrations of methane, carbon dioxide and oxygen were recorded in the first hour, and at least twice more during the duration of each of the pilot tests. The slack tube manometer and the Landtec GEM 500 were used to measure partial vacuum and methane, carbon dioxide and oxygen. Barometric pressure and ambient temperature were recorded at least twice each day.

3.5 Condensate Handling

The blower unit included a 20 gallon knock-out tank for collecting condensate. The tank was checked for condensate at the end of each day of testing. No condensate was generated during the pilot tests; therefore no sample was available for analysis.

4.0 PILOT TEST RESULTS

Monitoring results are summarized on the following tables:

- Table 1 provides methane concentrations at observation points;
- Table 2 provides carbon dioxide concentrations at observation points;
- Table 3 provides oxygen concentrations at observation points;
- Table 4 provides partial vacuum measurements at observation points;
- Table 5 provides methane, carbon dioxide, oxygen, air flow rates, temperature and partial vacuum at each of the extraction points;
- Table 6 provides Draeger tube measurements of vinyl chloride during the tests; and
- Table 7 provides laboratory analytical results for the samples collected in the Summa canisters.

The results for each day of pilot testing are discussed below.

4.1 Day 1 Pilot Testing

4.1.1 Extraction System Monitoring

During the first day, the blower was connected to gas vents GV-1 and GV-3. The partial vacuum measured in the pipe to GV-1 ranged from 8.9 to 9.4 inches of water column (wc), and the partial vacuum in the GV-3 leg ranged from 10.4 to 10.65 inches wc. The total flow rate of air was about 175 cfm during the test.

Methane concentrations in the gas from GV-1 ranged from 23.5 to 31.7%, and oxygen concentrations ranged from 5.3% to 10.1%. The methane concentrations increased slightly throughout the day, while the oxygen concentrations decreased accordingly. Based on the air velocity measurements, between 70 and 80% of the total flow (i.e., 120 to 140 cfm) was originating from GV-1.

Methane concentrations in GV-3 ranged from 16.7 to 25.2%, and oxygen concentrations ranged from 7.8 to 11.1%. Methane concentrations declined over the course of the day, and oxygen concentrations rose slightly. The gas flow originating from GV-3 was about 35 to 55 cfm.

Draeger tube samples were taken from the overall flow to the blower during the middle and at the end of the pilot test. Both samples indicated vinyl chloride concentrations of about 0.5 parts per million by volume (ppmv); this is equivalent to 1.3 mg/m^3 by mass.

Analytical results for gas samples collected by Summa canister at the end of the extraction test are summarized on Table 7. The first test (GV-1 and GV-3) had 1.1 ppmv of vinyl chloride. Previous gas sampling results in 2004 ranged from 0.13 to 25.4 ppmv and are provided on Table 8.

4.1.2 Observation Point Monitoring

Concentrations of methane, carbon dioxide, oxygen, and partial vacuum at observation points are provided on Tables 1 through 4. The following are observations that can be obtained from the data:

- Methane concentrations, as well as carbon dioxide concentrations, declined at various locations that were monitored. These included all of the leachate head wells, all gas vents, groundwater monitor wells MW-101, MW-103 and MW-104 and gas probes GP-1, GP-3, GP-7 and GP-8. As would be expected, oxygen concentrations generally rose in those locations where the methane and carbon dioxide declined.
- Partial vacuums were measurable in all of the leachate head wells, all of the gas vents, and in three of the six gas probes (GP-3, GP-6 and GP-7).
- The only observation location that originally contained methane and was not significantly affected during the first day of testing was gas probe GP-2. No reduction in methane concentration was observed, and no partial vacuum was detected at the end of the testing.

The partial vacuums observed throughout the monitoring locations indicate that the extraction system was able to influence all of the gas vents, leachate head wells, and the gas probes located nearest to the landfill.

4.2 Day 2 Pilot Testing

4.2.1 Extraction System Monitoring

During the second day, the blower was connected to gas vents GV-2 and GV-4 and leachate head well LC-3. The partial vacuum measured in the pipe to GV-2 ranged from 15.5 to 16.0 inches wc, and the partial vacuum in the GV-4 leg ranged from 14.1 to 14.6 inches wc. The partial vacuum in LC-3 ranged from 18.8 to 19.9 inches wc. The total flow rate of air ranged from 170 to 190 cfm during the test.

Methane concentrations in the gas from GV-2 ranged from 8.3 to 14.6%, and oxygen concentrations ranged from 10.4 to 13.9%. The methane concentrations increased slightly throughout the day.

Methane concentrations in GV-4 ranged from 14.5 to 31.1%, and oxygen concentrations ranged from 6.1 to 10.6%. Methane concentrations increased over the course of the day.

Methane concentrations in LC-3 ranged from 0 to 30.5%, and oxygen concentrations ranged from 10.5 to 21%. Methane concentrations were steady over most of the day, but declined to zero at the end of the day.

Draeger tube samples were taken from the overall flow to the blower during the middle and at the end of the test. Samples indicated vinyl chloride concentrations of approximately 0.3 to 0.5 parts per million (ppm) by volume; this is equivalent to 0.8 to 1.3 mg/m^3 by mass.

Analytical results for gas samples collected by Summa canister at the end of the extraction test are summarized on Table 1. The second test (GV-2, GV-4 and LC-3) had 2.9 ppmv of vinyl chloride.

4.2.2 Observation Point Monitoring

The following are observations that can be obtained from the data on Tables 1 through 4 for the second day of the test:

- Methane concentrations, as well as carbon dioxide concentrations, declined at all locations except the two remaining leachate head wells and gas probe GP-2. Several locations outside of the landfill (MW-101, MW-103, MW-104, GP-3) that had methane prior to the first day of testing did not contain methane on the second day.
- The methane concentrations actually increased in GV-1 and GV-3, rising from zero to over 30% in each vent. Carbon dioxide concentrations also rose and oxygen concentrations declined in these vents.
- Partial vacuums were measurable in all leachate head wells and gas vents, and in three of the six gas probes (GP-3, GP-6 and GP-7).
- As compared to the first day of testing, methane concentrations in GP-2 declined from approximately 27% to 0.5% or less. Carbon dioxide also declined and oxygen increased accordingly.

The increase in methane concentrations in GV-1 and GV-3 indicates steady state conditions had not been reached during the short duration test. If gas extraction were to occur over a longer period of time, or if it were performed with a higher vacuum, it is expected that the methane concentrations in these vents would also decline.

The partial vacuums that were observed throughout the monitoring locations indicate that the extraction system was able to influence all of the gas vents and leachate head wells, and the gas probes nearest to the landfill.

4.3 Air Emissions

The WDNR has established several air emission limits that may apply to sources of VOCs. Section NR406.04(2)(c) of the Wisconsin Administrative Code (WAC) limits the maximum amount of volatile organic compounds that can be emitted to the ambient air without any air

pollution control permit to 5.7 pounds per hour. Section NR419.07(4)(b) WAC limits maximum emissions with a permit to 9 pounds per hour. These limits apply to full time operation of gas vent systems for remediation.

Section NR 419.07 WAC requires air emission controls for a landfill gas extraction system if VOC emissions exceed 216 pounds per day (see ch. NR 445, Table 3). The Lowest Achievable Emission Rate is required if a source emits more than 300 pounds per year of vinyl chloride. Assuming an extraction rate of about 100 cubic feet per minute and an average vinyl chloride concentration of 2.0 ppmv based on the Summa Canister test results during the pilot study, the estimated average emission rate for vinyl chloride would be 0.002 lb/hr or 0.048 lb for a 24-hour day. This is approximately 17.5 lb/year for a system that is operating continuously. Based on these calculations, air emissions controls for VOCs or vinyl chloride are not expected to be required for long-term operation of an active gas extraction system.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

1. When connected to a vacuum blower, the existing passive landfill gas venting system was capable of reducing methane concentrations at the gas probes located off-site.
2. Vinyl chloride is present in the landfill gas at concentrations between 0.5 and 2.9 ppm by volume. For an active gas extraction system operating at 100 cfm, this would provide an annual emission of about 17.5 pounds of vinyl chloride, which is far below the threshold of 300 pounds per year that requires air pollution control.
3. The methane concentration observed during the pilot testing was less than 35%, which is the minimum required to sustain a flame in a flare or to operate a microturbine. Therefore, energy recovery with a microturbine is not practical at this site.
4. As indicated in the pilot test approval letter from the WDNR, a flare is not necessary for an active gas extraction system for the FF/NN landfill because the landfill contains fewer than 500,000 cubic yards of wastes, and does not exceed air pollution limits in chapter NR 400 WAC.
5. Because of the short-term nature of the pilot test, it was not determined whether the active removal of landfill gas containing vinyl chloride from the gas vent system will improve groundwater quality over the long-term.
6. A greater vacuum (4 to 5-inches of mercury) is necessary to withdraw landfill gas from the leachate head wells as compared to the passive gas extraction system (1-inch of mercury). This is due to the small diameter of the leachate head wells, and the large volume of pipe and pore space that is associated with the passive gas system.

5.2 Recommendations

1. An interim active gas extraction system should be constructed to evaluate the off-site migration of methane on groundwater quality. The active gas extraction system should utilize the passive gas vents for collecting methane.

2. The Focused Feasibility Study (FFS) for Groundwater should be completed for the FF/NN Landfill and include the evaluation of active gas extraction from the landfill as a means to remove vinyl chloride as a source of impacts to groundwater.
3. As an interim measure, a temporary blower unit with above-ground piping should be connected to the existing passive gas venting system. The same blower unit and associated equipment may be used for both the interim and final systems. The advantages of such an interim system are that 1) it can be implemented in a short period of time (during 2005) to reduce the methane and possibly vinyl chloride, 2) the effect on groundwater quality can be better evaluated with the longer-term operation and monitoring of the system, 3) the need to connect additional vents and/or leachate wells can be determined for final system design, if changes are needed, and 4) air emission monitoring of the system could provide compliance data regarding removal rates and the effectiveness of the system.

5.3 Active Gas System Conceptual Design

The conceptual design of an active gas system would include the following components:

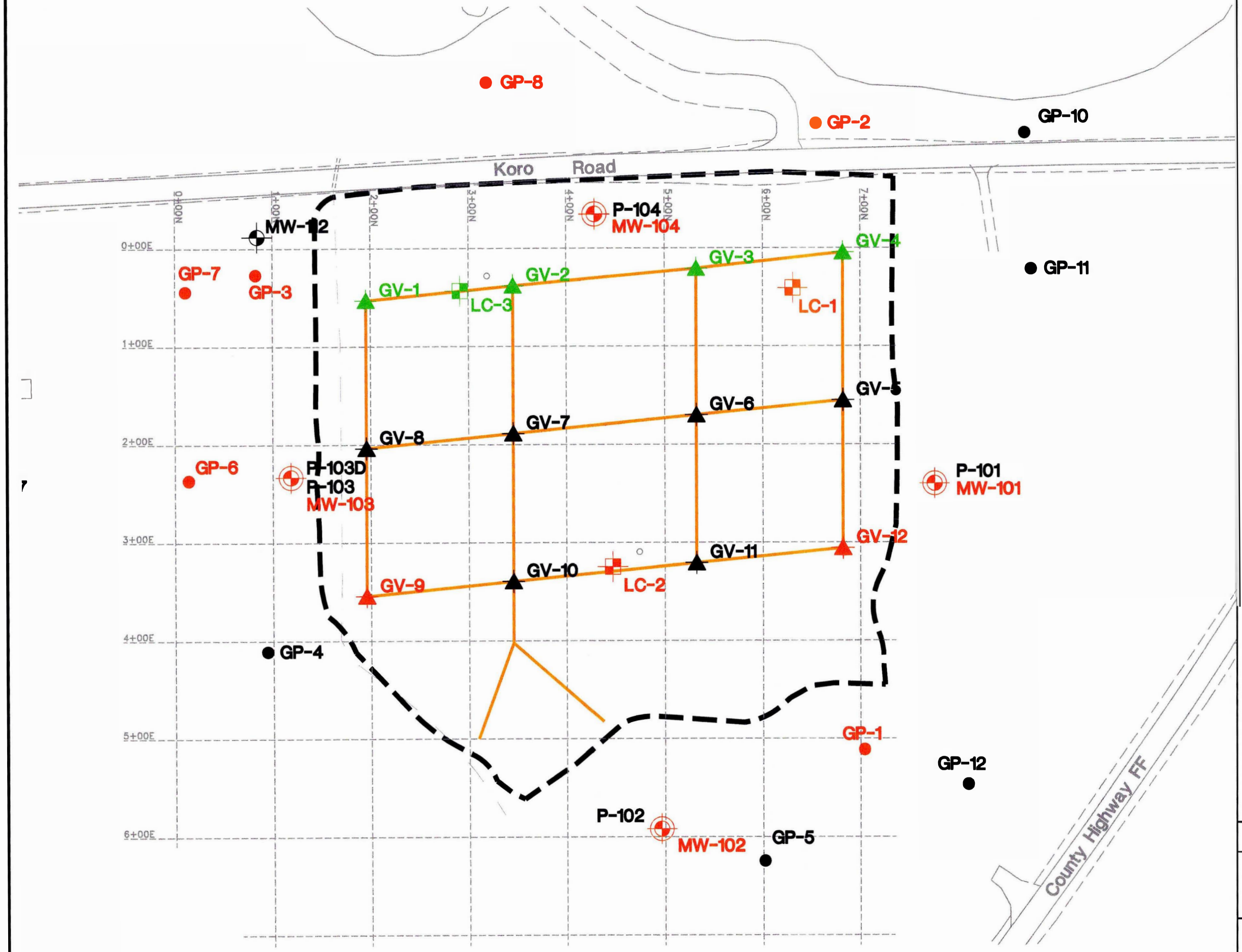
- Variable speed blower and motor, capable of producing a vacuum of 1 to 5-inches of mercury, with a flow rate of 100 to 200 cfm;
- Inlet particulate filter and exhaust silencer;
- Condensate collection tank;
- High level shutdown switch for condensate collection tank;
- Control panel with on-off switch, motor starter and overload; and
- A stack to exhaust gases.

