SCS ENGINEERS

Gas Collection and Control System (GCCS) Design Plan

Southeast County Landfill
Hillsborough County, Florida

Presented to:

Hillsborough County

Solid Waste Management Department

601 E. Kennedy Boulevard, 24th Floor
Tampa, Florida 33601

Presented by:

SCS ENGINEERS
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610
(813) 621-0080
Fax: (813) 623-6757

July 11, 2008
File No. 09207055.00

Environmental Consultants
and Contractors

4041 Park Oaks Boulevard
Suite 100
Tampa, FL 33610

813 621-0080
FAX 813 623-6757
www.scsengineers.com

SCS ENGINEERS

July 11, 2008
File No. 09207055.00

Mr. David Zell
Florida Department of Environmental Protection
Division of Air Resource Management - Southwest District
13051 N. Telecom Parkway
Temple Terrace, FL 33637-0926

Subject: Submittal of Gas Collection and Control System (GCCS) Design Plan
Southeast County Landfill, Hillsborough County, Florida
Facility ID No. 0570854

Dear David:

SCS Engineers (SCS) is submitting this landfill gas collection and control system (GCCS) design plan on behalf of the Hillsborough County Solid Waste Management Department.

As you know, per the requirements of 40 CFR Part 60, Subpart WWW, this report is to being submitted because the site-wide non-methane organic compound (NMOC) emissions for the site are above 50 megagrams (Mg) per year as reported in the Tier 2 Sampling report prepared by Jones Edmunds & Associates Inc. dated July 19, 2007.

This plan has been prepared by SCS in accordance with the requirements of the federal New Source Performance Standards (NSPS) for municipal solid waste landfills.

Please call us if you have any questions or need additional information.

Sincerely,

for

David H. Penoyer, P.E.
Project Manager
SCS ENGINEERS

Raymond J. Dever, P.E., BCEE
Vice President
SCS ENGINEERS

DHP/RJD:drc

cc: Patricia V. Berry, Hillsborough County

Enclosures

Gas Collection and Control System (GCCS) Design Plan
Southeast County Landfill
Hillsborough County, Florida

Prepared for:

Hillsborough County
Solid Waste Management Department
601 E. Kennedy Blvd. County Center 24th Floor
P.O. Box 1110
Tampa, Florida 33601

Prepared by:

SCS Engineers
4041 Park Oaks Blvd. Suite 100
Tampa, Florida 33610
(813) 621-0080
Fax: (813) 623-6757

Florida Board of Professional Engineers
Certificate No. 00004892

July 11, 2008
File No. 09207055.00

David H. Penoyer, P.E. 7/11/08
No. 56065

Table of Contents

Section **Page**

CONTENTS (Continued)

Section **Page**

CONTENTS (Continued)

TABLES

FIGURES

Appendices

CERTIFICATION

I certify that the landfill gas collection and control system as described in this Plan meets the design requirements specified in 40 CFR 60.759 and any alternatives pursuant to 40 CFR 60.752(b)(2). I further certify that this Plan was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Florida.

Project: Gas Collection and Control System Design Plan
Southeast County Landfill, Hillsborough County, Florida

7/11/08
Date

David H. Penoyer, P.E. No. 56065

1 INTRODUCTION

1.1 PURPOSE OF REPORT

This report was prepared by SCS Engineers (SCS) on behalf of the Hillsborough County Solid Waste Management Department (SWMD) to fulfill the requirements of the New Source Performance Standards (NSPS), 40 CFR Part 60, Subpart WWW, for a Gas Collection and Control System (GCCS) Design Plan for Southeast County Landfill (SCLF). The landfill is located in Hillsborough County and is owned and operated by the SWMD. The site is regulated under the NSPS and is required to address landfill gas (LFG) collection and control due to its design capacity exceeding 2.5 million megagrams (Mg) and a Tier 2 non-methane organic compounds (NMOC) annual emission rate which was calculated to exceed 50 Mg per year.

1.1.1 Site Background Information

Southeast County Landfill is permitted by the Florida Department of Environmental Protection (FDEP) as a Class I landfill consisting of the 162.4 acre Phase I-VI disposal area and the 147 acre capacity expansion area of which 34.4 acres is currently permitted. The capacity expansion area permitted currently includes Sections 7 and 8 with Section 9 currently under construction. Sections 10 through 12 will also be built and filled during the site buildout addressed in this Design Plan. Waste disposal at the site began in 1984.

Based on the Tier 2 Sampling and NMOC Emission Estimate report dated July 19, 2007 prepared by Jones Edmunds & Associates, Inc., the NMOC emissions exceeded the 50 Mg/yr NMOC threshold. Therefore, per 40 CFR 60.752(b)(2) the SWMD is required to submit a GCCS Design Plan by July 19, 2008 and a GCCS must be installed and operational by January 19, 2010, which is 30 months after the initial exceedance of the 50 Mg per year NMOC emission rate threshold.

1.1.2 GCCS Design Plan Submittal

The following Plan fulfills the requirements of a GCCS Design Plan as set forth in 40 CFR §60.752 and §60.759, as described herein (referred to hereafter as §60.752 and §60.759). The scope of this Plan is limited to description, documentation, and certification that the GCCS will meet the requirements set forth in §60.752 - *Standards for Air Emissions from Municipal Solid Waste Landfills* and §60.759 - *Specifications for Active Collection Systems*. This Plan was developed in accordance with the NSPS and the guidance set forth in the *Enabling Document for the New Source Performance Standards and Emission Guidelines for Municipal Solid Waste Landfills*.

As required by the NSPS, the Design Plan addresses those landfill areas where refuse in place is at least five years or older, and includes landfill areas that are expected to be filled during the useful life of the proposed GCCS equipment, which is expected to be at least 15 years. Note that LFG collection is also required for landfill areas that are closed or at final grade where the first refuse deposited is two years or older (§60.752(b)(2)(ii)(A)). As presently constructed, no landfill areas meet this later criterion.

This Design Plan is organized into five sections:

- Section 1 - Introduction
- Section 2 - Proposed Gas Collection and Control System
- Section 3 - Future Site Development
- Section 4 - Compliance Review and Evaluation
- Section 5 - Requested Alternative Monitoring/Record Keeping/Recording Procedures

Information presented in this Design Plan was compiled from SCS's review of landfill background information provided by the SWMD, review of available construction phasing, record drawings, design documentation and calculations for the GCCS design, and discussions with SWMD personnel.

1.2 COMPLIANCE SUMMARY TABLE

A summary of the compliance requirements and the project-specific conditions is presented in Table 1-1.

