



February 2, 2012

Susan Pelz, P.E.  
Southwest District  
Florida Dept. of Environmental Protection  
13051 North Telecom Pkwy.  
Temple Terrace, FL 33637

Dept. Of Environmental Protection

FEB 06 2012

Southwest District

RE: Citrus County Central Landfill  
Landfill Gas Remediation System Status Report  
Jones Edmunds Project No.: 03860-038-01

Dear Ms. Pelz:

Jones Edmunds & Associates, Inc., on behalf of Citrus County, installed a solar powered soil vapor extraction system (system) to remediate groundwater contamination near MW-10 at the Citrus Central Landfill. The system has been operating since October 2010. Details of the remedial system construction were submitted to FDEP on December 16, 2010 and are summarized below. In the December 16, 2010 report, Jones Edmunds indicated that an update on the system results would be submitted after one-year of data collection. This report details the system operation and results.

The system consists of five soil vapor extraction wells installed between MW-10 and the closed landfill. The wells are spaced approximately 50 feet apart. Three wells were installed to 100 feet total depth and two wells were installed to 60 feet total depth. The wells are constructed of 4-inch-diameter PVC and 0.020-inch slotted PVC screen. The extraction wells are connected to a solar powered electric blower by a 2-inch diameter PVC suction line. Each well has a valve to modify flow from the well, a sample port to measure landfill gas concentration, and a condensate collection trap. Attachment 1 contains the Site Map and Gas Extraction Well Location detail from the December 16, 2010 report.

### **System Initiation and Adjustment**

The system has been monitored at least once each month from October 2010 through August 2011 when monitoring was reduced due to consistent performance of the system. Monitoring of the system has included checking the fans, battery voltage, condensation traps, and field measurements of Methane, Carbon Dioxide, and Oxygen from each well. Between October 2010 and March 2011, the system did not run consistently due to a faulty battery and breakers with too low of a voltage allowance. In March of 2011, a new battery was installed the issue with the breakers was resolved. The system has been performing adequately since March of 2011.

The following lists the field observations and adjustments made to the system.

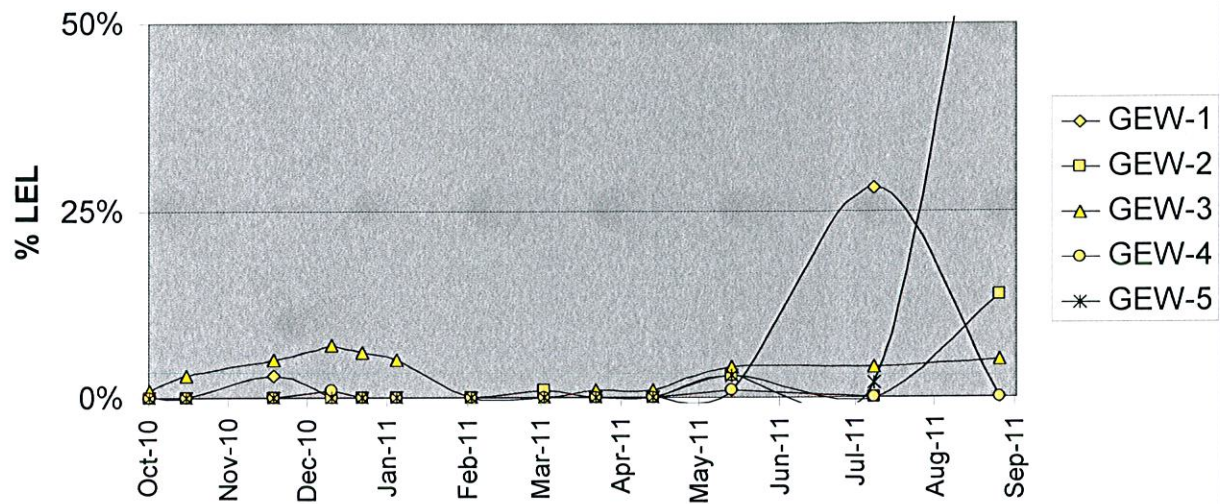
- October 1, 2010: System off, battery-line breakers are tripped. System restarted.
- October 8, 2010: System off, same breakers are tripped. System restarted.
- October 15, 2010: Fan off, low-voltage disconnect, faulty controller. Replaced 2 breakers.
- October 22, 2010: Replaced Controller, system restarted.
- October 27, 2010: System off, 10A breaker is tripped, voltage too low.
- November 1, 2010: Changed breaker (to 45A) and charged battery. System restarted.
- November 4, 2010: System running.
- November 18, 2010: System running. 1-inch condensate in well #4, no condensate in other traps.
- December 10, 2010: System running, but low-voltage disconnect light is on. Very little condensate in wells #4 and #5.
- December 22, 2010: System running.
- January 4, 2011: Fan off. Battery is recharging (12.43V, should turn on at 12.5V)
- February 2, 2011: Fan off. Battery is recharging (11.08V, should turn on at 12.5V)
- March 2, 2011: System off. Battery is not charging (8.5V, battery is dead) No condensate.
- March 11, 2011: Installed new battery. System restarted.
- March 22, 2011: System running. No condensate.
- April 13, 2011: System running. No condensate.
- May 13, 2011: System running. No condensate.
- June 18, 2011: System running. No condensate.
- July 8, 2011: Fan off due to low-voltage disconnect (Battery voltage is 12.34V; will turn on at 12.50V). Turned system on and waited for voltage to drop to 11.50V to make sure it shut off properly. System running properly.
- August 26, 2011: System running. No condensate.
- October 21, 2011: System running. No condensate.
- December 20, 2011: System running. No condensate.