As indicated in the pilot test approval letter from the WDNR, a flare is not necessary for an active gas extraction system for the FF/NN landfill since it contains fewer than 500,000 cubic yards of wastes, and does not otherwise exceed air pollution limits in chapter NR 400 WAC based on the pilot test results.

The layout of the conceptual system is shown on Figure 3. The components of an example system are described in Appendix E. The blower unit and associated equipment would be located at the southeast corner of the landfill to access the available power lines across the southern portion of the site, and to facilitate gravity drainage of condensate in the header lines. The header piping would be extended to the gas vents at the four corners of the landfill in order to equalize withdrawal of gas throughout the area of the landfill.

Single phase electricity is available from the power line that runs across the southern portion of the landfill. According to a representative of Alliant Energy, the cost to extend three-phase power to the site is about $25,000. The additional cost to extend three-phase power to the site will be compared to the lower power usage and costs for a three-phase motor as a part of the design of the interim gas extraction system.

FIGURES



EXPLANATION

- P-104 / MW-104 — MONITOR WELL, PIEZOMETER LOCATION, DESIGNATION
- LC-2 — LEACHATE HEAD WELL LOCATION, DESIGNATION
- OUTLINE OF CLOSED LANDFILL
- GP-1 — GAS PROBE LOCATION AND DESIGNATION
- GV-9 — GAS VENT LOCATION AND DESIGNATION
- PASSIVE GAS COLLECTION SYSTEM PIPING
- GP-1 — PILOT TEST MONITORING LOCATION
- GV-1 — LANDFILL GAS EXTRACTION LOCATION

NOTE: GAS EXTRACTION LOCATIONS GV-1, GV-2, GV-3, GV-4, AND LC-3 WERE USED AS MONITORING POINTS WHEN NOT USED FOR EXTRACTION. GAS EXTRACTION ON DAY 1 WAS FROM GV-1 AND GV-3, AND ON DAY 2 WAS FROM LC-3, GV-2, AND GV-4.

N

SCALE

0 200

Feet

FF/NN LANDFILL
RIPON, WISCONSIN

LANDFILL GAS PILOT TEST EXTRACTION AND MONITORING LOCATIONS

DATE:	5/20/05
DESIGNED:	GLD
CHECKED:	RHS
APPROVED:	GLD
DRAWN:	HJW
PROJ.:	1011.002

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Figure 1

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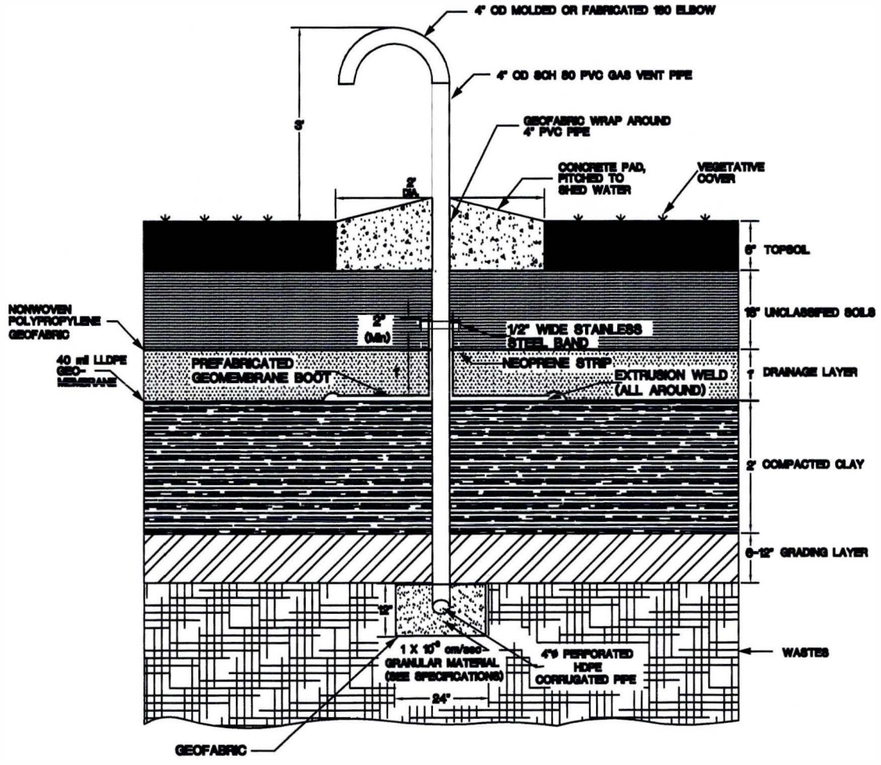
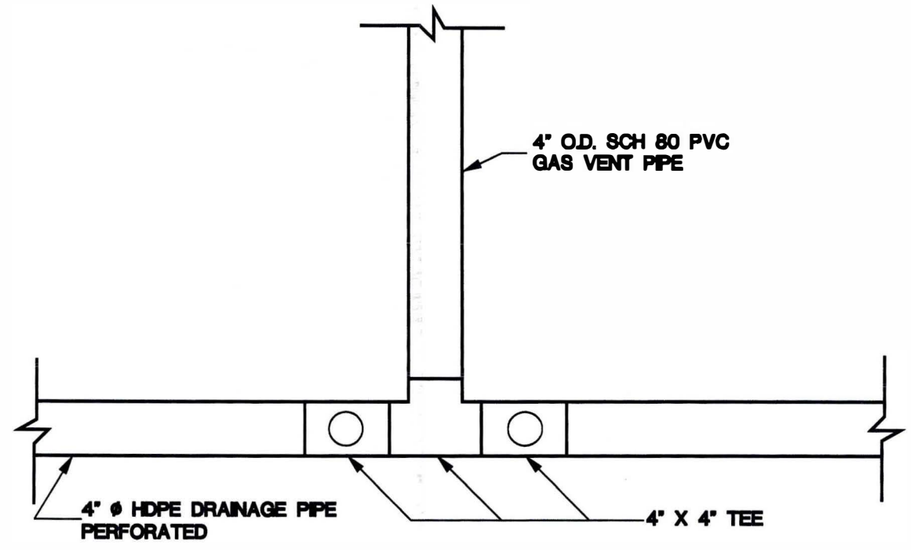


A Passive Vent Detail
NTS



B Gas Vent Piping Detail
NTS

FF/NN LANDFILL RIPON, WISCONSIN	DATE: 2/16/05 DESIGNED: GLD CHECKED: RHS APPROVED: GLD DRAWN: HJW PROJ.: 1011.002
GAS VENT DETAILS	
GeoTrans, Inc. A TETRA TECH COMPANY	Figure 2

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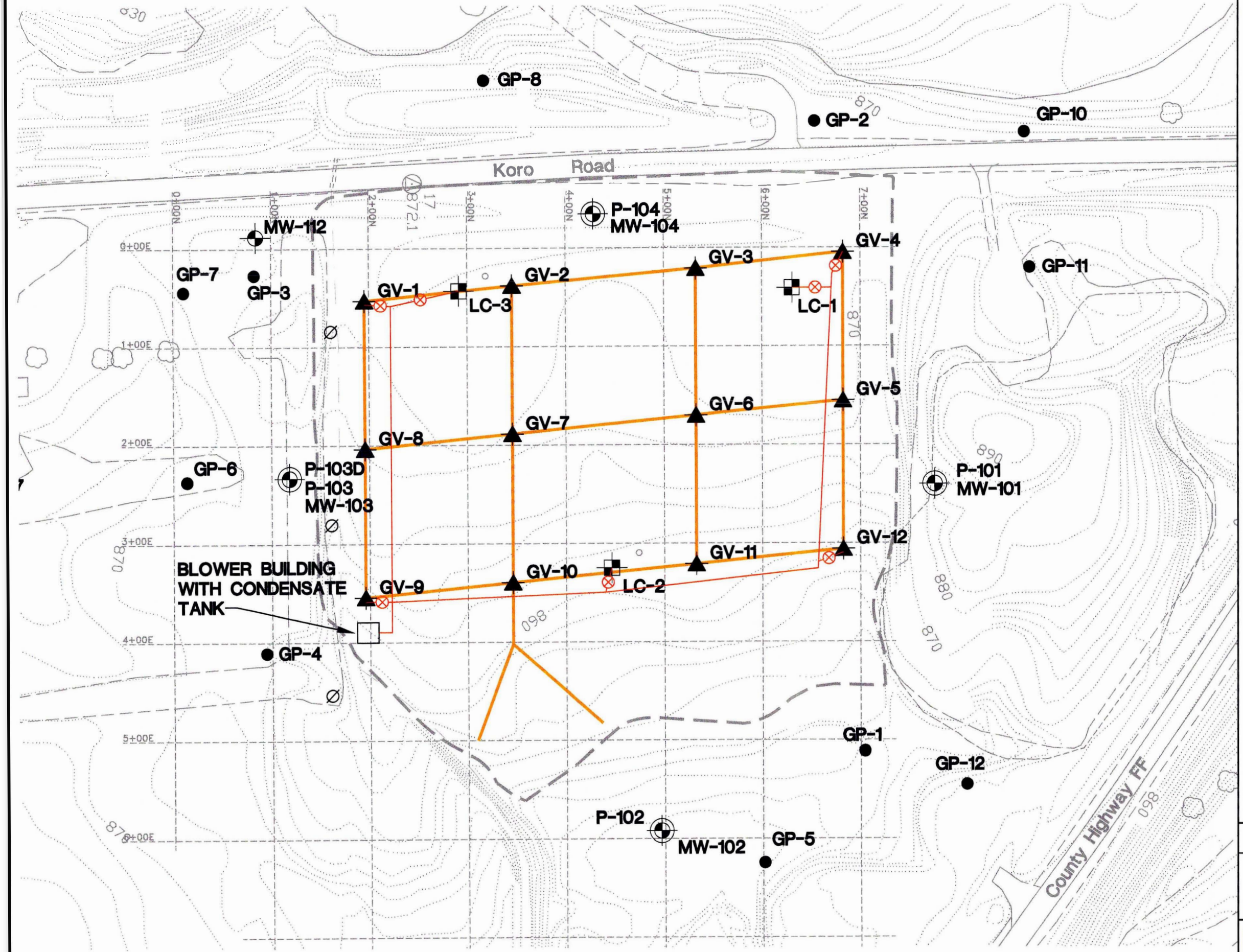

EXPLANATION

- P-104 / MW-104 — MONITOR WELL, PIEZOMETER LOCATION, DESIGNATION
- LC-2 — LEACHATE HEAD WELL LOCATION, DESIGNATION
- OUTLINE OF CLOSED LANDFILL
- GP-1 — GAS PROBE LOCATION AND DESIGNATION
- GV-9 — GAS VENT LOCATION AND DESIGNATION
- PASSIVE GAS COLLECTION SYSTEM PIPING
- GAS EXTRACTION HEADER PIPING
- CONTROL VALVE
- POWER POLE

NOTE: CONTOURS ON LANDFILL DO NOT REFLECT CURRENT TOPOGRAPHY.