Table 1-1. Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.752(b)(2)	Submit a collection and control system design plan prepared by a professional engineer to the Administrator within 1 year of the calculated NMOC emission rate equaling or exceeding 50 Mg per year.	This GCCS Design Plan satisfies this requirement.	
§60.752(b)(2)(i)(A)	The collection and control system as described in this plan shall meet the design requirements of paragraph (b)(2)(ii) of this section.	As presented in this design report, the proposed GCCS meets the design requirements.	
§60.752(b)(2)(i)(B)	The collection and control system design plan shall include any alternatives to the operational standards, test methods, procedures, compliance measures, monitoring, record keeping, or reporting provisions of §60.753 through §60.758 as proposed by the owner or operator.	Hillsborough County SWMD requests alternatives that are specified in Section 5. Additional alternatives may be requested through supplemental submittals to FDEP or addenda to this Design Plan.	
§60.752(b)(2)(i)(C)	The collection and control system design plan shall either conform to specifications for active collection systems in §60.759, or include a demonstration to the Administrator's satisfaction of the sufficiency of alternative provisions under §60.759.	As presented in this design report, the proposed system meets the design requirements, as will be confirmed during surface emissions testing.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.752(b)(2)(i)(D)	The Administrator shall review the information submitted under this section and either approve it, disapprove it, or request that additional information be submitted. Because of the many site-specific factors involved with LFG system design, alternative systems may be necessary. A wide variety of system designs are possible such as vertical wells, combination horizontal and vertical collection systems, or horizontal trenches only, leachate collection components, and passive systems.	Information required for review is presented within this report. Future construction will comply with industry-standard methods.	
§60.752(b)(2)(ii)	Install a collection and control system within 18 months of the submittal of the design plan that effectively captures the gas generated within the landfill.	The GCCS will collect gas from all areas of the landfill that conform to the 2- or 5-year control-required criteria set forth in the NSPS and are not considered non-productive or otherwise exempt from collection. Future expansion of the GCCS will be performed in accordance with the scheduling requirements set forth in the NSPS or an approved alternative schedule.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.752(b)(2)(ii)(A)(1)	An active collection system shall be designed to handle the maximum expected flow rate from the entire area of the landfill that warrants control over the intended use period of the gas control or treatment system equipment.	The header system is designed to handle the maximum flow for the GCCS during the proposed life of the equipment, as estimated from landfill gas recovery modeling. Future GCCS expansion designs will confirm the appropriateness of the equipment already installed and additional capacity will be designed and constructed if deemed necessary to continue to maintain compliance with surface emissions requirements or conform with industry-standard design principles for GCCSs.	
§60.752(b)(2)(ii)(A)(2)	The GCCS shall collect gas from each area, cell, or group of cells in the landfill in which the initial solid waste has been placed for a period of 5 years or more if active, or 2 years or more if closed or at final grade.	Collection will occur in areas meeting the 2- or 5-year collection-required criteria unless an alternative schedule is approved. Future expansion of the GCCS will be performed in accordance with scheduling requirements set forth in the NSPS or an approved alternative schedule.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.752(b)(2)(ii)(A)(3)	The GCCS shall collect gas at a sufficient extraction rate.	Landfill gas will be collected at a sufficient rate as will be confirmed during surface emissions monitoring of inactive areas of the landfill. Rates of collection may be modified based on results of surface emissions monitoring.	
§60.752(b)(2)(ii)(A)(4)	The GCCS shall be designed to minimize off-site migration of subsurface gas.	The GCCS is designed to minimize off-site migration of subsurface gas by reducing gas pressures within the landfill.	
§60.752(b)(2)(iii)(A)	All collected gas shall be routed to an open flare designed and operated in accordance with §60.18.	Collected landfill gas may be conveyed to an open flare designed and operated in accordance with §60.18. Alternatively, LFG may be combusted in on-site equipment or piped off-site for utilization.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.752(b)(2)(iii)(B)	All collected gas shall be routed to a control system designed and operated to reduce NMOC by 98 percent weight, or when an enclosed combustion device is used for control, to either reduce NMOC by 98 percent weight or to reduce the outlet NMOC concentration to less than 20 parts per million by volume, dry basis as hexane, at 3 percent oxygen. The reduction efficiency or parts per million by volume shall be established by an initial performance test, required under §60.8, using the test methods specified in §60.754(d).	The SWMD does not plan to install an enclosed flare, and therefore this item is not applicable. However, if an enclosed flare is installed in the future, it will be designed to meet the 98 percent by weight reduction of NMOC or the 20 parts per million by volume emission rate.	
§60.752(b)(2)(iii)(C)	Route the collected gas to a treatment system that processes the collected gas for subsequent sale or use. All emissions from any atmospheric vents from the gas treatment system shall be subject to the requirements of (b)(2)(iii)(A) or (B) of this section.	The GCCS will initially include only a candlestick flare. However, if a gas treatment system for a LFG energy project is constructed in the future, emissions from atmospheric vents will comply with these requirements.	
§60.759(a)(1)	Collection devices within the interior and along the perimeter areas shall be certified to achieve comprehensive control of surface gas emissions by a professional engineer.	Collection devices included in the design will provide control of surface emissions as will be confirmed by future surface emissions monitoring. This GCCS Design Plan has been signed and sealed by a Professional Engineer licensed in Florida.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(a)(1)	The following issues shall be addressed in the design: depth of refuse, refuse gas generation rates, flow characteristics, cover properties, gas system expandability, leachate management, condensate management, accessibility, compatibility with filling operations, integration with closure end use, air intrusion control, corrosion resistance, fill settlement, and resistance to the refuse decomposition heat.	All applicable issues are addressed in the design and are discussed in this Design Plan.	
§60.759(a)(2)	Gas collection devices shall be installed in sufficient density to address landfill gas migration issues and augmentation of the collection system through use of active or passive systems at the landfill perimeter or exterior.	Gas collection devices will be installed at a sufficient density to facilitate control as will be confirmed by future LFG migration and surface emissions monitoring.	
§60.759(a)(3)	Placement of gas collection devices shall control all gas producing areas, except those from asbestos, non-degradable, and non-productive areas of the landfill.	Gas will be controlled in all regulatory-required gas-producing areas of the landfill. The SWMD is not proposing any non-productive areas at this time.	
§60.759(a)(3)(i)	Segregated areas of asbestos or non-degradable material may be excluded from collection if sufficiently documented.	There are currently no segregated areas of asbestos or non-degradable material at the SCLF that are being excluded from collection.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(a)(3)(ii)	Any non-productive areas of the landfill may be excluded from control, provided excluded areas can be shown to contribute less than 1 percent of the total amount of NMOC emissions from the landfill.	This item is currently not applicable to this site.	
§60.759(b)(1)	LFG extraction components shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other non-porous corrosion-resistant material.	The GCCS will be constructed of non-porous, corrosive resistant materials, mostly PVC and HDPE, as described in Sections 2 and 4.4, and the response to §60.759(b)(3) in this table.	
§60.759(b)(1)	Dimensions of gas extraction components shall be sufficient to convey projected amounts of gas; withstand installation, static, and settlement forces; and withstand planned overburden or traffic loads.	The GCCS design is sufficiently sized to convey the projected amount of gas for the system. Future modifications to the GCCS design will be made as required to accommodate collection of gas from future waste disposal operations. The designed system components are consistent with the “state-of-the-practice” for modern GCCS designs and can withstand the installation and operational stresses placed on the components.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(b)(1)	The collection system shall extend as necessary to comply with the emission and migration standards.	The GCCS will be expanded as necessary to conform to emission standards set forth in the NSPS. Future expansion of the GCCS will be performed in accordance with scheduling requirements set forth in the NSPS or an approved alternative schedule.	
§60.759(b)(1)	Collection devices such as wells and horizontal collectors shall be perforated to allow gas entry without head loss sufficient to impair performance across the intended extent of control.	Collection pipes in extraction wells and collectors will be perforated so as not to increase head loss, in accordance with current "state-of-the-practice" methods.	
§60.759(b)(1)	Perforations shall be situated with regard to the need to prevent excessive air infiltration.	The effective depth of perforations typically will be at least 15 to 20 feet below existing grade, which will be sufficient to control excessive air infiltration.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(b)(2)	Vertical wells shall be placed so as not to endanger underlying liners and shall address the occurrence of water within the landfill.	Survey data for the top of the leachate collection and removal sand layer were used to design the well depths in Phases I through VI. Vertical wells in this landfill area will terminate at the top of the sand layer and not impact the underlying clay slimes. In Sections 7 though 12, and any future geomembrane-lined landfill areas, vertical extraction wells will be installed with the bottom of the borehole at least 10 feet above the bottom of refuse for vertical extraction wells. Drilling logs for the vertical extraction wells will document the occurrence of water in the landfill.	
§60.759(b)(2)	Holes and trenches constructed for piped wells and horizontal collectors shall be of sufficient cross-sectional area so as to allow for their proper construction and completion including the centering of pipes and placement of gravel backfill.	Wells will be installed in 30- or 36-inch diameter boreholes, which are sufficient for proper installation of well casings and backfill materials. All holes and trenches for piped wells and horizontal collectors will be of sufficient cross-sectional area so as to allow for their proper construction and completion including the centering of pipes and placement of gravel backfill.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(b)(2)	Collection devices shall be designed so as not to allow indirect short-circuiting of air into the cover or refuse into the collection system or gas into the air.	Wells will be designed to prohibit short-circuiting of air into cover or refuse.	
§60.759(b)(2)	Any gravel used around pipe perforations shall be of sufficient dimension so as not to penetrate or block perforations.	Stone or tire chips used for backfill of extraction wells and horizontal collectors will be of sufficient size to not penetrate or block perforations. Backfill for future LFG collection features will be sized in a similar manner.	
§60.759(b)(3)	Collection devices may be connected to the collection header pipes below or above the landfill surface.	Both above and below grade header and laterals may potentially be used for the GCCS. The proposed initial construction includes only below grade header and lateral piping.	
§60.759(b)(3)	The connector assembly shall include a positive closing throttle valve, any necessary seals and couplings, access couplings, and at least one sampling port.	Wells incorporate a control valve, sampling ports, and a means to access the well via an access port or removable cap. Future wells will have similar features.	