The system has been running consistently since March 2011.

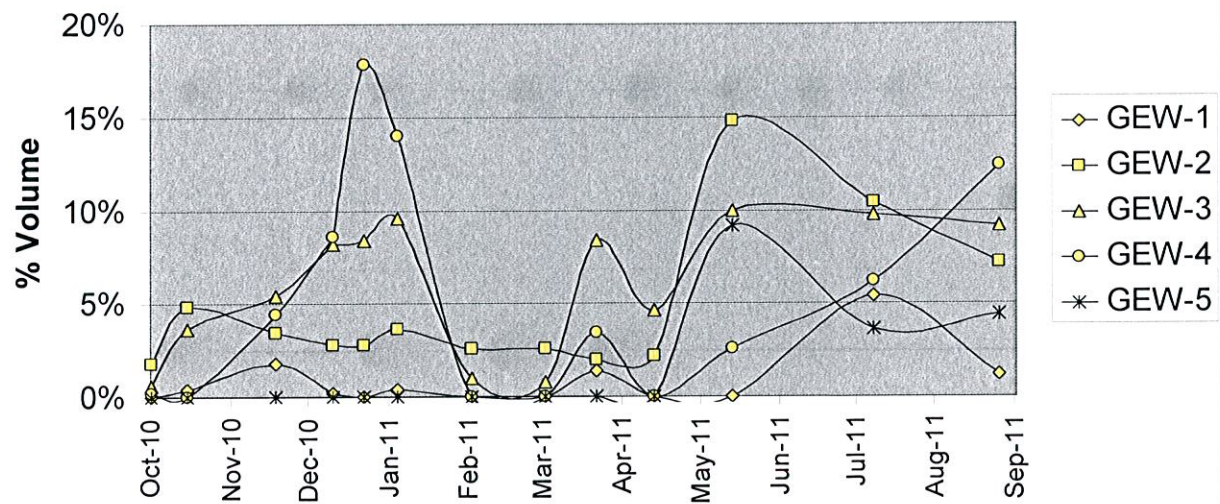
### **Vadose Gas Responses to the System**

Gas monitoring results are graphed in Figures 1 through 3. Table 1 provides a summary of the monitoring results for each site visit through August 2011. Methane detections in GEW-3 appear to be stable. However, Methane in GEW-1, GEW-2, and GEW-5 appear to be increasing. Carbon Dioxide and Oxygen are showing nearly equal and opposite reactions in all wells; as Carbon Dioxide increases, Oxygen decreases. Also evident in the data are the responses to the system's temporary shut-down from February to March in GEW-3 and GEW-4. This pattern shows that gas is being drawn from the wells as designed.