N

SCALE

0 200

Feet

FF/NN LANDFILL
RIPON, WISCONSIN

ACTIVE GAS EXTRACTION SYSTEM CONCEPTUAL PLAN

DATE:	6/8/05
DESIGNED:	GLD
CHECKED:	RHS
APPROVED:	GLD
DRAWN:	HJW
PROJ.:	1011.002

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Figure 3

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TABLES

Table 1 - CH_4 Monitoring
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

			Baseline	Running GV-1 & GV-3			Running GV-2, GV-4, LC-3		
		Date	5/9/2005	5/10/2005			5/11/2005		
		Time Start	12:14	10:06	15:49	17:54	7:31	12:08	14:23
	Location	Time End	14:04	10:53	16:52	18:51	8:31	13:08	15:33
Within waste	NW	LC-1	55.8	5.34	35	27.1	NM	18.5	0.9
	E	LC-2	0.6	29.5	0	0	0.1	0	0
	SW	LC-3	36.1	41.5	31.5	28.5	43.5	extraction point	
	SW	GV-1	18.8	extraction point			0	32	32.6
	W	GV-2	25	1.9	0	0	11.4	extraction point	
	W	GV-3	10.6	extraction point			0	29.7	41
	NW	GV-4	NM	NM	NM	0	7.9	extraction point	
	SE	GV-9	30.7	30.4	21.2	17.3	18.1	28.1	21.5
	NE	GV-12	0	4.2	0	0	0.7	0.8	0.3
	W	MW-104	18.1	0	0	0	0	0	0
Outside waste	N	MW-101	1.6	0	NM	0	0	NM	NM
	E	MW-102	0	0	0	0	0	0	0
	S	MW-103	6	0	0	0	0	0	0
	E	GP-1	29.5	27.7	21.2	18.7	26.3	23.1	22.9
	W	GP-2	28	27.6	27.6	26.1	26.8	0	0.5
	S	GP-3	18.3	0	0	0	0	0	0
	S	GP-6	0.2	0.3	0.2	0.1	0	0	0
	S	GP-7	1.7	1.8	0.9	0.7	0.3	0.1	0.1
	W	GP-8	0.3	0	0	0	0	0	0

Table 2 - CO_2 Monitoring
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

			Baseline	Running GV-1 & GV-3			Running GV-2, GV-4, LC-3		
		Date	5/9/2005	5/10/2005			5/11/2005		
		Time Start	12:14	10:06	15:49	17:54	7:31	12:08	14:23
	Location	Time End	14:04	10:53	16:52	18:51	8:31	13:08	15:33
Within waste	NW	LC-1	37.8	35.6	23.4	17.7	NM	11.9	0.8
	E	LC-2	0.4	18.6	0	0	0.1	0	0
	SW	LC-3	21.9	24.8	19.1	17.8	25.7	extraction point	
	SW	GV-1	12.2	extraction point			9	22.2	22.1
	W	GV-2	15.3	1.5	0	0	7.4	extraction point	
	W	GV-3	6.5	extraction point			0	20.7	26.7
	NW	GV-4	NM	NM	NM	0	4	extraction point	
	SE	GV-9	17.6	17.3	13.6	12	12.7	28.1	14.4
	NE	GV-12	0	3	0	0	0.8	0.8	0.3
	W	MW-104	17.9	0	0	0	0	0	0
Outside waste	N	MW-101	16.4	0	NM	0	9.4	NM	NM
	E	MW-102	2.3	0	0	0	0.1	0	0
	S	MW-103	15.9	0	0	0	0	0	0
	E	GP-1	11.8	11	8.9	8.1	11.3	10	9.7
	W	GP-2	26.1	25.6	25.8	25.1	24.1	0.7	1
	S	GP-3	19	0	0	0	0	0	0
	S	GP-6	6.8	7.7	5.8	5.1	3.3	2.7	2.3
	S	GP-7	7.8	7.7	5.4	5.3	3.7	2.5	2.7
	W	GP-8	8.9	15	0.4	0.2	0.4	0.4	0.3

Table 3 - O_2 Monitoring
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

			Baseline	Running GV-1 & GV-3			Running GV-2, GV-4, LC-3		
		Date	5/9/2005	5/10/2005			5/11/2005		
		Time Start	12:14	10:06	15:49	17:54	7:31	12:08	14:23
	Location	Time End	14:04	10:53	16:52	18:51	8:31	13:08	15:33
Within waste	NW	LC-1	1	1.9	8	10.9	NM	14.7	20.2
	E	LC-2	19.9	10.3	20.5	20.5	20.9	20.8	20.3
	SW	LC-3	7.5	5.6	9.1	10.5	6.4	extraction point	
	SW	GV-1	11.1	extraction point			20.8	4.9	3.7
	W	GV-2	10.5	19.5	20.5	21.1	15.4	extraction point	
	W	GV-3	16.2	extraction point			20.7	6.2	2
	NW	GV-4	NM	NM	NM	20.8	17.6	extraction point	
	SE	GV-9	7.6	7.6	10.7	11.9	12.3	8.7	11.3
	NE	GV-12	20.3	17.8	20.6	20.8	20	19.9	20.3
	W	MW-104	0.2	20.5	20.7	21.1	20.7	20.7	20.7
Outside waste	N	MW-101	1.6	20.6	NM	20.7	9.4	NM	NM
	E	MW-102	14.6	20.4	20.8	20.7	20.7	21	20.1
	S	MW-103	0.4	20.6	20.7	20.7	21	21	20.8
	E	GP-1	1.7	3.5	6.4	8.1	4.2	6.7	5.1
	W	GP-2	1.7	2.1	1.7	2.2	4	20.5	20
	S	GP-3	0.2	20.6	20.6	20.7	21	20.9	20.7
	S	GP-6	10.5	8.9	12.6	14.3	18.2	18.5	18.8
	S	GP-7	10	10.4	13.1	13.9	17.2	18.5	18.1
	W	GP-8	9.3	18.8	19.8	20.4	20.8	20.8	20.8

Table 4 - Vacuum Monitoring
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

			Baseline	Running GV-1 & GV-3			Running GV-2, GV-4, LC-3		
		Date	5/9/2005	5/10/2005			5/11/2005		
		Time Start	Not taken - presumed zero	11:48	15:49	17:53	7:28	12:08	14:25
	Location	Time End		12:40	16:51	18:42	8:35	12:59	15:35
Within waste	NW	LC-1		1	0.9	0.7	NM	0.9	0.9
	E	LC-2		0.2	1.4	1.85	NM	1.6	1.4
	SW	LC-3		0.8	0.5	0.85	NM	extraction point	
	SW	GV-1		extraction point			0	2.15	2.2
	W	GV-2		2.65	2.3	2.8	NM	extraction point	
	W	GV-3		extraction point			0	2.1	2.1
	NW	GV-4		NM	NM	2.6	NM	extraction point	
	SE	GV-9		0.35	2.5	2.6	NM	2.05	2
	NE	GV-12		0.005	2.3	2.5	NM	2.1	2.5
	W	MW-104		no cap	no cap	no cap	NM	no cap	no cap
Outside waste	N	MW-101		no cap	no cap	no cap	NM	no cap	no cap
	E	MW-102		no cap	no cap	0	NM	0	0
	S	MW-103		no cap	no cap	no cap	NM	no cap	no cap
	E	GP-1		0.1	0	0	NM	0	0
	W	GP-2		0.1	0	0	NM	0	0
	S	GP-3		0	0.15	0.15	0	0.1	2.2
	S	GP-6		0	0.1	0.1	NM	0.1	0
	S	GP-7		0	0.1	0.1	NM	0.1	0
	W	GP-8		0	0	0	NM	0	0

Table 5 - System Monitoring
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

	5/10/2005				5/11/2005				
	Blower Exhaust	Blower Inlet	GV-1 Leg	GV-3 Leg	Blower Exhaust	Blower Inlet	LC-3	GV-2	GV-4
Temp			NT	NT			NT	NT	NM
Vacuum (water level)			9"	10.4"		4" hg	19.2	15.8"	14.5"
Flow Rate (fpm)			NT	NT			NT	NT	NM
CH_4			28.5	24.3			26	8.3	14.5
CO_2			16.4	15.9			15.4	9	12.8
O_2			8.2	9.1			11.9	13.9	10.8
Time			10:00	10:00		8:35	11:27	11:25	11:20
Temp			NT	NT			NT	NT	NM
Vacuum (water level)			NT	NT			19.3"	16.0"	14.6"
Flow Rate (fpm)			NT	NT			NT	NT	NM
CH_4			25.3	25.2			20.8	9.5	21.2
CO_2			15.2	18.4			12.2	9.3	14.7
O_2			9.5	7.8			13.9	13.8	10
Time			11:32	11:29			11:52	11:58	11:59
Temp			NT	GV-3 Leg turned off at valve for approximately ___ minutes			51	50	
Vacuum (water level)			14.5"						
Flow Rate (fpm)			NT			50 cfm	500	1750	
CH_4			23.5						
CO_2			14.5						
O_2			10.1						
Time			11:37						
Temp			NT	NT			NT	NT	NM
Vacuum (water level)			8.9"	10.4"			18.9"	15.8"	14.4"
Flow Rate (fpm)			3750	827			NT	NT	NM
CH_4			28.5	24.5			30.5	14.6	30.1
CO_2			17.9	18.6			17.3	13.9	19.9
O_2			7.5	7.9			10.5	10.4	6.1
Time			12:35	12:35			13:10	13:12	13:10
Temp			68	86			67	64	NM
Vacuum (water level)			9"	10.65"			18.8"	15.5	14.1
Flow Rate (fpm)			3950	1525			750	1624	NM
CH_4			31.9	19.3			0	10.1	21.4
CO_2			20.9	15			0	9.8	14.6
O_2			5.1	9.8			21	13.4	10.6
Time			16:50	16:55			15:46	15:45	15:44
Temp			54	65					
Vacuum (water level)			9.4"	11"					
Flow Rate (fpm)			NT	NT					
CH_4			30.7	16.7					
CO_2			21	13.6					
O_2			5.3	11.1					
Time			19:00	19:00					

Table 6 - Drager Tube Measurements
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

Extraction Points	Date	Time	Vinyl Chloride Measurement
GV1, GV-3	5/10/2005	16:15	0.5 ppm
GV1, GV-3	5/10/2005	19:20	0.5 ppm
LC-1, LC-3	5/11/2005	9:15	0.0 ppm
LC-3, GV-2, GV-4	5/11/2005	12:10	0.5 ppm
LC-3, GV-2, GV-4	5/11/2005	15:45	0.5 ppm

Notes:
Used Drager tube for vinyl chloride with detection limit 0.5 ppmv.
Tubes sampled for equivalent of five strokes (hand pumps)

Table 7: Landfill Gas Analytical Results
Landfill Gas Extraction Pilot Study
FF/NN Landfill, Ripon, WI

Sampling Point	Date	cis-1,2-dichloroethene	Ethylbenze	Total Hydrocarbons as gas	Toluene	Vinyl Chloride	Total Xylenes
GV-1 & GV-3	5/10/2005	630		11700	2200	1100	400
GV-2 & GV-4 & LC-3	5/11/2005	2200	320	11400	2500	2900	890

Values in ppbv (parts per billion by volume)
Analyzed using EPA Method TO-14A

Table 8: Landfill Gas Analytical Results
FF/NN Landfill, Ripon, WI

Sampling Point ID	Date	Benzene	Chlorobenzene	Chloroethane	Chloromethane	Dichlorodifluoromethane	1,1-Dichloroethene	cis-1,2-dichloroethene	trans-1,2-Dichloroethene	1,2-dichloro-1,1,2,2-tetrafluoroethane	Total Hydrocarbons as gas	Tetrachloroethene	Toluene	Trichloroethene	Vinyl Chloride
GP-1	9/29/04	31.2		208		2,980									
	1/28/05				0.6								1.8		
GP-2	9/29/04	61.1	58.1	70.6	73	347		343	22.5	220		23.1		72.8	410
	1/28/05					270		470		190	4,600				
GP-3	9/29/04	102		689		909	110	6,660	229	131				205	25,400
	1/28/05			450		590		4,500			4,800				12,600
LC-1	9/29/04			9.1		70.8				9.5					
	1/28/05					553		1,080		178	10,400				130

Values in ppbv (parts per billion by volume)
Analyzed using EPA Method TO-14A

APPENDIX A
APPROVAL LETTER AND ANSWERS TO QUESTIONS

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Scott Hassett, Secretary
Ron Kazmierczak, Regional Director

Oshkosh Service Center
625 E. County Road Y, Suite 700
Oshkosh, WI 54901-9731
Telephone 920-424-3050
FAX 920-424-4404

April 20, 2005

Ray Roder (Representative for the Ripon FF/NN landfill Potentially Responsible Party (PRP) Group)
Reinhart, Boerner, Van Deuren S.C.
P.O. Box 2018
Madison, WI 53701-2018

SUBJECT: Conditional Approval of the Pilot Test Workplan Landfill Gas Extraction System report for the Ripon HWY FF/NN Landfill, WDNR License # 467, **BRRTS # 02-20-000915**

Dear Mr. Roder:

The Department has received the March 23, 2005 GeoTrans report titled "Pilot Test Work Plan Landfill Gas Extraction System" on behalf of the PRP Group via an email dated March 23, 2005. You have requested our approval of this workplan prior to implementation. The Department and EPA had some initial questions in regards to the workplan which were then answered in a email memorandum dated April 7, 2005 from Jerry DeMers at GeoTrans. This memorandum will be considered an amendment to the workplan. The Department of Natural Resources ("Department"), hereby conditionally approves the landfill gas workplan for the closed Ripon FF/NN Landfill (License number 467) subject to the following conditions:

1. Please add MW-101 and MW-102 as part of the vacuum measurement locations.
2. The condensate from the testing that will be disposed of at the local WWTP – the analytical should be submitted in the gas pilot testing report.
3. After the first test is completed, overnight recovery of the methane in the landfill may not be adequate. If methane levels/pressure levels have not returned to pre-testing conditions, more time should be allowed for recovery. This should be done to make sure the next test is representative.
4. Please include photo-documentation of the differing testing setups in the gas pilot testing report.
5. It has been previously discussed in an email from Jerry DeMers dated March 29th, 2005 that the PID meter would not be used for VOC measurements because of the interference's due to the high methane concentrations. The Department is in concurrence with this. Summa canisters will still be utilized to obtain a representative VOC analysis of the extracted gases and a Landtec GA90 instrument will measure methane, oxygen and carbon dioxide concentrations.
6. The Department will allow, in the pilot test, to utilize a vacuum on GP-3 for the third test, but would also like to state that utilization of gas extraction for a full scale implementation (if requested) is discouraged and potentially would not be approved. Gas extraction should be taking place from within the waste mass, which will tend to

keep the gas more confined and deter landfill gas from escaping out the sides of the waste mass.