Table 1-1. (Continued) Regulatory Compliance Checklist
Southeast County Landfill, Hillsborough County, Florida

Regulatory Reference	Regulatory Requirement	Description of Site-Specific Conditions	Regulatory Review
§60.759(b)(3)	Collection devices shall be constructed of PVC, HDPE, fiberglass, stainless steel, or other non-porous material of suitable thickness.	The system will be constructed of "state-of-the-practice" materials with proven performance in landfills across the United States. Wells will be constructed of PVC or HDPE pipe, laterals and collection headers will be constructed of HDPE, and the valves will be constructed of PVC or other appropriate materials.	
§60.759(c)	The gas mover equipment shall be sized to handle the maximum gas generation flow rate expected over the intended use period of the gas moving equipment.	The gas mover system is designed to handle the maximum expected LFG flow rate from the existing landfill cells. Modifications to the system may be required to accommodate collection of gas from any future landfill expansions.	
§60.759(c)(1)	For existing gas collection systems, existing flow data shall be used to project the maximum flow rate. If no flow data exists, procedures delineated in the item below shall be used.	There is no existing GCCS at this site.	
§60.759(c)(2)	For new collection systems, the maximum flow rate shall be in accordance with the methods specified in §60.755(a)(1).	The maximum flow for evaluating the design was derived from LFG recovery modeling using U.S. EPA default values. A similar approach will be used for future system expansions.	

2 PROPOSED GAS COLLECTION AND CONTROL SYSTEM

2.1 GENERAL

This section presents a description of the proposed GCCS design and planned future expansions. The proposed GCCS design incorporates vertical extraction wells, horizontal collectors, and tie-ins to the leachate collection and removal system (LCRS) for LFG collection. Future GCCS expansions will likely use a similar approach; decisions regarding the appropriateness of each type of collection device will be addressed during future designs. The proposed GCCS design will be constructed so that future expansion of the system can be accommodated. This includes sizing the header to be compatible with the future flow rates expected during the life of the system components and the installation of blind flanges along portions of the header to allow for future tie-ins. Future headers will likely also be constructed in this manner.

Landfill gas collected from the landfill will be routed to a blower/flare station where the LFG will be combusted in a candlestick flare. The candlestick flare will be designed to provide the LFG destruction efficiency required by §60.752(b)(2)(iii) of the NSPS. If alternate control devices are used in the future, they will be designed to comply with the applicable requirements of the NSPS. Drawings depicting the proposed initial system as well as a final build out design can be found in Appendix A.

2.2 LANDFILL GAS EXTRACTION

Landfill gas extraction will be provided by a combination of vertical extraction wells, horizontal collectors, and tie-ins to the LCRS. While Hillsborough County intends to install vertical extraction wells to the maximum extent practical, particularly on sideslopes or in areas at or near final grade, horizontal collectors may be employed when installation of vertical wells is not appropriate due to site geometry or sequence of filling. In areas where horizontal collectors are installed, additional vertical wells may be required at final buildout depending on the performance of the collectors. Horizontal collectors will be designed to provide comprehensive coverage over the landfill.

2.2.1 Vertical Extraction Wells

The design of vertical extraction wells at the site will vary depending on the landfill area in which the wells will be installed. In Phases I though VI, vertical wells will be drilled to depths equal to the top of the sand drainage layer in order to promote drainage of liquids that may be present within the waste mass. In landfill areas with geomembrane liners, such as Sections 7 through 12, vertical wells will typically terminate at least 10 feet above the bottom of refuse. Vertical wells typically have an effective radius of influence that ranges from approximately 2.0 to 2.25 times the well depth. Consequently, the well spacing at SCLF varies generally from 100 to 200 feet, depending on the estimated radii of influence of the wells.

Vertical wells will be constructed of either HDPE or PVC pipe installed in 30-inch or 36-inch diameter boreholes, unless an engineering judgment is made that an alternate sized borehole is

more appropriate. Typically, approximately the lower two-thirds of the well pipe will be perforated. However, perforations (or, in the case of "caisson" wells, the effective depth of perforations) will not be closer than 15 feet from the landfill surface unless the wells are being installed in an active area and additional refuse will be filled around the wells within a reasonable period of time. Perforations typically will be either 1/2-inch diameter holes spaced at 16 holes per foot, or 3/8-inch wide by 8-inch long slots spaced at approximately four slots per foot. However, alternative slot or perforation designs which provide comparable performance may be considered.

Note that the drawings included with this design plan are conceptual in nature. The exact locations of new wells will be determined during future design phases and may be subject to relocation due to site conditions or filling operations. The appropriateness of GCCS designs and expansions will be demonstrated through compliance with the surface emissions monitoring requirements of the NSPS.

2.2.2 Horizontal Collectors

The initial GCCS design incorporates horizontal collectors for the interior areas of the landfill in order to accommodate ongoing filling activities and keep LFG extraction components such as wellheads away from the active area.

Horizontal collectors typically have a horizontal zone of influence of approximately 75 feet, which results in a lateral spacing of approximately 150 feet between collectors. Horizontal collector lengths will vary depending on site conditions at the time of system expansion, but generally will be less than 1,000 feet long.

Horizontal collectors will be constructed to include the following features:

- Collector pipe will normally be 6- or 8-inch diameter solid or corrugated HDPE pipe with a smooth interior wall with sufficient strength to resist crushing force due to the overburden of the landfill.

- The perforated collector pipe will be installed in a trench filled with appropriate aggregate material such as chipped tires or rock. The permeable backfill material will be sized so as to not pose significant risk of clogging the pipe perforations.

- Perforated pipe will cease at least 100 feet inward from the end of the collector. The remaining length of collector will be solid-wall pipe. This will reduce the potential for air infiltration into the collectors.

- Perforations in the pipe will be sufficiently large to not cause excessive head loss detrimental to LFG collection. Typical perforations will be 1/2 inch diameter.

2.2.3 LCRS Tie-ins for LFG Collection

To provide supplemental LFG collection, the SWMD may install tie-ins to existing and future LCRS riser pipes. These collectors are intended to provide supplemental collection and therefore

are not considered NSPS compliance points for the purpose of GCCS monitoring and reporting, as described in Section 5 of this Design Plan.

2.2.4 Wellheads

Each extraction well and horizontal collector will include a wellhead constructed of appropriate materials, such as SCH 80 PVC. Wellheads will include a valve for flow control and monitoring ports for measuring gas quality, temperature, and flow rate.

2.3 HEADER AND LATERAL COLLECTION PIPING

The header and lateral collection piping will be constructed of fusion-welded HDPE pipe. Header and lateral piping may be installed either below or above grade. In locations where above grade header and laterals are used, the piping will be appropriately anchored, if necessary.