**Figure 1: CH<sub>4</sub> Concentrations**



**Figure 2: CO<sub>2</sub> Concentrations**



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**Figure 3: O<sub>2</sub> Concentrations**

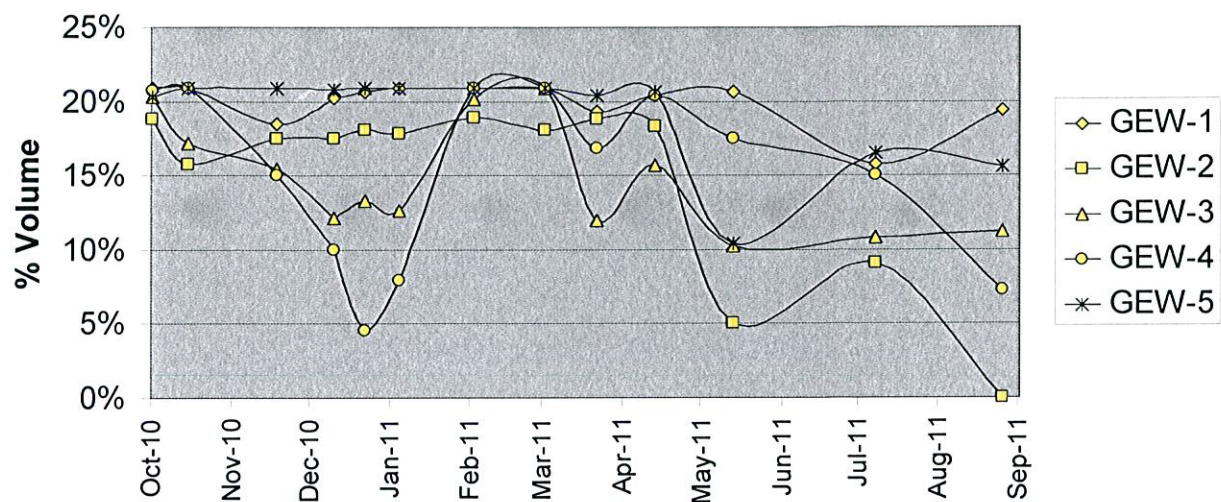


Table 1: Gas Monitoring Data

Extraction Well	1-Oct-10			15-Oct-10			18-Nov-10		
	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)
GEW-1	20.90%	0%	0.00%	20.90%	0%	0.40%	18.50%	3%	1.80%
GEW-2	18.80%	0%	1.80%	15.80%	0%	4.80%	17.50%	0%	3.40%
GEW-3	20.30%	1%	0.60%	17.20%	3%	3.60%	15.40%	5%	5.40%
GEW-4	20.70%	0%	0.20%	20.90%	0%	0.00%	15.00%	0%	4.40%
GEW-5	20.30%	0%	0.00%	20.90%	0%	0.00%	20.90%	0%	0.00%

Extraction Well	10-Dec-10			22-Dec-10			4-Jan-11		
	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)
GEW-1	20.20%	0%	0.20%	20.60%	0%	0.00%	20.90%	0%	0.40%
GEW-2	17.50%	0%	2.80%	18.10%	0%	2.80%	17.80%	0%	3.60%
GEW-3	12.10%	7%	8.20%	13.30%	6%	8.40%	12.60%	5%	9.60%
GEW-4	10.00%	1%	8.60%	4.50%	0%	17.80%	7.90%	0%	14.00%
GEW-5	20.80%	0%	0.00%	20.90%	0%	0.00%	20.90%	0%	0.00%