The installation of large diameter vertical gas extraction wells should not be discarded as a possibility for remediation. If the pilot test shows that the current gas system is not adequate for gas extraction, then large diameter gas extraction wells should be considered as part of the Feasibility Study.

It should be noted that a flare type gas extraction unit may not be necessary. Currently, under NR506.08(6) (WAC) landfills which exceed a mass of 500,000 cubic yards are required to have a gas extraction system that collects and combusts the gases. However, due to the size of the landfill (less than 500,000 cubic yards), combustion is not necessary if the emissions do not exceed any standards in NR400 (WAC). However, a 25 foot stack would be necessary to vent the landfill gases without prior gas combustion.

If you have any questions concerning this letter, please contact me at (920) 303-5447 or Lee at 608-267-0542.

Sincerely,

Jennie Easterly
Hydrogeologist
Remediation and Redevelopment Program

Lee Archiquette
Solid Waste Engineer
Solid and Hazardous Waste Program

cc: Oshkosh Case File
Jerry DeMers – GeoTrans Inc. via email
Bernard Schorle – EPA via email

Memorandum

To: Jennie Easterly, WDNR
Cc: Ray Roder, Nelson Olavarria, Steve Barg, Lee Archiquette, Bernard Schorle
From: Jerry DeMers, GeoTrans
Date: April 7, 2005
Re: Response to WDNR and US EPA Comments on Gas Extraction Pilot Test Work Plan

Response to Lee Archiquette's Comments from the WDNR

Page 2-2, Sec. 2.3: Why is a vacuum being applied on GP-3 during the test?

A vacuum is to be applied to GP-3 on the third day of the test. It is hoped that when the vacuum is applied to the passive gas vent system (day 1) and to the leachate head wells (day 2) that we will be able to induce a vacuum at off-site gas probes. If we are not able to do this when drawing from the passive vents and the leachate head wells, then day 3 will include drawing from both together, plus from GP-3, to see if this combination can induce a vacuum at other off-site gas probes.

It is possible that the existing infrastructure of passive gas vents and leachate head wells may not be adequate as part of an active gas collection system for the landfill. The construction of new gas extraction wells through the existing composite cap is both costly and it compromises the integrity of the cap. If drawing on the passive gas system and leachate head wells cannot induce a vacuum in the off-site areas where landfill gas is now present, then also drawing from a new extraction well(s) outside of the landfill (simulated by drawing from GP-3) may provide a collection system adequate to prevent landfill gas from traveling off-site.

Page 2-4, Sec. 2.4.2: Are all locations going to be monitored during each phase of the test?

All of the locations will be monitored during each phase of the test.

Page 2-5, Sec. 2.4.2: Add barometric trend. (last sentence)

By measuring the barometric pressure at the beginning, middle and end of the day for each of the three days we will be able to determine the barometric trend.

Page 2-5, Sec. 2.5.1: Do they have an acceptance agreement with the POTW for the condensate?

Phil Hoopman, the operator of the Ripon POTW, has indicated that the condensate from the pilot study can be disposed of at the POTW. Although not indicated in the work plan,

we will collect a sample of the condensate and analyze it for VOCs. VOC concentrations will thus be known if larger quantities of condensate from an active gas extraction system require disposal at the POTW.

Page 2-6, Sec. 2.6: Include oxygen concentrations in report.

Oxygen concentrations will be included in the report.

Page 2-7: Assess the use of non-continuous flare.

The report will include an assessment of the use of a non-continuous flare.

Response to Bernard Schorle's Comments from US EPA

Section 1.3. Using the equation in their Method B in the appendix, I would get 17.3 cubic feet of landfill gas (methane and carbon dioxide) per minute using their estimate of the amount of wastes and some different default values. This compares to their 15.6 cubic feet per minute, a nonsignificant difference considering the assumptions that are needed. (I did not find something that said this should be standard cubic feet.)

No response is necessary. The purpose of the calculation was to determine the relative size of the blower to be used for the pilot test. The estimated generation rate is in cubic feet per minute, not standard cubic feet per minute.

Section 2.3. I assume that when it says on the first day, for example, that the vacuum blower will be connected to two of the vents, GV-1 and GV-3, that the blower will be connected to these two vents at the same time, that these two vents will be connected together above the surface of the cap. Is this the case? How will the connections be made to the blower and to each other? There is nothing said in section 2.2 concerning the changes to the ends of the vent pipes that takes into account connecting a vent pipe to the blower. Note that these two vents, as is the case for all of the vents, are already connected to each other through the buried, perforated piping. I am assuming that when a vent pipe or leachate well is connected to the blower it will be possible to measure the vacuum and concentrations at the pipe or well. For the third day, when the blower is connected to the four points manifolded together, I assume it will be disconnected from the gas probe. Is this correct? Will the primary control consideration regarding vacuums in the system be that the oxygen concentrations remain within the stated range? Or will you initially determine what type of vacuum you can use and meet the oxygen criteria and then use that vacuum through the rest of the testing as long as the oxygen criteria is not violated? You say, "Oxygen concentrations in gases extracted from the landfill will be maintained within 3 % of their initial level. . ." Is this the level measured in the combined exhaust gases? If the initial oxygen level is 4.0 volume percent, does this mean that the oxygen content will not be allowed to go above 4.12 volume percent or above 7.0 volume percent? Will anything be done if the oxygen content drops significantly below the initial

level?

These two vents will be connected to the blower with above-ground piping. The vacuum inlet piping from the blower will be extended from the blower and divided with a wye or tee, and then piped to each of the vents separately with isolation valves. The vent pipes are 4-inch diameter PVC pipe, and an elbow will be placed on each of the two vents to be connected to the blower inlet pipe. The details of the piping were not included in the work plan; additional parts required to complete the connection will be obtained as needed from the local hardware store.

It may not be necessary to connect to two different vent pipes since they are all interconnected beneath the cap. We are connecting to two vent pipes to try to equalize the extraction over the western area of the site.

You are correct in assuming that we will be able to measure the vacuum and gas concentrations at the vent or well that is connected to the blower.

For part of the third day, the blower will be connected to the two leachate head wells, two gas vents and the gas probe at the same time. While not stated in the work plan, we will also run the blower while connected to the two vents and two leachate head wells while not connected to the gas probe.

We will initially determine what type of vacuum to use that meets the oxygen criterion, and then use that vacuum during the rest of that day's test as long as the oxygen criterion is not violated. Because of the different characteristics of the passive vent system and the leachate head wells, a different vacuum and blower rate will likely be used on different days of the test.

If, as in your example, oxygen is initially 4 percent, we will not let the oxygen concentration rise above 7 percent. If the oxygen concentration falls or stays the same at the beginning of the test, we will increase the flow rate; a falling oxygen concentration would indicate that we are not withdrawing as much landfill gas as is being generated.

Section 2.4.1. Is the Landtec GA90 Gas Analyzer also being used to measure the carbon dioxide and oxygen concentrations? I assume in Table 6 that "Total Hydrocarbons as gas" does not include methane, and maybe ethane and propane. Is this the case? Does it include chlorinated hydrocarbons? Does it represent the nonmethane organic compounds (NMOCs) content?

A Landtec GA90 instrument will be used to measure methane, oxygen and carbon dioxide concentrations.

The Total Hydrocarbons as gas is a measure of compounds with 5 to 12 carbon atoms and does not include methane, ethane, propane, or chlorinated hydrocarbons. According to Pace Analytical Labs, it includes gasoline range hydrocarbons. It includes a subset of

non-methane organic compounds (NMOCs), but total NMOCs would be a different analytical procedure. Because this is a small, old landfill, air emissions of NMOCs are not an issue of concern for this site. We will be collecting Summa canisters and analyze for VOCs using method TO-14.

Section 2.4.2. What will be used to measure the methane, oxygen, and carbon dioxide levels at the points where the pressures are being measured, the Landtec GA90 Gas Analyzer or some other instrument?

The Landtec GA90 instrument will be used to measure the concentrations of methane, oxygen and carbon dioxide.

Will any attempt be made to measure the temperature of the gas being withdrawn from the landfill at or near the vent pipes or leachate wells?

We will measure the temperature as well as the velocity at those locations where gas is being withdrawn.

Jerry DeMers - Venting of Landfill Gases at Ripon Site

From: "Hostak, Matthew L." <Matthew.Hostak@dnr.state.wi.us>
To: <gdemers@geotransinc.com>
Date: 6/22/2005 1:53 PM
Subject: Venting of Landfill Gases at Ripon Site
CC: "Easterly, Jennifer S." <Jennifer.Easterly@dnr.state.wi.us>

Hi Jerry,

Re: Venting of Landfill Gases (including Vinyl Chloride) from Abandoned Landfill in Ripon

This is a follow-up to our earlier conversation. I've taken a look at the Air Mgt. rules and I've spoken with a couple other DNR Air staff. Based upon the information provided by you and Jennifer Easterly, there does not appear to be any special requirements or limitations in the DNR Air Mgt. rules (NR 400's).

Your estimate of annual vinyl chloride emissions is well below the NR 445 thresholds, so no minimum stack height is required. Also, it appears that NR 419.03 does not apply because your project is not specifically intended to remediate contaminated soil or water. Finally, it appears that NR 420 does not apply because the contaminants of concern are not from gasoline or petroleum.

If you have any additional Q's, please let me know.

- Matt

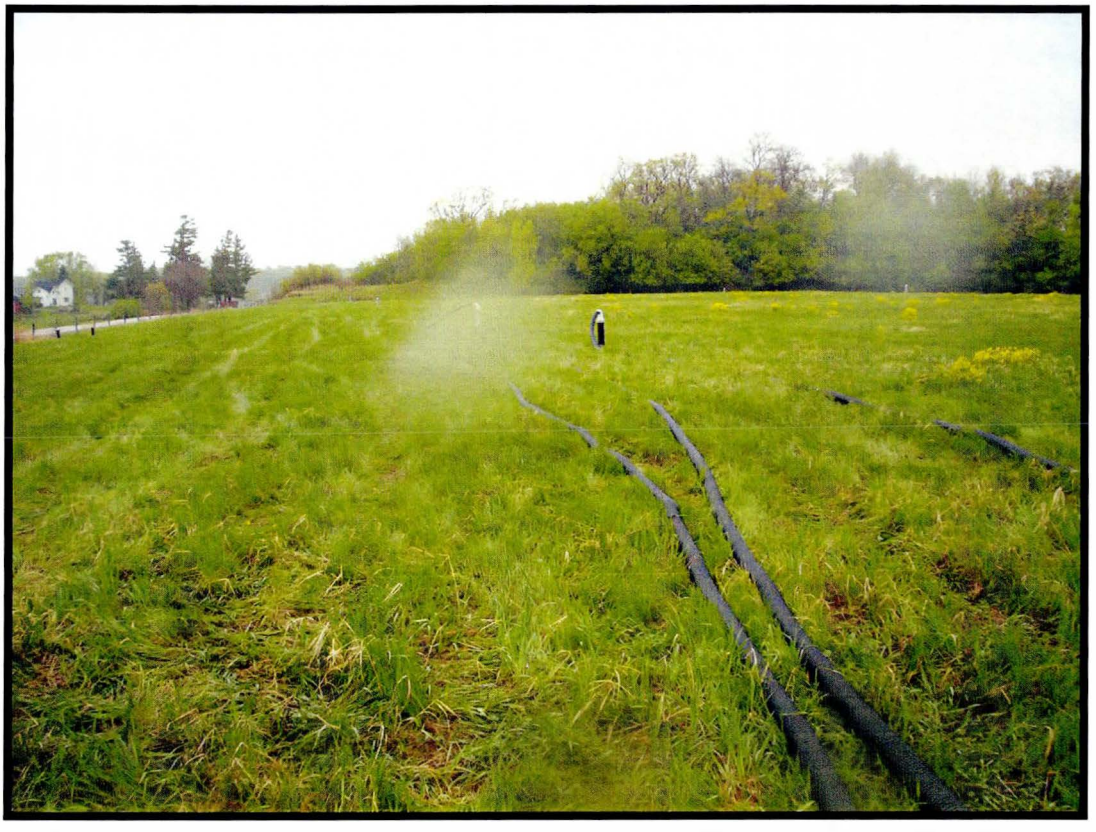
Matt Hostak
Air Pollution Engineer (Compliance)
NER - Oshkosh
(920) 424-7893
matthew.hostak@dnr.state.wi.us