The header system will be sized to handle the maximum projected future flow rates over the useable life of the system. The header will consist of 16-inch diameter pipe with 4, 6 and 10-inch diameter laterals. Future laterals typically will be 4 or 6-inch diameter, with header sizes determined based on the expected flow patterns of the gas and the projected LFG flow rate. Criteria considered in sizing header piping include:

- Unit Header Loss - Head losses in any given section of piping are standardized to 100-foot sections with a maximum allowable head loss of 1 inch of water column (in-w.c.).
- Gas Velocity - In general, design gas velocities will not exceed 2,400 feet per minute (fpm).
- Multiple Flow Path Options - The proposed final system build-out will allow gas to flow in multiple directions. Header sizing calculations were prepared assuming a worst-case condition for flow in one direction that could be caused by closed valves to isolate a section for repair or obstructions in the header.
- Future Expansion – In future designs, header piping will include blind flanges for system expansion into future landfill phases or will be buried to a depth shallow enough to allow for tie-ins using electrofusion couplings. The tie-ins for future new laterals to the existing laterals or header will be accomplished by connecting to existing vertical risers.

2.4 HEADER ISOLATION VALVES

In order to allow for isolation of certain sections of header in case of the need to perform repairs without shutting down the entire system, or for troubleshooting purposes, header isolation valves will be installed throughout the system. These valves will be constructed of corrosion resistant materials such as PVC, and all metal parts potentially exposed to LFG will be coated with enamel or similar coatings to increase corrosion resistance. Both the seals and valve bodies will

be appropriate for the specified application. Additional header isolation valves may be installed as the LFG collection system is expanded.

2.5 CONDENSATE PRODUCTION AND MANAGEMENT

Condensate is formed as LFG that is extracted from the landfill cools in the header piping. The rate at which it is generated is dependent on the LFG flow rates and the temperature differential between the warmer gas and the cooler surrounding soil or air. For the GCCS at SCLF, condensate generation rates were estimated based on a gas temperature of 100 degrees Fahrenheit (^{o}F) and an ambient air temperature of 50 ^{o}F.

Based on estimated future maximum flow rates of 4,000 scfm in the year 2034, assuming a 90-percent collection efficiency, the maximum estimated daily condensate generation rate based on a 50 ^{o}F temperature differential is 1,692 gallons per day (gpd).

This value represents the anticipated maximum daily amount of condensate that would be generated during cool days in winter months when temperature differentials between collected LFG and ambient air are greatest. This is not expected to be the typical daily condensate generation rate. The GCCS design includes six self-draining condensate traps and three u-traps connected to the LCRS within the footprint of waste, as well as one condensate sump outside of waste to collect condensate generated in the GCCS.

As shown on the drawings included in Appendix A, additional condensate traps and/or sumps will be required for final buildout.

2.6 BLIND FLANGES FOR FUTURE EXPANSION

To accommodate future system expansion, blind flanges will be installed at various locations along the header system and will also be included in future header system construction plans. These blind flanges may be buried to prevent potential damage from landfill operations. Buried flanges and bolts will be coated with corrosion-resistant coatings.

2.7 BLOWER/FLARE STATION

The proposed blower/flare station is described in the following sections.

2.7.1 Blower Station

The proposed specifications for the blower station are as follows:

- Two to three 60-horsepower blowers will be installed, each capable of handling up to 2,000 scfm of LFG at a discharge pressure of 10 inches of water column (in.-w.c).
- The vacuum exerted on the header system will be approximately 60 in-w.c.

- A moisture separator/filter to maximize condensate removal upstream of the blower to minimize corrosion will be installed.

- An actuator valve to shut off flow of LFG to the blowers during shut-down will be included.

The blower/flare station is design to accommodate a maximum flow of 4,000 scfm, which is not anticipated to occur until 2034. This will most likely be beyond the life of the blower/flare station.

2.7.2 Flare

The candlestick flare will be designed to provide a minimum non-methane organic compound (NMOC) destruction efficiency of 98 percent. The candlestick flare will be designed and operated in accordance with §60.18 and will have a flow capacity of 4,000 scfm.

2.7.3 Blower/Flare Controls

The controls at the blower/flare station will likely include the following:

- Programmable logic controller (PLC).

- Landfill gas flow meter.

- Blower and flare controls interface for automatic motor starting following pilot ignition.

- Alarm indicators for high temperature, low temperature, flame failure, pilot failure, inlet valve failure, and blower failure.

- Chart recorder for flare temperature and flow rate.

3 FUTURE SITE DEVELOPMENT

3.1 LANDFILL DEVELOPMENT PLAN

Complete fill sequence plans are maintained on site and are on file with FDEP. In general, waste disposal will continue to alternate between Phases I through VI and the capacity expansion area during the time envisioned by this GCCS Design Plan. Over time, as the landfill grows and site conditions dictate, various features of the GCCS may be relocated or replaced in order to accommodate landfill operations.

Typically, it is assumed that the more durable GCCS components such as header, laterals, wells, sumps, and blower/flare station will have a maximum life of approximately 15-20 years. After that length of time it often becomes necessary to perform significant maintenance or to replace some of these components. It is intended that future GCCS designs will incorporate similar engineering judgment and methods as explained in this report. The specific layout of the phased installation of system components will be addressed during the design of those future LFG system expansions.

3.2 GAS SYSTEM EXPANSION CAPABILITIES

While the specific layout of future LFG system components that may be necessary in future permitted landfill areas are not decided at this point, the GCCS design will accommodate expansion of the system into future landfill areas. These considerations include appropriate header and condensate trap/sump sizing, additional blower and flare capacity, and tie-in locations for connection to the expansion areas. Header and condensate traps/sumps are sized based on the projected LFG recovery rates from the current landfill areas based on historical and projected future waste disposal rates.

4 COMPLIANCE REVIEW AND EVALUATION

The purpose of this Section is to describe and document information required to certify compliance of the GCCS with the applicable sections of 40 CFR 60.759 - *Specifications for Active Collection Systems*, including:

- §60.759(a) - Compliance with §60.752(b)(2)(i).
- §60.759(b) - Construction procedures.
- §60.759(c) - Conveyance of LFG in compliance with §60.759(b)(2)(iii).

Additionally, portions of §60.755 - *Compliance Provisions* relevant to GCCS specifications are addressed, including:

- §60.755(a)(1) - Calculations for maximum expected gas generation flow rate.
- §60.755(a)(2) - Sufficient density of gas collectors.
- §60.755(a)(3) - Collection system flow rate sufficiency.
- §60.755(a)(5) - Identification of excess air infiltration.

4.1 COMPLIANCE WITH §60.759(a)(1)

The following report sections address compliance with the applicable requirements of §60.759(a)(1).

4.1.1 Control of Surface Emissions

The proposed GCCS for SCLF is designed to minimize surface emissions. An example of a potential surface emissions monitoring route for the current and proposed interim landfill buildout are shown in Figures 4-1, 4-2, and 4-3. These maps are intended to show that surface emissions monitoring will be conducted in accordance with §60.755(c). Actual surface emissions monitoring routes will vary depending on site conditions.

4.1.2 Depths of Refuse

The bottom of refuse varies by landfill area, but is generally at approximate elevation 110-120 feet NGVD in Phases I through VI and elevation 125-135 feet NGVD in Sections 7 through 12. Phases I through VI currently have a maximum elevation of 200 feet and an average depth of refuse of 80 feet. Maximum elevation at final build out of Phases I through VI will be 255 feet and Sections 7 through 12 will be 300 feet.

4.1.3 Refuse Gas Generation Rates and Flow Characteristics

Landfill gas modeling was performed to estimate the future LFG recovery rate for the landfill. Modeling was performed using the U.S. EPA Landfill Gas Emission Model (LandGEM). Waste disposal rates used in the model were taken from the Tier 2 report dated July 19, 2007 by Jones Edmunds and from information provided by the SWMD. A copy of the model output (which includes the assumptions used in the model) is provided in Appendix B.