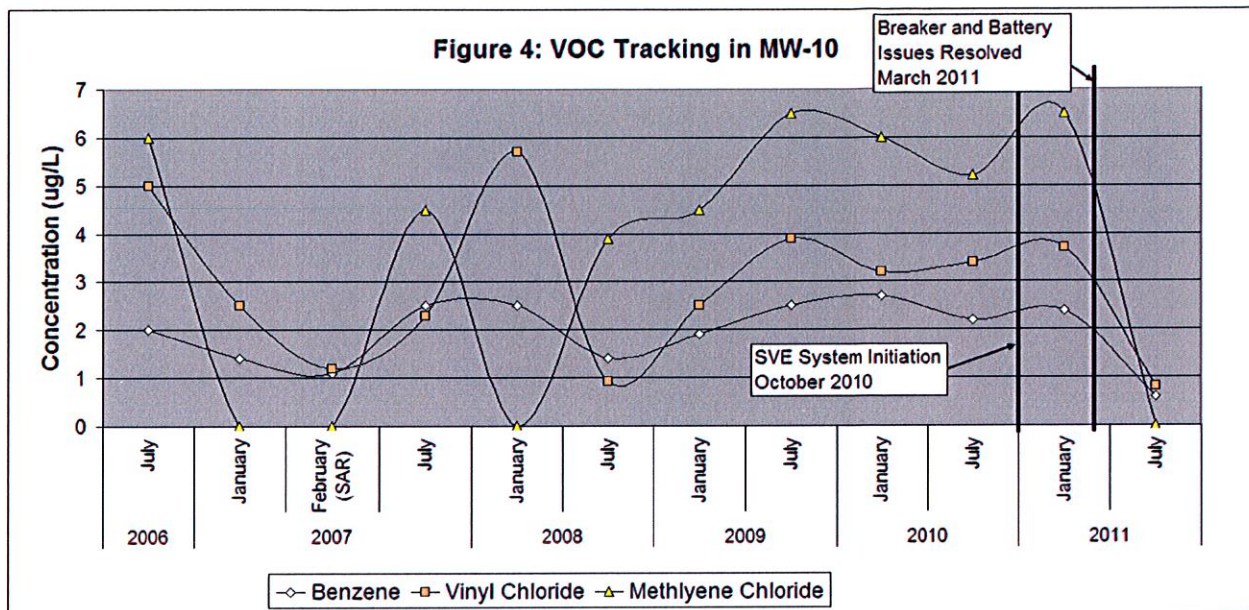
Extraction Well	2-Feb-11			2-Mar-11			22-Mar-11		
	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)
GEW-1	20.90%	0%	0.00%	20.90%	0%	0.00%	19.30%	0%	1.40%
GEW-2	18.90%	0%	2.60%	18.10%	1%	2.60%	18.80%	0%	2.00%
GEW-3	20.10%	0%	1.00%	20.90%	0%	0.80%	12.00%	1%	8.40%
GEW-4	20.90%	0%	0.00%	20.90%	0%	0.00%	16.80%	0%	3.40%
GEW-5	20.90%	0%	0.00%	20.90%	0%	0.00%	20.40%	0%	0.00%

Extraction Well	13-Apr-11			13-May-11			18-Jun-11		
	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)
GEW-1	20.40%	0%	0.00%	20.60%	1%	0.00%	Gas meter out of calibration No data collected		
GEW-2	18.30%	0%	2.20%	5.00%	3%	14.80%			
GEW-3	15.70%	1%	4.60%	10.20%	4%	10.00%			
GEW-4	20.40%	0%	0.00%	17.50%	1%	2.60%			
GEW-5	20.60%	0%	0.00%	10.40%	3%	9.20%			

Extraction Well	8-Jul-11			26-Aug-11		
	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)	O <sub>2</sub> (%Vol.)	CH <sub>4</sub> (%LEL)	CO <sub>2</sub> (%Vol.)
GEW-1	15.80%	28%	5.40%	19.40%	0%	1.20%
GEW-2	9.10%	0%	10.40%	0.00%	14%	7.20%
GEW-3	10.80%	4%	9.80%	11.20%	5%	9.20%
GEW-4	15.00%	0%	6.20%	7.30%	0%	12.40%
GEW-5	16.50%	2%	3.60%	15.60%	85%	4.40%

## Groundwater Responses

Groundwater data, including all required quality assurance documentation, are submitted with the routine semiannual reports. Figure 4 summarizes the results for selected VOCs from the 2006 second semiannual sampling event to the 2011 second semiannual sampling event including notations on the initiation of the system and on the date when system issues were resolved.



The January 2011 sampling event (confirmed in a February 2011 resampling) show VOCs at about the same concentration as detected before the initiation of the system. However, the system checks between December 10, 2010 and March 2, 2011 showed that the battery was not providing consistent charge causing the system to fail or intermittently operate. In the four months after installing the new battery, the VOCs dropped to concentrations below 1  $\mu\text{g/L}$  as shown in the July 2011 sampling event.