APPENDIX B
PHOTOGRAPHS

Blower system with system piping/control valves and diesel generator (on right) – facing south

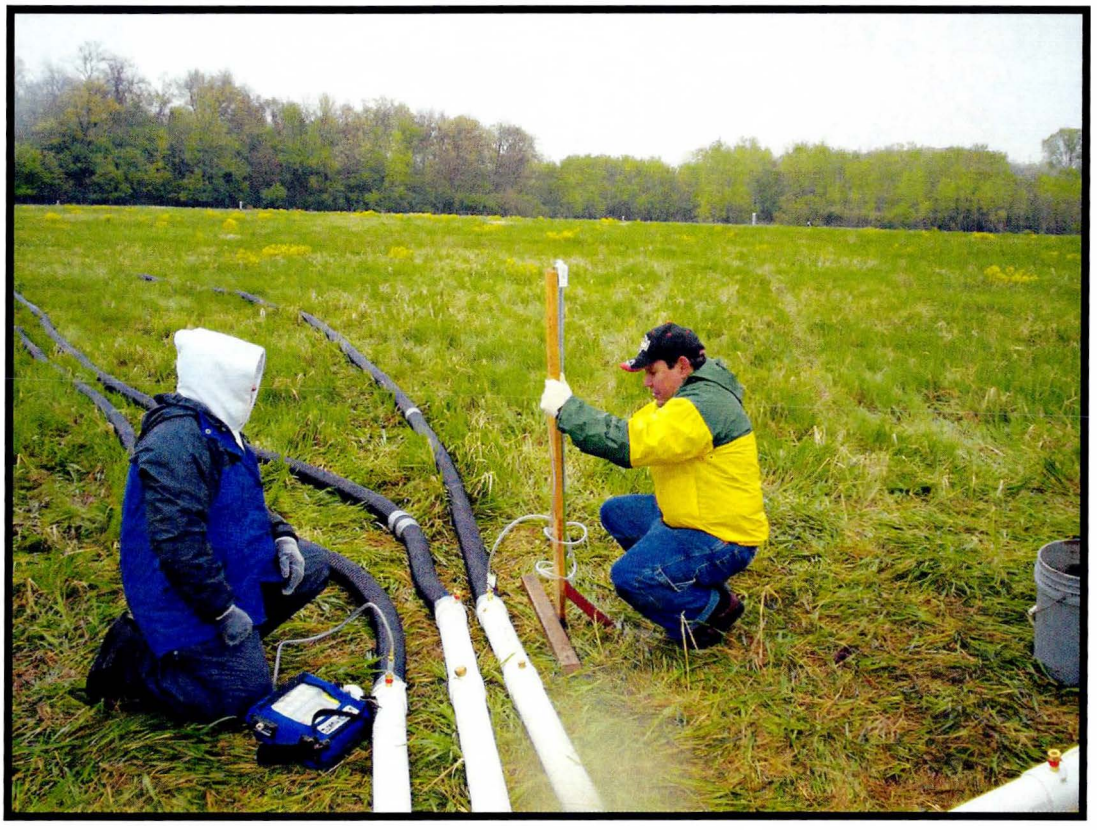
Blower system (looking northwest)

Blower system with control panel (grey box) – looking north-northeast



Extracting from leachate well LC-3 and gas vent GV-2 (also extracting from GV-4 to the north)

Extracting from gas vent GV-4 – looking northwest



Gas and manometer sampling – looking north-northeast

Reading the manometer

Taking gas measurements at leachate well LC-2

APPENDIX C
FIELD FORMS

GeoTrans, Inc.

Gas Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5-9-05

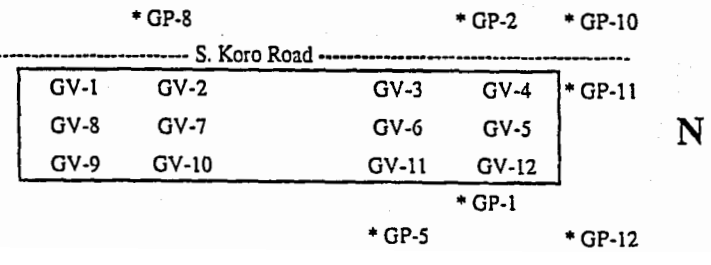
Personnel: Yantz, deMers

Bar. Pres.	Temp	Time
29.25	72	13:21

	CH_4	CO_2	O_2	Time	CH_4	CO_2	O_2	Time	CH_4	CO_2	O_2	Time
GP-1	29.5	11.5	1.7	1355								
GP-2	29.0	26.1	1.7	1340								
GP-3	18.3	19.0	0.2	1316								
GP-6	~~0~~	~~0~~	~~20.3~~	~~1338~~								
GP-7	~~0~~	~~0~~	~~20.3~~	~~1326~~								
GP-8	0.3	8.9	9.3	1336								
LC-1	55.8	37.3	1.0	1225								
LC-2	0.6	0.4	19.9	1241								
LC-3	36.1*	21.9	7.5	1218								
GV-1	18.8#	12.2	11.1	1214								
GV-2	25.0#	15.3	10.5	1220								
GV-3	10.6#	6.5	16.2	~~1229~~								
GV-9	30.7#	17.6	7.6	1245								
GV-12	~~0~~ #	~~0~~	20.3	1232								
MW-101	1.6	16.4	1.6	1345								
MW-102	~~0~~	2.3	14.6	1350								
MW-103	6.0	15.9	0.4	1316								
MW-104	18.1	17.9	0.2	1254								

* just capped
# not capped

GP-6 0.2 | 6.5 | 10.5 | 1402
GP-7 1.7 | 7.8 | 10* | 1404



GeoTrans, Inc.

Daily Log for Landfill Gas Pilot Study

FF/NN Landfill, Ripon, WI

Date: 5/10/05 Personnel: GD, HWH, NO

Started blower system at 9:35 am, connected to Gas Vents GV-1 and GV-3. 175 CFM at Blower
After contacting Schrader regarding low vacuum in extraction system (9 to 10 inches Water Column), checked system by trying to increase vacuum. Opened bleed for inlet air and closed leg 1 (GV-1); vacuum on leg 2 (GV-3) went to 15" W.C. With both legs closed, vacuum on blower unit read 4" Hg. Blower unit is producing appropriate vacuum; extraction points are just not producing enough friction to cause greater vacuum in system. System shuts itself off at 12:55 pm. System flow rate of 85 cfm and vacuum on blower of 4" Hg. Brought in electrician again; motor is drawing too much amperage (> 18 amps, vs 15 rating), and it is tripping the starter with overload. Suspect that motor is burning out and drawing too much current. Restart system at 2:10; shuts down again at 2:15. Tom Walgenbach of Ripon Electric comes and checks out power panel; tightens connections in starter and motor leads, and motor runs at ~ 13.5 amps. Restart system at 3:25 pm, running just leg 1 (GV-1). Throttle back flow to 100 CFM. System trips off at 3:40 pm. Apparently, there is too much friction with just one leg of system connected.
Restart system at 3:45 with both legs (GV-1 and GV-3). System operates until we turn it off at 7 pm.

GeoTrans, Inc.

System Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5/10/05

Extraction Points: GV-1 and GV-3

Personnel: HW4, GLD, NO

	Monitoring Points							
	Blower Exhaust	Blower Inlet	GV-1 Leg	GV-3 Leg		GV-1 Leg	GV-3 Leg	
Temp								
Vacuum			9.0"	10.4"				
Flow Rate								
CH_4			28.5	24.3		25.3	25.2	
CO_2			16.4	15.9		15.2	18.4	
O_2			8.2	9.1		9.5	7.8	
Time	10:00		10:00	10:00		11:32	11:29	
Temp								
Vacuum			14.5"	GV-3 Leg Turned off at valve		8.9"	10.4"	
Flow Rate						3750	827	
CH_4			23.5			28.5	24.5	
CO_2			14.5			17.9	18.6	
O_2			10.1			7.5	7.9	
Time			11:37			12:35	12:35	
Temp			68°	86°				
Vacuum			9.0"	10.65"				
Flow Rate			3950	1525		~~3950~~	~~152~~	
CH_4			31.9	19.3				
CO_2			20.9	15.0				
O_2			5.1	9.8				
Time			4:50	4:55				
Temp			54°	65°				
Vacuum			9.4"	11.0"				
Flow Rate								
CH_4			30.7	16.7				
CO_2			21.0	13.6				
O_2			5.3	11.1				
Time			19:00	19:00				

GeoTrans, Inc.

~~Dragon Tube~~ Measurements for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Leg #	Date	Time	Measurement	Notes	
#1	5-10	10:48	8.5" W.C.	at source.	GV-1
#2		10:48	9.8" W.C. Vacuum		GV-3
		10:50	Total Flow = ~175CFM	at Blower	
~~#1~~ #2		11:10	~~9.7~~ 10.2 175	at Blower	
	Running System Start at			3:25 pm - test leg	GV-1
			19.9 CH_4		
			12.7 CO_2		
			11.1 O_2		
			14.8" W.C.		
			Flow = 165 cfm		
	Throttle Back flow to			100 cfm	
			6.6" W.C.		
			29.8 CH_4		
			19.8 CO_2		
			6.0 O_2	System tripped	at 3:40
GV-1 & GV-3	Both	Legs	on-line	on at 3:45	
			GV-1 8.9"	W.C. 28.1 18.8	6.6
			GV-3 10.1"	W.C 22.2 16.8	8.7
				CH_4 CO_2	O_2
			Vacuum gauge 0.5" Hg	Total Flow = 175	cfm

System shuts itself down at 12:55 pm
Restart at 2:10

System flow rate of 85 cfm
Vacuum on system of
shut down at 2:15

GeoTrans, Inc.

Vacuum

~~Gas~~ Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5-10-05

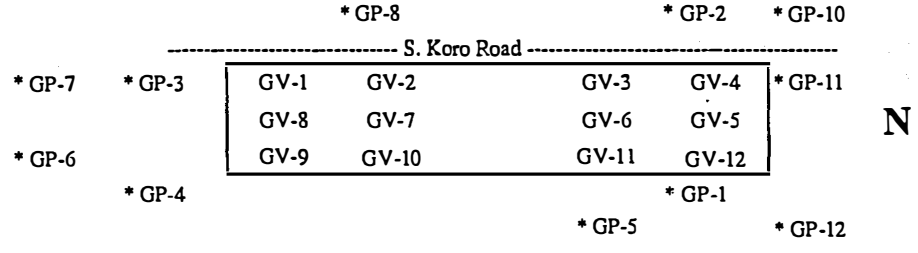
Personnel: GD N O yantz

operating system on Vacuum GV-1 & GV-3

Operating system on GV-1 & GV-3 began 1540

~~Bar. Pres.~~	Temp	Time

	~~CH_4~~	~~CO_2~~	~~O_2~~	~~Time~~	Vacuum time				Vacuum time			
					CH_4	CO_2	O_2	Time	CH_4	CO_2	O_2	Time
GP-1	0.1	1156			~~0~~ 0.1 DW	1605			~~0~~	~~1609~~ 1809	1809 DW	
GP-2	0.1	1236			~~0~~ 0.15	1651			0	1845		
GP-3	~~0~~	1240			0.15	1622			0.15	~~1839~~ 1836		
GP-6	~~0~~	1224			0.1	1637			0.1	1827		
GP-7	DW ~~0.40~~	1213			0.1	1641			0.1	1829		
GP-8	~~0~~	1232			~~0~~	1647			~~0~~	1847		
LC-1	1"	1151			0.9	1556			0.7	~~17~~ 1810		
LC-2	0.2"	1202			1.4	1611			1.85	1815		
LC-3	0.8"	11:47			0.5	1549			0.85	17:53		
GV-1	in use				DW ~~2.3~~	~~1550~~	in use		in use			
GV-2	2.6"	11:48			2.30	~~0~~ 1553	~~20.5~~ DW		2.8	1755		
GV-3	in use				in use				in use			
GV-9	0.35"	1204			2.5	1615			2.6	1819		
GV-12	DW ~~0.5~~ 0.05"	1153			2.3	1601			2.5	~~1611~~ 1806	1806 DW	
MW-101	no cap				no cap				no cap			
MW-102	no cap				no cap				~~0~~	1813	capped	
MW-103	no cap				no cap				no cap			
MW-104	no cap				no cap				no cap			
for GV-1	8.9	1247										
GV-3	10.4	1248										
GV-4	NM				NM				2.6	1803		



GeoTrans, Inc.