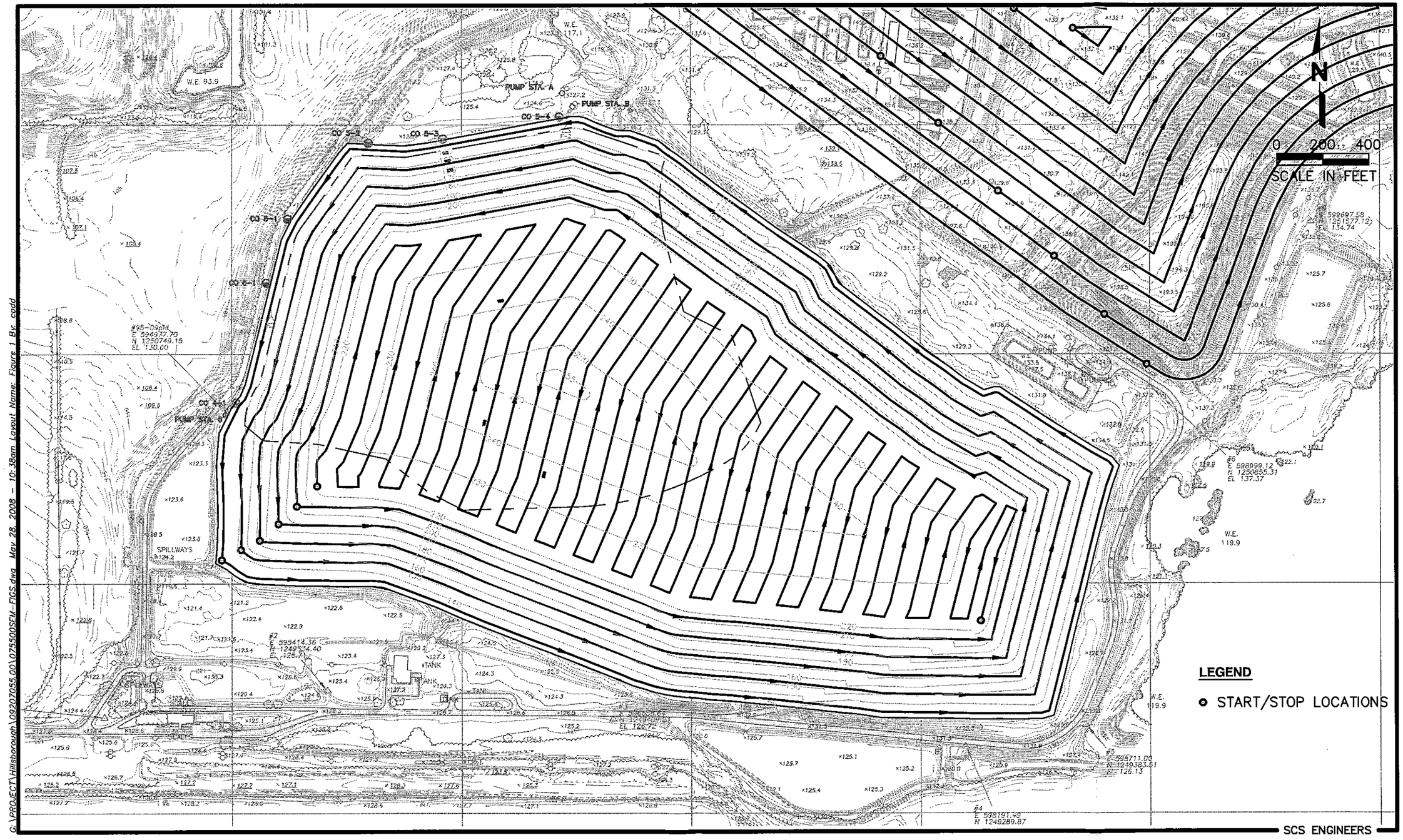


Figure 4–1. Proposed Surface Emissions Monitoring Route (Phases I–VI)

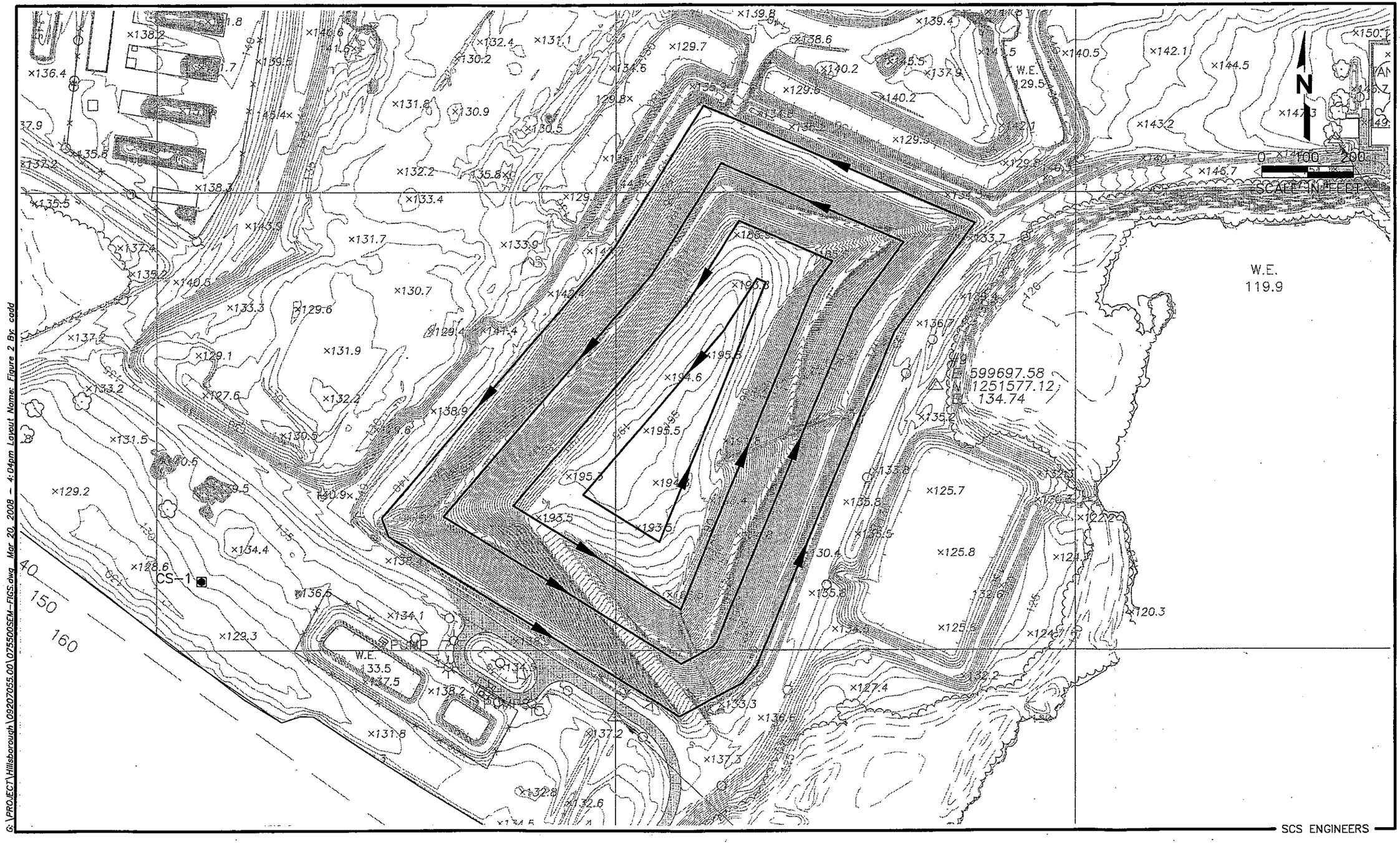


Figure 4-2. Proposed Surface Emissions Monitoring Route (Sections 7 & 8)