## Conclusion

The first year's data appear to show that the system is working to bring contaminant concentrations below the groundwater standards. However, this is only based on a single sampling event. After another year of operation with systems checks every two months to ensure the system is operating, we will submit a second remedial status report. The report will be submitted to FDEP by December 31, 2012.

If you have any questions concerning these documents, please call me at (352) 377-5821.



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Enclosures

xc: John Morris, FDEP  
Casey Stephens, Citrus County

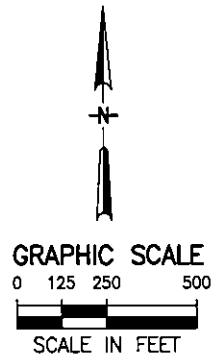
**ATTACHMENT 1**  
**SITE MAP AND GAS WELL ARRAY**

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**LEGEND**

- BACKGROUND WELLS
- ⊕ COMPLIANCE MONITORING WELL
- ⊕ ASSESSMENT MONITORING WELL
- INTERMEDIATE WELL
- ⊞ PIEZOMETERS
- GAS EXTRACTION WELL
- ▲ LEACHATE INFLUENT SAMPLING LOCATION
- △ LEACHATE EFFLUENT SAMPLING LOCATION
- - - ZONE OF DISCHARGE
- - - PROPERTY BOUNDARY (OWNED BY COUNTY)
- - - LIMITS OF WASTE
- - - PROPERTY BOUNDARY (LEASED BY COUNTY)