Gas Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5-10-05

Personnel: Yantz, Demers, Olavarria

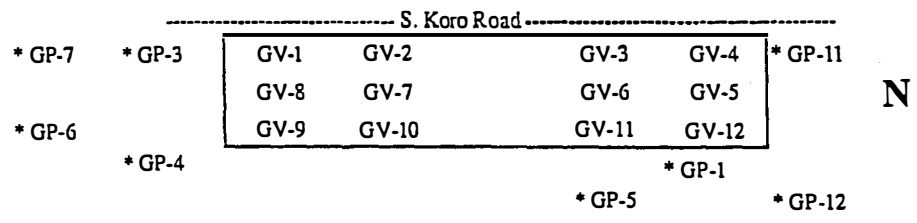
Bar. Pres.	Temp	Time	CH_4	O_2
29.775	64	10:00	0	20.4
29.73	64	1540	0	20.6

GV-1 & GV-3 started system @ 0935

started @ 1540

	CH_4	CO_2	O_2	Time	CH_4	CO_2	O_2	Time	CH_4	CO_2	O_2	Time	
GP-1	27.7	11.0	3.5	~~1017~~ 1114	21.2	8.9	6.4	1606	18.7	8.1	8.1	~~1610~~	1812
GP-2	27.6	25.6	2.1	1049	27.6	25.8	1.7	1652	26.1	25.1	2.2	1846	
GP-3	0	0	20.6	1040	0	0	20.6	1623	0	0	20.7	~~1637~~	1857
GP-6	0.3	7.7	8.9	1032	0.2	5.8	12.6	1639	0.1	5.1	14.3	~~1826~~	
GP-7	1.8	7.7	10.4	1130	0.9	5.4	13.1	1642	0.7	5.3	13.9	1830	
GP-8	0	1.5	18.8	1045	0	0.4	19.8	1648	0	0.2	20.4	1842	
LC-1	53.4	35.6	1.9	1009	35	23.4	8	1549	27.1	17.7	10.9	~~1602~~	1800
LC-2	29.5	18.6	10.3	1018	~~31.5~~	~~19.1~~	~~9.1~~ 20.5	~~1551~~ 1603	0	0	20.5	~~1617~~	
LC-3	41.5	24.8	5.6	1006	31.5	19.1	9.1	1551	28.5	17.8	10.5	1754	
GV-1	connected to system				—								
GV-2	~~41.5~~	~~24.8~~	~~5.6~~	~~1006~~	0	0	20.5	1553	0	0	21.1	1756	
GV-3	connected to system				—								
GV-9	30.4	17.3	7.6	1021	21.2	13.6	10.7	1616	17.3	12.6	11.9	1820	
GV-12	4.2	3.0	17.8	1011	0	0	20.6	1603	0	0	20.8	1807	
MW-101	0	0	20.6	1053	not measured				0	0	20.7	1851	
MW-102	0	0	20.4	1015	0	0	20.8	1609	0	0	20.7	1812	
MW-103	0	0	20.6	1042	0	0	20.7	1630	0	0	20.7	1839	
MW-104	0	0	20.5	1024	0	0	20.7	1556	0	0	21.1	1758	
GV-4	NM				NM				~~20.8~~ 0	0	~~20.8~~	~~1609~~	

GV-2 1.9 1.5 19.5 1008



GeoTrans, Inc.

Daily Log for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5/11/05 Personnel: GCD, HWY, N O

Start system at 8:35 am Shuts down (from overload) about 9:45; it's connect just to ~~GV~~ LC

Restart at 9:55, connected to LC-1 and LC-3. Q = 50 cfs; 4" Hg on inlet; 3" Hg on the line going to both LCs. System shuts down at 9:00; overload Called Schraden Env. Likely cause is motor, and solution is to replace. we will continue testing w/o changing motor. Restart System at 11:05, drawing from just GV-4 at NW corner. Q = 145 cfm; P = 3.5" Hg on blower Pressure drops to 2.5" Hg after 2 minutes. Purpose of Test is to see if can influence GP-2. System ran for 3 minutes before overloading and shutting down. No methane in pipe; calculated that volume of pipe = ~ 20 CF, and at 145 cfm, vapors from well would have been present Restart system connected to GV-4, LC-3 and GV-2
at 11:15 am, P = 0.5" Hg, Q = 185 CFM
at 11:40 am P = 1.0" Hg Q = 190 CFM
at 13:00 P = 1.0" Hg Q = 170 CFM

No condensate

GeoTrans, Inc.

System Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5/11/05

Extraction Points: ~~6~~ LC-1 and LC-3

Personnel: GD, HW4, N O

9:20 off

Barometric 29.53

	Monitoring Points					System connected to		
	Blower Exhaust	Blower Inlet	9:15 LC-1	LC-2	GV-1	LC-3	GV-2	GV-4
Temp								
Vacuum		4" Hg	3.4 Hg	3.4 Hg		19.2" wc	15.8" wc	14.5" wc
Flow Rate								
CH_4			0	0		26.8	8.3	14.5
CO_2			0	0		15.4	9.0	12.8
O_2			20.7	20.7		11.9	13.9	10.8
Time		8:35	9:20	9:20		11:27	11:25	11:20
Temp								
Vacuum					2.1" wc	19.3" wc	16.0 wc	14.6 wc
Flow Rate								
CH_4					26.8	20.8	9.5	21.2
CO_2					28.0	12.2	9.3	14.7
O_2					6.5	13.9	13.8	10.0
Time					11:54	11:52	11:58	11:59
Temp						51°	50°F	
Vacuum								
Flow Rate		90 cfm				500 fpm	1750 fpm	
CH_4								
CO_2								
O_2								
Time								
Temp								
Vacuum						18.9 " wc	15.8	14.4
Flow Rate								
CH_4						30.5	14.6	30.1
CO_2						17.3	13.9	19.9
O_2						10.5	10.4	6.1
Time						13:10	13:12	13:10

VC O

GeoTrans, Inc.

System Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5/11/05

Extraction Points: LC-3, GV-2, GV-4

Personnel: Yantz, Demers

	Blower Exhaust	Blower Inlet	LC-3	GV-2	GV-4			
			Monitoring Points					
Temp			67	~~NM~~ 64	~~456~~ [illegible] NM dry			
Vacuum	~~1" Hg~~	1" Hg	18.8	15.5	14.1			GV-4 had no sampling port for velocity/temp
Flow Rate	170 cfm		750	1624	NM			
CH_4			0	10.1	21.4			
CO_2			0	9.8	14.6			
O_2			21.0	13.4	10.6			
Time			1546	1545	1544			
Temp								
Vacuum								
Flow Rate								
CH_4								
CO_2								
O_2								
Time								
Temp								
Vacuum								
Flow Rate								
CH_4								
CO_2								
O_2								
Time								
Temp								
Vacuum								
Flow Rate								
CH_4								
CO_2								
O_2								
Time								

Total run time of system 13.8 hours minus 0.5 at start = 13.3 hours

shut down system at 16:00

GeoTrans, Inc.

Vacuum ~~Velocity~~ Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

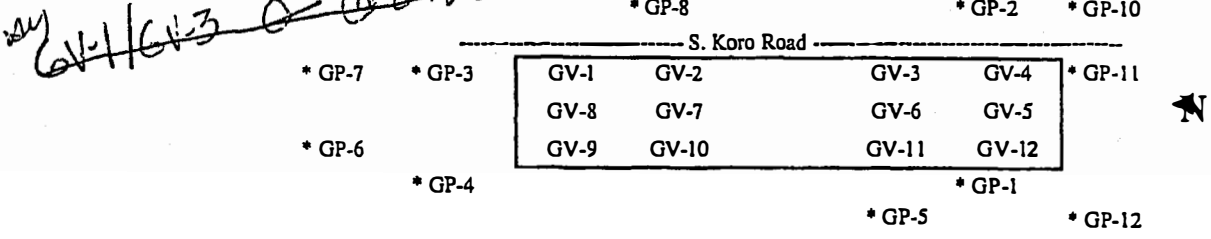
Date: 5-11-05

Extraction Points: ~~LC1, LC3~~ LC3, GV-2, GV-4 KM

Personnel: Yantz, Demers, Olavarria

	Baseline Vacuum		Vacuum		Vacuum					
	~~Velocity~~	Time	~~Velocity~~	Time	~~Velocity~~	Time	Velocity	Time	Velocity	Time
GP-1					0	1215	0	14:33		
GP-2					0	1259	0	1535		
GP-3	0	0835			0.1	1235	2.2	1472		
GP-6					0.1	1249	0	~~1525~~	1519 KM	
GP-7					0.1	1245	0	~~1526~~	1524 KM	
GP-8					0	1256	0	1529		
LC-1					0.9	1210	0.9	1425		
LC-2					1.6	1233	1.4	1458		
LC-3					inuse	—	—	—		
GV-1	0	0728	1.75"	11:25	2.15	1307	2.2	1504		
GV-2					inuse	—	—	—		
GV-3	0	0726	0.20	11:30	2.1	1306	2.1	1506		
GV-4					inuse	—	—	—		
GV-9					2.05	1237	2.0	1500		
GV-12					2.1	1212	2.5	1425		
MW-101					no cap		no cap			
MW-102					0	1220	0	1454		
MW-103					no cap		no	cap		
MW-104					no cap		no	cap		
6			System using							
			LC-3, GV-2							
			and GV-4							

KM ~~GV-1/GV-3 0 0726~~



GeoTrans, Inc.

Gas Monitoring for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Date: 5-11-05

Personnel: Yantz, demerg, davarria

GV-2, ~~LC-2~~ running
GV-4, LC-3

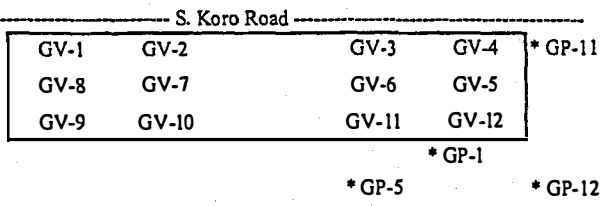
Bar. Pres.	Temp	Time	CH4	O2
29.5	49	0730	0	20.8
29.55	46	1345	0	20.7

Daily Baseline

	CH4	CO2	O2	Time	CH4	CO2	O2	Time	CH4	CO2	O2	Time
GP-1	26.3	11.3	4.0	0746	0	0	20.9	1217	22.9	9.7	5.1	14:32
GP-2	26.8	24.1	4.0	0533	0	9.7	20.5	1300	0.5	1.0	20.0	1533
GP-3	0	0	21.0	0803	0	0	20.9	1237	0	0	20.7	1500
GP-6	0	3.3	15.2	0810	0	2.7	18.5	1249	0	2.3	18.4	1519
GP-7	0.3	3.7	17.2	0815	0.1	7.5	18.5	1246	0.1	2.7	18.1	1524
GP-8	0	0.4	20.8	0820	0	0.4	20.6	1257	0	0.3	20.8	1530
LC-1	0	0 connected			19.5	11.9	14.7	1210	0.9	0.8	20.2	14:27
LC-2	0.1	0.1	20.9	0754	0	0	20.8	1225	0	0	20.3	1457
LC-3	43.5	25.7	6.4	0739	in use							
GV-1	0	0	20.5	0731	37	22.2	4.9	1308	32.6	22.1	3.7	1503
GV-2	11.4	7.4	15.4	0736	in use							
GV-3	0	0	20.7	0740	29.7	20.7	6.7 1205	1205	41.0	24.7	2.0	14:23
GV-4	7.9	4.9	17.6	0742	in use							
GV-9	19.1	12.7	12.3	0757	28.7	19.5	8.7	1233	21.5	14.4	11.7	
GV-12	0.7	0.8	20	0746	0.8	0.9	19.9	1213	0.3	0.3	20.3	14:30
MW-101	0	9.4	9.4	0831	NM				9.1	NM		
MW-102	0	0.1	20.7	0751	0	0	21.0	1221	0	0	20.1	1453
MW-103	0	0	21	0807	0	0	21	1240	0	0	20.8	15:12
MW-104	0	0	20.7	0738	0	0	20.7	1205	0	0	20.7	14:20

GP-1 23.1 10.0 67.5 1275

GP-7: For 13:00 reading, zeroed out/remeasured



GeoTrans, Inc.

Drager Tube Measurements for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Leg #	Date	Time	Measurement	Notes
GV-1 & GV3	5-10-05	4:15pm	0.5 ppm	slight purple color in tube
"	5-10-05	@1920	0.5 ppm	" "
LC-4 & LC-3	5-11-05	9:15	0.0 ppm	
LC-3 + GV2+GV4	5-11-05	12:10	0.5 ppm	~~Alex did 10 sticks~~ Brad
LC 3+ GV2+GV4	5-11-05	15:45	0.3 ppm	

GeoTrans, Inc.