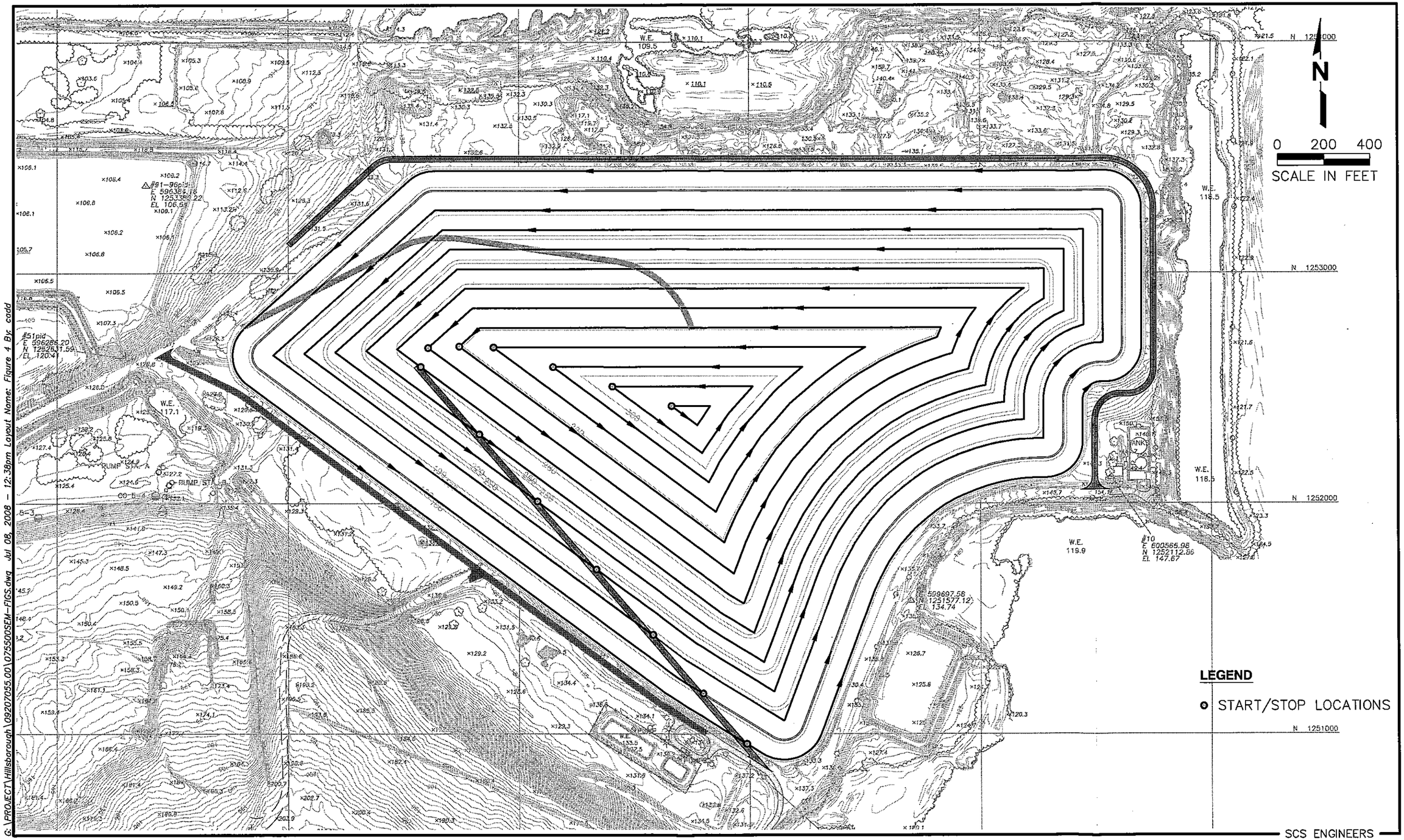


Figure 4–3. Proposed Surface Emissions Monitoring Route (Total Buildout)

4.1.4 Landfill Cover Properties

The final cover system will be designed in accordance with FDEP closure permits and the applicable Rules. Areas at interim grade are covered with 12 inches of cover soil, plus daily cover. These cap conditions are factored into the design of the LFG collectors and wells in order to minimize the potential for pulling ambient air into the landfill.

4.1.5 Gas System Expandability

The GCCS design has sufficient capacity to accommodate collection of up to 4,000 scfm of LFG at optimum vacuum conditions based on the flow capacity of the proposed header, blower station and control devices.

In the future when preparing to expand the GCCS, the SWMD may install separate headers to convey the collected gas from the landfill areas to the blower station. In designing these system expansions, the SWMD will evaluate whether additional modifications beyond those shown in this plan are necessary to maintain adequate flow and collection efficiency. Modifications may include changes to the proposed header size for future areas, locations of vertical wells and horizontal collectors, blower capacity, or condensate management options and will be presented in future NSPS Semiannual Compliance Reports for the site.

4.1.6 Leachate and Condensate Management

Leachate is collected by a series of pipes and sumps that overlay the bottom liner system. Leachate collected in the sumps is pumped to on-site leachate storage tanks. Condensate collected within header piping will either be drained or pumped into the leachate collection system.

4.1.7 Accessibility

Site access is provided by paved and unpaved access roads. Future access will be provided by access roads as needed.

4.1.8 Compatibility with Filling

The proposed GCCS design includes a combination of vertical extraction wells, horizontal collectors, and LCRS tie-ins. In order to provide collection system coverage to all parts of the landfill in the future, vertical wells may be installed in areas that will receive additional waste, thus requiring them to be raised.

For GCCS components installed in areas not filled to final grade, the SWMD will protect exposed wellheads and piping during subsequent filling activities. Concrete bollards may be installed around sumps, etc. to provide protection from traffic or other damage.

4.1.9 Integration with Closure End Use

Waste disposal activities are on-going at the site. At landfill closure the closure plan will address any integration of the GCCS with the intended end use, which has not yet been determined.

4.1.10 Air Intrusion Control

Air intrusion control for the GCCS will be provided by the engineered final cover system installed over areas filled to final grade. Air intrusion control also will be provided by the extraction well design, in as much as the slotted pipe in vertical wells is set no closer than 15 feet of ground surface. The SWMD will conduct wellfield tuning to reduce the oxygen content of the LFG to a level at or below the regulatory limits of 5 percent oxygen. Air intrusion control in future years will be accomplished by the final cover system after completion of filling in the individual areas and by proper tuning of the wellfield during operation of the GCCS.

The SWMD likely will use an instrument such as the Landtec GEM-2000 gas meter, or equal, to meet the equipment requirements set forth in §60.753(c)(2) for field measurement of oxygen. The GEM-2000 is suitable for use for the Method 3A testing prescribed for measuring wellfield performance. In the event the GEM-2000 or an equivalent meter does not conform precisely to the Rule, the SWMD requests a variance to the Rule to allow the use of the GEM-2000 or equal for measurement of wellfield performance. This is consistent with past positions taken by U.S. EPA.

4.1.11 Corrosion Resistance

In general, the system components described in Section 2 of this report represent "state-of-the-practice" materials, and have proven to be resistant to corrosion with proper installation, operation, and maintenance in GCCS applications across the United States.

4.1.12 Fill Settlement

Settlement or subsidence of waste fill due to decomposition can affect a GCCS in numerous ways, including:

- Damage or destruction of below grade header and lateral piping systems.
- Blockage of header and lateral piping systems as a result of condensate collecting in the piping (at locations where settlement has caused an unintended low point in the pipe), thereby blocking the flow of gas.
- Damage, displacement, or destruction of well casings, seals, and filter materials as a result of settlement in the landfill mass adjacent to the well.

Components or features that are incorporated into the GCCS design or may be used in future designs to address potential effects of settlement include:

- Installation of below grade laterals and headers installed within the waste mass will have a minimum 3 percent slope, thereby providing allowance for some settlement without damage or blockage of the piping systems.

- Installation of header access risers, which allow landfill personnel to identify the location of the below grade header in order to aid troubleshooting and repairs as settlement occurs.

- Use of fusion-welded HDPE piping for the headers and laterals. Fusion-welded HDPE pipe is less susceptible than PVC pipes to damage or collapse due to settlement of the waste. HDPE also is less susceptible to damage resulting from loss of plasticizers over time (i.e., aging), which can cause PVC pipe to become brittle.