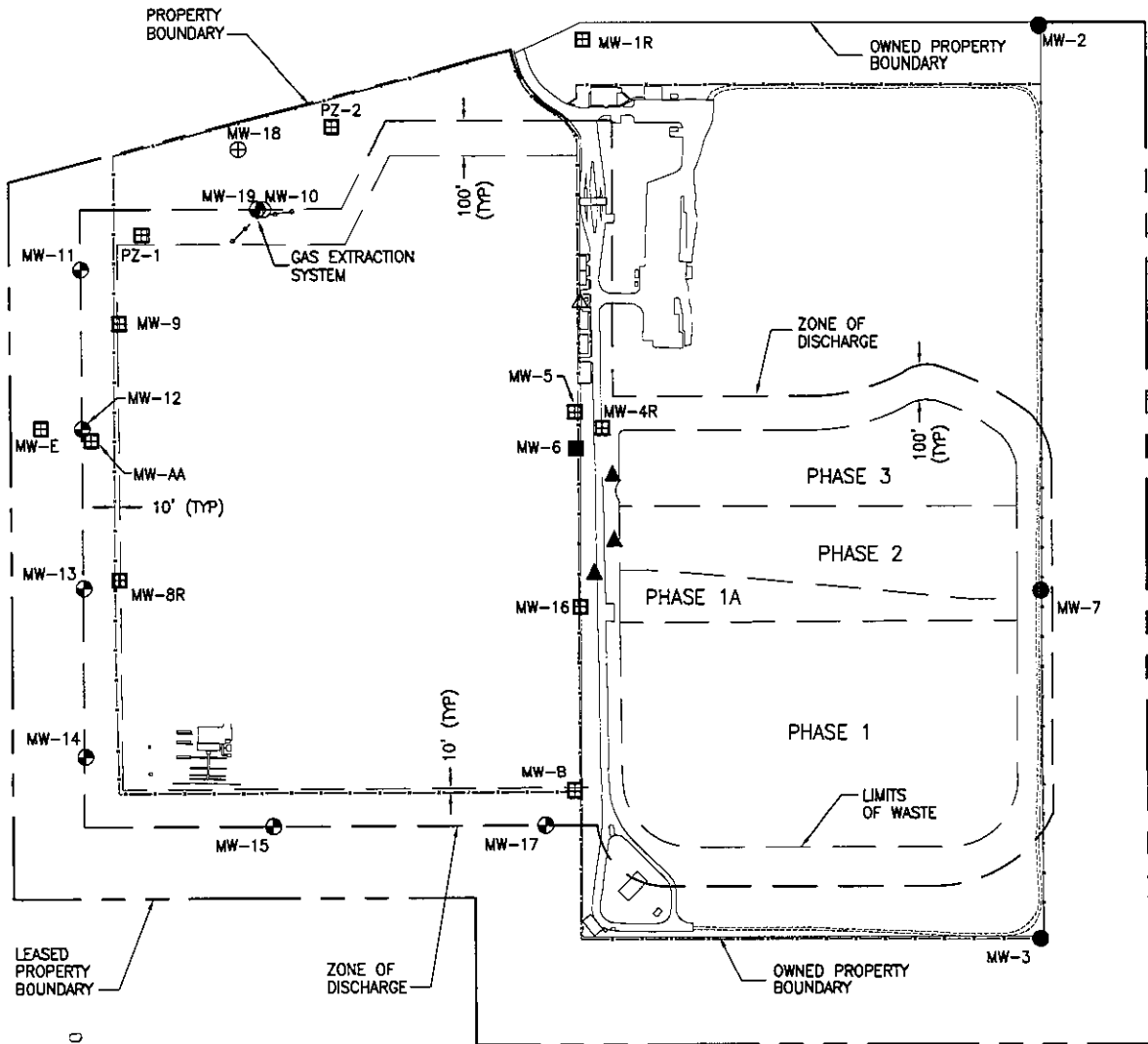


FIGURE 1  
SITE PLAN  
GAS EXTRACTION SYSTEM  
CITRUS COUNTY CENTRAL LANDFILL

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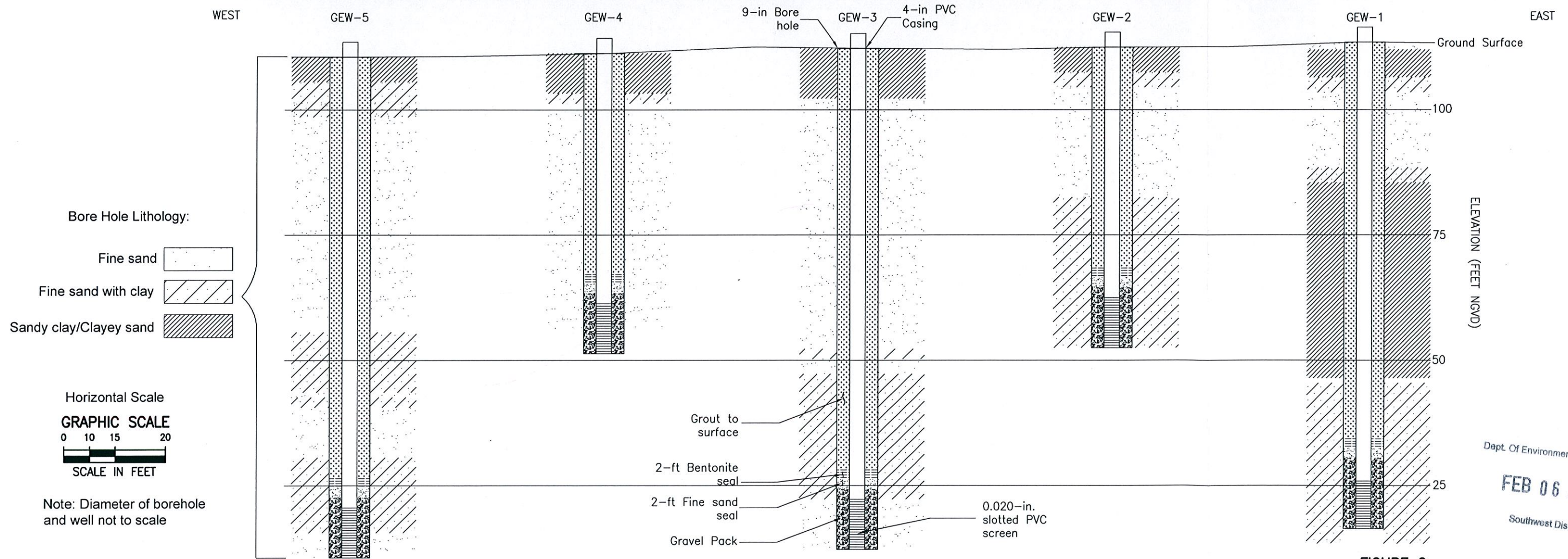


FIGURE 2  
GAS EXTRACTION WELL LOCATION  
AND CONSTRUCTION DETAILS  
CITRUS COUNTY CENTRAL LANDFILL

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