Meter Calibrations for Landfill Gas Pilot Study
FF/NN Landfill, Ripon, WI

Landfill Gas Meter: Landtec GEM 500

	Zero CH_4	Span CH_4	Span CO_2	Zero O_2	Span O_2	Verify CH_4
05/09/05	1129	1130	1132	1134	—	—
05/10/05	0951	—	—	—	—	ran out of gas
05/11/05	0730	—	—	—	—	—
	1230	—	—	—	—	—
05/12/05						

APPENDIX D
LABORATORY RESULTS

Pace Analytical®
www.pacelabs.com

Quarterly Report / Bilog

Pace Analytical Services, Inc.
5203 Triangle Lane
Export, PA 15632
Phone: 724.733.1161
Fax: 724.327.7793

6-7-05
Via Fax - Jerry DeMarco

June 2, 2005

Mr. Nelson Olavarria
Cooper Industries
600 Travis
Suite 5800
Houston, TX 77002

Dear Mr. Olavarria:

Enclosed are analytical results for samples submitted to Pace Analytical by Cooper Industries. The samples were received on May 12, 2005. The results reported in this project meet the requirements as specified in Chapter 5 of the NELAC Standards. Any deviations or discrepancies from the NELAC standards are documented in the case narrative(s) of this report. Please reference Pace project number 05-2695 when inquiring about this report.

Client Site: FF/NN Landfill
Client Ref.: Cooper

Pace Sample Identification	Client Sample Identification
0505-1574	GV-1 and GV-3
0505-1575	GV-2 and GV-4

General Comments: The samples were subcontracted to Pace Analytical Services, Inc., 1700 Elm Street, Suite 200, Minneapolis, MN 55414 for TO-14 analysis. Results of the analysis are reported on the Pace Analytical, Minnesota data tables.

Please call me if you have any questions regarding the information contained within this report.

Sincerely,

Raelyn E Sylvester

Raelyn E. Sylvester
Project Manager

REC: jld

Enclosures

Page 1 of 17

ENVIRONMENTAL AFFAIRS

JUN 0 6 2005

RECEIVED

REPORT OF LABORATORY ANALYSIS

ACCREDITED IN ACCORDANCE WITH nelac

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
5203 Triangle Lane
Export, PA 15632
Phone: 724.733.1161
Fax: 724.327.7793

Mr. Nelson Olavarria
Cooper Industries
600 Travis
Suite 5800
Houston, TX 77002

Client Site: FF/NN Landfill
Client Ref.: Cooper

Lab Project ID: **05-2695**
Lab Sample ID: **0505-1574**
Client Sample ID: GV-1 and GV-3
Sample Matrix: Air

Date Sampled: 05/10/2005
Date Received: 05/12/2005

Subcontracted Work

Test	Method	Result	Reporting Limit	Units	Analyst	Analysis Date	Method Blank ID	Blank Result
BTEX/TPH	TO-14	Completed	N/A	n/a			N/A	N/A

Sample Comments: Results reported on an as received basis.

REPORT OF LABORATORY ANALYSIS

Pace Analytical®
www.pacelabs.com

Pace Analytical Services, Inc.
5203 Triangle Lane
Export, PA 15632
Phone: 724.733.1161
Fax: 724.327.7793

Mr. Nelson Olavarria
Cooper Industries
600 Travis
Suite 5800
Houston, TX 77002

Client Site: FF/NN Landfill
Client Ref.: Cooper

Lab Project ID: **05-2695**
Lab Sample ID: **0505-1575**
Client Sample ID: GV-2 and GV-4
Sample Matrix: Air

Date Sampled: 05/11/2005
Date Received: 05/12/2005

Subcontracted Work

Test	Method	Result	Reporting Limit	Units	Analyst	Analysis Date	Method Blank ID	Blank Result
BTEX/TPH	TO-14	Completed	N/A	n/a			N/A	N/A

Sample Comments: Results reported on an as received basis.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, Inc.
1700 Elm Street, Suite 200
Minneapolis, MN 55414
Phone: (612)607-1700
Fax: (612)607-6444

May 31, 2005

Client Services
Pace Analytical Pittsburgh
5203 Triangle Lane
Export, PA 15632

RE: Project: 1013277
Project ID: 05-2695 COOPER

Dear Client Services:

Enclosed are the analytical results for sample(s) received by the laboratory on May 17, 2005. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Daryl Peterson
Daryl.Peterson@pacelabs.com

Illinois Certification #: 200011
Iowa Certification #: 368
Minnesota Certification #: 027-053-137
Wisconsin Certification #: 999407970

Enclosures

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Fax: (612)607-6444

SAMPLE SUMMARY

Project: 1013277
Project ID: 05-2695 COOPER

Lab ID	Sample ID	Matrix	Date Collected	Date Received
1013277001	GV-1 AND GV-3	Air	05/10/05 19:10	05/17/05 08:55
1013277002	GV-2 + GV-4 + LC-3	Air	05/11/05 15:36	05/17/05 08:55

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SAMPLE ANALYTE COUNT

Project: 1013277
Project ID: 05-2695 COOPER

Lab ID	Sample ID	Method	Analytes Reported
1013277001	GV-1 AND GV-3	TO-14 Source	40
1013277002	GV-2 + GV-4 + LC-3	TO-14 Source	40

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ANALYTICAL RESULTS

Project: 1013277
Project ID: 05-2695 COOPER
The results are reported as received by the laboratory.

Lab ID: 1013277001 Date Collected: 05/10/05 19:10 Matrix: Air
Sample ID: GV-1 AND GV-3 Date Received: 05/17/05 08:55

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	CAS No.	Qual	RegLmt
Air											
TO14 MSV AIR - Source Can	Analytical Method: TO-14 Source										
Benzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	71-43-2		
Bromomethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	74-83-9		
Carbon tetrachloride	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	56-23-5		
Chlorobenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	108-90-7		
Chloroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-00-3		
Chloroform	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	67-66-3		
Chloromethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	74-87-3		
1,2-Dibromoethane (EDB)	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	106-93-4		
1,2-Dichlorobenzene	ND	ppmv	0.18	1.38			05/23/05 19:37	PMW	95-50-1		
1,3-Dichlorobenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	541-73-1	1	
1,4-Dichlorobenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	106-46-7		
Dichlorodifluoromethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-71-8		
1,1-Dichloroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-34-3		
1,2-Dichloroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	107-06-2		
1,1-Dichloroethene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-35-4		
cis-1,2-Dichloroethene	0.63	ppmv ✓	0.14	1.38			05/23/05 19:37	PMW	156-59-2		
trans-1,2-Dichloroethene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	156-60-5		
1,2-Dichloropropane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	78-87-5		
cis-1,3-Dichloropropene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	10061-01-5		
trans-1,3-Dichloropropene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	10061-02-6	2	
Dichlorotetrafluoroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	76-14-2		
Ethylbenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	100-41-4		
Hexachloro-1,3-butadiene	ND	ppmv	0.50	1.38			05/23/05 19:37	PMW	87-68-3	1	
Methylene chloride	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-09-2		
Styrene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	100-42-5		
1,1,2,2-Tetrachloroethane	ND	ppmv	0.28	1.38			05/23/05 19:37	PMW	79-34-5	1	
Tetrachloroethene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	127-18-4		
THC as Gas	11.7	ppmv ✓	1.4	1.38			05/23/05 19:37	PMW			
Toluene	2.2	ppmv ✓	0.28	2.76			05/23/05 21:13	PMW	108-88-3		
1,2,4-Trichlorobenzene	ND	ppmv	0.44	1.38			05/23/05 19:37	PMW	120-82-1	1	
1,1,1-Trichloroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	71-55-6		
1,1,2-Trichloroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	79-00-5		
Trichloroethene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	79-01-6		
Trichlorofluoromethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-69-4		
1,1,2-Trichlorotrifluoroethane	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	76-13-1		
1,2,4-Trimethylbenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	95-63-6	1	
1,3,5-Trimethylbenzene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	108-67-8	1	

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ANALYTICAL RESULTS

Project: 1013277
Project ID: 05-2695 COOPER
The results are reported as received by the laboratory.

Lab ID: **1013277001** Date Collected: 05/10/05 19:10 Matrix: Air
Sample ID: **GV-1 AND GV-3** Date Received: 05/17/05 08:55

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	CAS No.	Qual	RegLmt
Vinyl chloride	1.1	ppmv	0.14	1.38			05/23/05 19:37	PMW	75-01-4		
m&p-Xylene	0.40	ppmv	0.28	1.38			05/23/05 19:37	PMW	1330-20-7		
o-Xylene	ND	ppmv	0.14	1.38			05/23/05 19:37	PMW	95-47-6		

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ANALYTICAL RESULTS

Project: 1013277
Project ID: 05-2695 COOPER
The results are reported as received by the laboratory.

Lab ID: **1013277002** Date Collected: 05/11/05 15:36 Matrix: Air
Sample ID: **GV-2 + GV-4 + LC-3** Date Received: 05/17/05 08:55

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	CAS No.	Qual	RegLmt
Air											
TO14 MSVAIR - Source Can	Analytical Method: TO-14 Source										
Benzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	71-43-2		
Bromomethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	74-83-9		
Carbon tetrachloride	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	56-23-5		
Chlorobenzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	108-90-7		
Chloroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-00-3		
Chloroform	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	67-66-3		
Chloromethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	74-87-3		
1,2-Dibromoethane (EDB)	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	106-93-4		
1,2-Dichlorobenzene	ND	ppmv	0.18	1.38			05/23/05 20:43	PMW	95-50-1		
1,3-Dichlorobenzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	541-73-1	1	
1,4-Dichlorobenzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	106-46-7		
Dichlorodifluoromethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-71-8		
1,1-Dichloroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-34-3		
1,2-Dichloroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	107-06-2		
1,1-Dichloroethene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-35-4		
cis-1,2-Dichloroethene	2.2	ppmv	0.69	6.9			05/23/05 23:28	PMW	156-59-2		
trans-1,2-Dichloroethene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	156-60-5		
1,2-Dichloropropane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	78-87-5		
cis-1,3-Dichloropropene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	10061-01-5		
trans-1,3-Dichloropropene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	10061-02-6	2	
Dichlorotetrafluoroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	76-14-2		
Ethylbenzene	0.32	ppmv	0.14	1.38			05/23/05 20:43	PMW	100-41-4		
Hexachloro-1,3-butadiene	ND	ppmv	0.50	1.38			05/23/05 20:43	PMW	87-68-3	1	
Methylene chloride	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-09-2		
Styrene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	100-42-5		
1,1,2,2-Tetrachloroethane	ND	ppmv	0.28	1.38			05/23/05 20:43	PMW	79-34-5	1	
Tetrachloroethene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	127-18-4		
THC as Gas	11.4	ppmv	1.4	1.38			05/23/05 20:43	PMW			
Toluene	2.5	ppmv	0.69	6.9			05/23/05 23:28	PMW	108-88-3		
1,2,4-Trichlorobenzene	ND	ppmv	0.44	1.38			05/23/05 20:43	PMW	120-82-1	1	
1,1,1-Trichloroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	71-55-6		
1,1,2-Trichloroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	79-00-5		
Trichloroethene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	79-01-6		
Trichlorofluoromethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	75-69-4		
1,1,2-Trichlorotrifluoroethane	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	76-13-1		
1,2.4-Trimethylbenzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	95-63-6	1	
1,3,5-Trimethylbenzene	ND	ppmv	0.14	1.38			05/23/05 20:43	PMW	108-67-8	1	

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ANALYTICAL RESULTS

Project: 1013277
Project ID: 05-2695 COOPER
The results are reported as received by the laboratory.

Lab ID: **1013277002** Date Collected: 05/11/05 15:36 Matrix: Air
Sample ID: **GV-2 + GV-4 + LC-3** Date Received: 05/17/05 08:55

Parameters	Results	Units	Report Limit	DF	Prepared	By	Analyzed	By	CAS No.	Qual	RegLmt
Vinyl chloride	2.9	ppmv	0.69	6.9			05/23/05 23:28	PMW	75-01-4		
m&p-Xylene	0.74	ppmv	0.28	1.38			05/23/05 20:43	PMW	1330-20-7		
o-Xylene	0.15	ppmv	0.14	1.38			05/23/05 20:43	PMW	95-47-6		

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ANALYTICAL RESULTS QUALIFIERS

Project: 1013277
Project ID: 05-2695 COOPER

PARAMETER QUALIFIERS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

ANALYTE QUALIFIERS

[1] The continuing calibration for this compound is outside of method control limits. The result for this compound should be considered an estimation.

[2] The initial calibration for this compound is outside of method control limits. The result for this compound is an estimation.