- Placement of the well casings in 30 or 36-inch diameter boreholes, which provide additional separation between the waste and the well casings, thereby reducing the potential for differential stresses being placed on the casings.

4.1.13 Resistance to Decomposition Heat

The components incorporated into the GCCS design have a track record of good performance when subjected to the heat of decomposition under normal operating conditions. Typically, the components used in modern GCCSs are resistive to temperatures up to 150 ^{o}F. The GCCS components most susceptible to heat damage are the well casings and any lateral or header piping systems installed within the waste mass. HDPE and PVC pipe have proven successful for numerous GCCS applications across the United States.

4.2 COMPLIANCE WITH §60.759(a)(2) - DENSITY OF GAS COLLECTION DEVICES

As described in Section 2, the wells and collectors were designed and laid out to provide comprehensive coverage with appropriate zones of influence. The GCCS is intended to provide sufficient collection coverage to meet the NSPS surface emissions monitoring requirements. The adequacy of the well density will be confirmed during future surface emissions monitoring, including identifying areas that may require additional control measures based on monitoring results.

4.3 COMPLIANCE WITH §60.759(a)(3) - COLLECTION DEVICES PLACEMENT

Collection devices will be installed in all areas of the landfill where waste has been in place for five years or more in active areas, or two years or longer if the landfill is closed or at final grade with the exception of certain exempt areas. The SWMD is not proposing to exempt any areas from LFG control due to the presence of non-degradable wastes.

4.4 COMPLIANCE WITH §60.759(b)(1), (2), AND (3) - CONSTRUCTION OF SYSTEM COMPONENTS

As described in previous sections of this report, the GCCS components will be constructed of materials suitable for LFG applications.

4.5 COMPLIANCE WITH §60.759(c)(1) AND (2) - LANDFILL GAS CONVEYANCE

As described in Sections 4.1.3 and 4.1.5 above, the existing GCCS blower/flare station will be designed to handle approximately 4,000 scfm of LFG which is the approximate LFG recovery rate projected for 2034. Because the expected life of the blower/flare station equipment will be approximately 15-20 years, the proposed equipment will be adequate for the projected LFG flow rates. Future equipment will also be designed to handle projected future LFG flow rates through their expected life.

The proposed GCCS components are consistent with current "state of the practice" designs. If future design modifications are required to accommodate collection of LFG generated by future waste disposal and subsequent expansions of the GCCS coverage area, proposed modifications will be documented in the NSPS semiannual reports.

4.6 PLAN FOR SURFACE EMISSIONS MONITORING

Figures showing potential surface emissions monitoring routes are presented in Figures 4-1, 4-2, and 4-3. Surface emissions monitoring will be performed in accordance with the requirements set forth in the NSPS. Future surface emissions monitoring associated with expansion of the GCCS to future landfill phases will be scheduled to coincide with installation and startup of the GCCS per the NSPS startup dates for the respective phases, in accordance with the NSPS requirements.

4.7 RECORD KEEPING

No variances to the record keeping requirements set forth in §60.757(f) and (g) are proposed in this Design Plan. Record keeping shall be performed as set forth in the regulations.

5 REQUESTED ALTERNATIVE MONITORING/RECORD KEEPING/RECORDING PROCEDURES

Per 40 CFR 60.752(b)(2)(i)(B), the design plan shall include proposed alternatives to the prescriptive monitoring, record keeping, and reporting requirements outlined in the NSPS. This section addresses exemptions/alternatives proposed in this submittal. The SWMD requests alternatives for complying with the operations standards as described below.

5.1 OXYGEN MONITORING

The NSPS states that "oxygen shall be determined by an oxygen meter using Method 3A." The SWMD proposes to utilize a Landtec GEM-2000 gas meter, or equal, to provide field measurements of oxygen. These meters meet the equipment requirements set forth in §60.753(c)(2), and previously have been approved by U.S. EPA for oxygen monitoring in compliance with the NSPS.

5.2 SURFACE EMISSIONS MONITORING

As allowed by §60.753(d), the SWMD will avoid the following potentially dangerous areas when conducting surface emissions monitoring.

- Roads;
- Active areas or working face;
- Truck traffic areas;
- Slopes steeper than 3:1;
- Sideslopes lined with exposed geomembrane;
- Areas where the landfill cover material has been exposed for the express purpose of installing, expanding, replacing, or repairing components of the LFG, leachate, or gas condensate collection and removal systems.

5.3 WELLHEAD MONITORING AND OPERATION

The NSPS requires that at each wellhead, oxygen concentration must be less than five percent (§60.753(c)), and each well must be under vacuum (§60.753(b)). The only time that a well is allowed to not have vacuum is in the case of a landfill fire or increased well temperature, use of a geomembrane or synthetic cap, or for a decommissioned well.

SCS and the SWMD recognize at least one scenario when these two criteria may be incompatible with each other. In the case where a well is inadvertently "overpulled", either as a result of aggressive LFG system operation or declining LFG production in a portion of the landfill, oxygen may be present in concentrations greater than five percent. This condition occurs when

LFG is extracted at a rate that is faster than it is being generated by the decomposing refuse. To remediate this situation, the most immediate course of action is to decrease the vacuum that is applied to the well or to shut off the well.

If wellhead valve adjustments are not effective in decreasing the oxygen concentration, even at vacuum readings on the order of 0.1 in-w.c., it may be necessary to temporarily shut the wellhead valve until the well is able to "recharge" and allow the methane concentration to increase and oxygen to decrease. Otherwise, to continue to exert vacuum on the well, even at low levels, could contribute to conditions conducive for a landfill fire.

If temporarily closing a wellhead valve is necessary to remediate overpulling of a well, the SWMD will continue to monitor the well on a monthly basis for oxygen concentration and pressure. However, non-negative vacuum readings or oxygen concentrations greater than or equal to five percent by volume recorded during this period will not be considered an exceedance of the NSPS wellhead operating criteria.

During this temporary period, the well will be maintained such that positive pressure does not occur. If positive pressure occurs, the wellhead valve will be opened to relieve the pressure. If the oxygen concentration has decreased to less than five percent by volume, the well will remain online. However, if the oxygen concentration remains above five percent, the wellhead valve will be shut off again after the pressure is relieved. Once oxygen concentration returns to less than five percent, the wellhead valve will be opened and the well returned to service.

U.S. EPA approved similar flexibility in wellhead operations for the Orange County Solid Waste Management Facility in Orlando, Florida. A copy of that approval letter and request is included in Appendix C.

5.4 WELLFIELD EXPANSION

The drawings included with this Design Plan show the initial GCCS design and the conceptual design of the future GCCS at buildout through Section 12, based on current waste filling plans. As filling progresses, the locations and number of various GCCS components may vary from that which is shown on the attached drawings. While the configuration of the future GCCS will almost certainly vary from the enclosed drawings, subsequent GCCS designs will result in similar overall wellfield coverage, which will be demonstrated through surface emissions monitoring. Record drawings for future GCCS expansions will be maintained on site to document the as-built conditions, and surface emissions monitoring will demonstrate the adequacy of the GCCS wellfield to control LFG emissions. In addition, the SWMD will submit updated site plans showing the location of new LFG collectors in semiannual NSPS reports.

5.5 SYSTEM EXPANSION EXEMPTION WITHIN 180 DAYS OF STARTUP OF NEW WELLS OR COLLECTORS

Landfill gas collection systems are typically constructed in phases in order to accommodate additional waste placement as well as repair or replacement of existing GCCS components. When installing new vertical extraction wells, horizontal collectors, or other collection

components, it can take time to rebalance the system and achieve steady operating conditions. During this well tuning period, it may not be possible to achieve negative pressure in all of the wells or to meet the requirements for temperature and oxygen concentration in the new wells/collectors.