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QUALITY CONTROL DATA

Project: 1013277
Project ID: 05-2695 COOPER

QC Batch: AIR/2089 Analysis Method: TO-14 Source
QC Batch Method: TO-14 Source Analysis Description: TO14 MSV AIR - SOURCE CAN
Associated Lab Samples: 1013277001 1013277002

METHOD BLANK: 90290
Associated Lab Samples: 1013277001 1013277002

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
THC as Gas	ppmv	ND	1.0	

METHOD BLANK: 90290
Associated Lab Samples: 1013277001 1013277002

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Benzene	ppmv	ND	0.10	
Bromomethane	ppmv	ND	0.10	
Carbon tetrachloride	ppmv	ND	0.10	
Chlorobenzene	ppmv	ND	0.10	
Chloroethane	ppmv	ND	0.10	
Chloroform	ppmv	ND	0.10	
Chloromethane	ppmv	ND	0.10	
1,2-Dibromoethane (EDB)	ppmv	ND	0.10	
1,2-Dichlorobenzene	ppmv	ND	0.13	
1,3-Dichlorobenzene	ppmv	ND	0.10	1
1,4-Dichlorobenzene	ppmv	ND	0.10	
Dichlorodifluoromethane	ppmv	ND	0.10	
1,1-Dichloroethane	ppmv	ND	0.10	
1,2-Dichloroethane	ppmv	ND	0.10	
1,1-Dichloroethene	ppmv	ND	0.10	
cis-1,2-Dichloroethene	ppmv	ND	0.10	
trans-1,2-Dichloroethene	ppmv	ND	0.10	
1,2-Dichloropropane	ppmv	ND	0.10	
cis-1,3-Dichloropropene	ppmv	ND	0.10	
trans-1,3-Dichloropropene	ppmv	ND	0.10	2
Dichlorotetrafluoroethane	ppmv	ND	0.10	
Ethylbenzene	ppmv	ND	0.10	
Hexachloro-1,3-butadiene	ppmv	ND	0.36	1
Methylene chloride	ppmv	ND	0.10	
Styrene	ppmv	ND	0.10	
1,1,2,2-Tetrachloroethane	ppmv	ND	0.20	1
Tetrachloroethene	ppmv	ND	0.10	
Toluene	ppmv	ND	0.10	
1,2,4-Trichlorobenzene	ppmv	ND	0.32	1
1,1,1-Trichloroethane	ppmv	ND	0.10	
1,1,2-Trichloroethane	ppmv	ND	0.10	

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QUALITY CONTROL DATA

Project: 1013277
Project ID: 05-2695 COOPER

Parameter	Units	Blank Result	Reporting Limit	Qualifiers
Trichloroethene	ppmv	ND	0.10	
Trichlorofluoromethane	ppmv	ND	0.10	
1,1,2-Trichlorotrifluoroethane	ppmv	ND	0.10	
1,2,4-Trimethylbenzene	ppmv	ND	0.10	1
1,3,5-Trimethylbenzene	ppmv	ND	0.10	1
Vinyl chloride	ppmv	ND	0.10	
m&p-Xylene	ppmv	ND	0.20	
o-Xylene	ppmv	ND	0.10	

LABORATORY CONTROL SAMPLE: 90291

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzene	ppmv	0.52	0.44	84	65-141	
Bromomethane	ppmv	0.52	0.45	87	68-145	
Carbon tetrachloride	ppmv	0.53	0.41	78	61-140	
Chlorobenzene	ppmv	0.52	0.44	84	61-136	
Chloroethane	ppmv	0.52	0.42	81	50-150	
Chloroform	ppmv	0.54	0.42	77	64-141	
Chloromethane	ppmv	0.51	0.58	113	62-143	
1,2-Dibromoethane (EDB)	ppmv	0.53	0.46	86	56-137	
1,2-Dichlorobenzene	ppmv	0.5	0.39	78	50-150	
1,3-Dichlorobenzene	ppmv	0.52	0.29	56	50-150	1
1,4-Dichlorobenzene	ppmv	0.5	0.41	81	50-150	
Dichlorodifluoromethane	ppmv	0.53	0.39	74	58-147	
1,1-Dichloroethane	ppmv	0.52	0.42	81	68-139	
1,2-Dichloroethane	ppmv	0.53	0.47	90	68-137	
1,1-Dichloroethene	ppmv	0.54	0.47	89	68-142	
cis-1,2-Dichloroethene	ppmv	0.54	0.47	88	73-139	
trans-1,2-Dichloroethene	ppmv	0.52	0.42	82	50-150	
1,2-Dichloropropane	ppmv	0.52	0.41	79	63-137	
cis-1,3-Dichloropropene	ppmv	0.53	0.54	102	53-138	
trans-1,3-Dichloropropene	ppmv	0.53	0.60	113	50-142	2
Dichlorotetrafluoroethane	ppmv	0.5	0.39	78	59-144	
Ethylbenzene	ppmv	0.52	0.48	91	62-142	
Hexachloro-1,3-butadiene	ppmv	0.55	ND	19	50-150	1
Methylene chloride	ppmv	0.53	0.38	72	70-139	
Styrene	ppmv	0.52	0.46	88	50-150	
1,1,2,2-Tetrachloroethane	ppmv	0.52	0.30	57	50-150	1
Tetrachloroethene	ppmv	0.52	0.43	84	67-139	
Toluene	ppmv	0.52	0.49	94	62-142	
1,2,4-Trichlorobenzene	ppmv	0.54	ND	13	50-150	1
1,1,1-Trichloroethane	ppmv	0.52	0.43	82	64-141	

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QUALITY CONTROL DATA

Project: 1013277
Project ID: 05-2695 COOPER

LABORATORY CONTROL SAMPLE: 90291

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
1,1,2-Trichloroethane	ppmv	0.52	0.40	77	60-139	
Trichloroethene	ppmv	0.52	0.43	83	66-141	
Trichlorofluoromethane	ppmv	0.5	0.43	85	58-145	
1,1,2-Trichlorotrifluoroethane	ppmv	0.52	0.44	85	60-145	
1,2,4-Trimethylbenzene	ppmv	0.52	0.31	59	50-150	1
1,3,5-Trimethylbenzene	ppmv	0.54	0.26	48	50-150	1
Vinyl chloride	ppmv	0.52	0.49	94	75-142	
m&p-Xylene	ppmv	1	0.93	88	60-140	
o-Xylene	ppmv	0.54	0.43	81	57-140	

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QUALITY CONTROL DATA QUALIFIERS

Project: 1013277
Project ID: 05-2695 COOPER

QUALITY CONTROL PARAMETER QUALIFIERS

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

QUALITY CONTROL ANALYTE QUALIFIERS

[1] The continuing calibration for this compound is outside of method control limits. The result for this compound should be considered an estimation.

[2] The initial calibration for this compound is outside of method control limits. The result for this compound is an estimation.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: 1013277
Project ID: 05-2695 COOPER

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
1013277001	**GV-1 AND GV-3**	TO-14 Source	AIR/2089		
1013277002	**GV-2 + GV-4 + LC-3**	TO-14 Source	AIR/2089		

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CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

879967

Page: 1 of 1

Required Client Information: Section A	Required Client Information: Section B	To Be Completed by Pace Analytical and Client Section
Company: GEOTRANS, INC	Report To: Gerald DeMars	Quote Reference:
Address: 175 N. Corporate Dr. Brookfield, WI 53045	Copy To:	Project Manager:
	Invoice To:	Project #: 05-21095
	P.O.	Profile #:
Phone: 262-792-1282 Fax: 262-792-1310	Project Name: FF/NN Landfill, Ripon	
	Project Number: 1011.002	

Client Information (Check quote/contract).
Requested Due Date: *TAT:

*Turn around time less than 14 days subject to laboratory and contractual obligations and may result in a Rush Turnaround Surcharge.
Turn Around Time (TAT) in calendar days.

Requested Analysis: TO-14 VOC's; Summa Canister

ITEM #	Section D Required Client Information: SAMPLE ID (One character per box. (A-Z, 0-9 / .-) Sample IDs MUST BE UNIQUE)	Valid Matrix Codes (MATRIX / CODE): DRINKING WATER DW; GROUNDWATER GW; SURFACE WATER SW; WASTE WATER WW; PRODUCT P; SOIL SL; OIL OL; WIPE WP; AIR AR; OTHER OT	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	TO-14 VOC's	Summa Canister	Remarks
1	GV-1 and GV-3		AR	G	5/10/05	19:00	5/10/05	19:10	70°F								X	1508-1571	0278
2	GV-2 + GV-4 + LC-3		AR	G	5/11/05	15:34	5/11/05	15:36	56°F								X	1575	0165
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			

SITE LOCATION	REGULATORY AGENCY
☐ NC ☐ SC ☐ GA ☒ Other WI	☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER ☐ UST ☐ RCRA ☒ Other Air Sample

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Gerald DeMars/GeoTrans	5/12/05	1:20pm		5/12/05	08

SAMPLE CONDITION

Temp in °C	[illegible]
Received on Ice	Y/N
Sealed Cooler	Y/N
Samples Intact	Y/N

Additional Comments:

SAMPLE NOTES: *Copper work** Third summa canister was not used. Charge for unused Summa can $50

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Gerald DeMars

SIGNATURE of SAMPLER: Gerald DeMars

DATE Signed: 5/12/05 (MM / DD / YY)

SEE REVERSE SIDE FOR INSTRUCTIONS

Form COC01 Rev.

2100

APPENDIX E
EXAMPLE BLOWER SYSTEM

Fliteway Technologies, Inc.
6901 Industrial Loop • P.O. Box 108 • Greendale, WI 53129
(414) 423-5600 • 1-800-236-3580 • FAX (414) 423-9007

June 3, 2005

Q13185

GeoTrans, Inc.
175 N. Corporate Drive, Suite 100
Brookfield, WI 53045

EASTERN [illegible]
PROJECT # 1011.002
CC:

Attention: Gerald L. Lewis
Reference: SVE System for Ripon Landfill Site

Dear Gerald,

Following is our quotation for an SVE Unit you requested, I have quoted two systems one rated for a maximum vacuum of 3" HG and the other rated for 5" HG.

- **Fliteway Model FV1582X3 – American Fan # SN-04-26.5N rated for 200 SCFM at 3" HG** with the following equipment:

  - **10 HP Explosion Proof 230 VAC Three Phase** 1750 RPM motor
  - American Fan turbo pressure blower / exhauster (Spark Resistant Fan Construction
  - Fliteway "Cyclonic Action" 82 Gallon Vertical knockout/demister tank, carbon steel with site gauge, 6" cleanout, and drain.
  - 4" inlet, liquid filled vacuum gauge, and sample port.
  - 10 micron in-line filter between tank and vacuum pump.
  - Valved sample port on outlet side.
  - Two(2) 2 1/2" liquid filled vacuum gauges before and after the filter to monitor differential pressure across filter element.
  - Premium chamber/absorption carbon steel discharge silencer.
  - Vacuum relief valve on inlet side of pump, field adjustable from 0 to 15"
  - Easily replaceable sheaves and bushings for CFM adjustability.
  - Adjustable motor slide base.
  - OSHA Belt guard.
  - Metal Skid Base
  - Explosion Proof High Liquid Level Switch mounted on tank
  - Inlet Manifold with Four (4) 4" Legs
    - Four (4) 4" Brass Ball Valves
    - Four (4) Vacuum Gauges
    - Four (4) Valved Sample Ports
  - Steel Base Skid with forklift pockets and stand for control panel
  - Base skid constructed for possible later addition of steel weather enclosure

[redacted]

Note: Add [redacted] for 15 HP American Fan Model BC-7-10-31.5 A Spark Resistan Fan Construction rated for 480 SCFM at 5" HG. not needed -

- **NEMA 4 Control Panel (230 VAC Single Phase) mounted and tested on SVE Skid**

  - NEMA 4 Box with inner panel
  - Disconnect
  - Variable Frequency Drive to operate the Blower Motor on 230 VAC Single Phase Power.
    - 10 HP SVE Motor
  - HOA switch
    - SVE
  - Alarm Lights
    - SVE HHL
  - Hour Meter
  - Control Transformer
  - Transient Protection
  - One (1) Dual Intrinsically Safe Switch Repeater
  - Lightning Protection
  - Surge Protection
  - UL Certification

[redacted]

Note: Add $ 571 for 15 HP Variable Frequency Drive in place of 10 HP above not needed

Total for 10 HP System $[redacted]

- **Optional Steel Weather Enclosure with vent fan and access panels (can be added at later date)**

For 10 HP System $[redacted]

For 15 HP System $[redacted]

Quotation Valid for 30 Days

Pricing: FOB Greendale, WI (Applicable sales taxes if any not included)
Terms: Net 30 from shipment. (1.5% per month finance charge on invoices over 30 Days)
Delivery: 7-8 weeks from date written order received at our plant.
Estimated Freight: $ 500

Sincerely,

William E. Diehl
President