Per 40 CFR 60.755(a)(4), the landfill owner is not required to expand the system during the first 180 days after gas collection system startup. The SWMD requests that this exemption also be applied to the startup of new extraction wells, horizontal collectors, and other LFG collection points. During this 180-day period after new wells and collectors are installed, an exceedance of the pressure, temperature, or oxygen concentration that cannot be remediated within 15 days will not trigger the requirement to further expand the system.

5.6 ALTERNATIVE SURFACE EMISSIONS REMEDIAL ACTIONS

Section 60.755(c)(4)(v) of the NSPS requires that for any location where monitored methane concentrations exceed 500 parts per million by volume (ppmv) above background three times in a quarter, a new well or collector shall be installed within 120 days of the initial exceedance. An alternative to installing additional wells or collectors, such as upgrading the blower, header pipes, or control device must be approved by the Administrator for approval.

While alternatives are permitted if approved by the Administrator, the SWMD recognizes that requesting and receiving approval within 120 days may not always be possible, depending on the review schedule of FDEP or U.S. EPA. Therefore, in order to streamline implementation of alternative remedial actions that may be appropriate for correcting surface emissions monitoring exceedances and minimizing fugitive LFG emissions, the SWMD proposes that the following remedial actions be accepted as alternatives to installing additional wells:

- Installation of shallow subsurface LFG collectors immediately adjacent to the well or collectors closest to the surface emissions exceedance. The shallow collectors would be installed with valves and monitoring ports to control LFG extraction and provide monitoring data, similar to a standard LFG extraction wellhead. Each shallow collector will be assigned a unique identification number and be included in future monthly monitoring events. Record documentation for the installation and location of the collectors will be included in future semiannual NSPS reports. If future monitoring shows that the shallow collectors are no longer needed, they will be abandoned in place by shutting off the valve or capping the collector.

- Installation of leachate dewatering pumps in wells at which a significant portion of the slotted well pipe is submerged in liquid. Dewatering of wells often increases LFG extraction rates, which can both improve the quality of the LFG extracted from a particular well and reduce the likelihood of surface emissions.

- Upgrades to the blower system. This may include installing larger or additional blowers, making improvements to the blower station piping system, including valves, etc., or upgrading the condensate knockout system at the blower station. A

description of the constructed improvements will be included in the semiannual NSPS report following the remediation.

- Troubleshooting and upgrades or repairs to header and lateral pipes, condensate sumps, or header isolation valves, which may be the cause of decreased vacuum or gas collection capacity in the vicinity of the exceedance. A description of the improvements will be included in the semiannual NSPS report following the remediation.

5.7 EXCLUSION OF ACTIVE AREAS FROM WELLHEAD MONITORING

As stated in Section 5.2, surface emissions monitoring will be conducted so as to avoid dangerous areas such as roads, active landfill areas, etc., as allowed by §60.753(d) of the NSPS. The SWMD feels that a similar alternative is occasionally appropriate for monthly monitoring of the wells that are located within the limits of, or immediately adjacent to, the landfill's active face. Safety concerns include field personnel attempting to monitor wells in the midst of the operation of heavy equipment and waste disposal vehicles, and the need for personnel to tune wellheads that are a significant height above ground surface.

In order to provide for the safety of field personnel, the SWMD recognizes that in some instances it may be excessively dangerous to monitor certain LFG extraction wells or collectors within or near the active face of the landfill. The SWMD proposes that if unsafe conditions exist due to waste filling activities, monthly monitoring of the affected wells pursuant to §60.756(a) may not be possible. Two examples of potential situations in which monthly monitoring may be omitted for affected wells are described below.

5.7.1 LFG Wells and Collectors at the Active Face

Personnel in the vicinity of the active face of the landfill encounter numerous hazards that render wellhead monitoring dangerous. This includes traffic from waste hauling vehicles and heavy equipment (i.e., from dozers, compactors, and off-road dump trucks) and spreading and compacting the waste. In addition, walking over exposed waste presents trip/fall and puncture hazards.

Therefore, because these hazards are consistent with the hazards described in §60.753(d) related to surface emissions monitoring, the SWMD requests a similar variance with respect to monitoring wellheads within and immediately adjacent to the active face of the landfill if unsafe conditions exist. If this situation arises and prevents the monthly monitoring of a wellhead, the SWMD will document that such conditions exist for semiannual report and will resume monthly monitoring when filling activities have moved away from the affected wells. However, failure to obtain a monthly wellhead reading as a result of dangerous conditions at a well will not constitute a violation of §60.756(a).

5.7.2 Raised Wells and Collectors at the Active Face

In order to accommodate waste disposal activities, certain wells, lateral risers, and wellheads may be raised up to 10 to 20 feet into the air as waste is placed around the wells. This may be an ongoing process for periods exceeding one month at a time, and affected wells may not be accessible for all or a portion of this time.

From a construction standpoint, a specific challenge with raising wells 10 to 20 feet into the air is that it may not be possible to connect the wellhead to both the well casing and the lateral riser pipe. Typically, the wellhead cannot be attached to both of these pipes until the ground surface is within 7 to 10 feet of the top of the pipes. In addition, wellhead adjustments are not possible for wells that have been raised 10 to 20 feet into the air.

If this situation arises and prevents the monthly monitoring of a wellhead, the SWMD will document that such conditions exist for semiannual report and will resume monthly monitoring when filling activities have moved away from the affected wells and the wellheads are within 5 to 7 feet of ground surface. The required monthly monitoring will resume at that time. Failure to obtain a monthly wellhead reading as a result of dangerous conditions at a well will not constitute a violation of §60.756(a).

5.8 EXCEEDANCE CORRECTION WITHOUT EXPANSION OF GCCS

Per §60.755(a)(3) and (5), if exceedances of the pressure, temperature, or oxygen criteria are not remediated within 15 days of the initial exceedance, the GCCS must be expanded within 120 days of the initial exceedance unless an alternative timeline is approved. However, expansion of the GCCS is not always required in order to remediate pressure, temperature, or oxygen exceedances. Therefore, the SWMD requests approval for alternative actions to remediate an exceedance in lieu of expanding the GCCS.

Examples of potentially appropriate remedial actions include:

- Installation of dewatering pumps to reduce the liquid level in a well in order to remediate an oxygen exceedance.
- Repair of extraction well piping or wellheads that may be causing air infiltration that causes an oxygen exceedance.
- Header or blower station piping modifications or repairs to remediate pressure exceedances.
- Repair of condensate management features to remediate pressure and/or oxygen exceedances.
- Repair of header valves to remediate pressure and/or oxygen exceedances.

- Additional troubleshooting and wellfield tuning to remediate pressure, temperature, and oxygen exceedances.

- Repair of the landfill cap to reduce ambient air infiltration into a well and remediate an oxygen exceedance.

These examples are meant to be representative of typical operations and maintenance activities that may be appropriate for remediating pressure, temperature, and oxygen exceedances in lieu of expanding the GCCS. Other actions that result in the remediation of an exceedance within the 120-day timeline would also be covered under this alternative. Alternative remedial actions will be documented in semiannual NSPS reports.

5.9 ESTABLISH HIGHER TEMPERATURE OPERATING VALUE

Per 40 CFR 60.753(c), the landfill owner/operator may establish a higher operating value at the well for temperature. The SWMD will only seek to establish a higher operating value at an extraction well subsequent to failed attempts to correct the temperature exceedance. The demonstration will provide the following supporting data:

- The elevated parameters will not cause an environment conducive for subsurface oxidation.

- The higher temperature will not inhibit anaerobic decomposition by killing methanogens.

For this reason, if an extraction well is demonstrated to have a normal operating temperature that is stable above 131 °F, a higher operating temperature threshold will be established for the extraction well. The SWMD will make this determination on a well-by-well basis and submit notification to FDEP within 120 days of an initial temperature exceedance, unless an alternate timeline is deemed more appropriate. If that is the case, the SWMD will submit a proposed alternate timeline for establishing a higher operating temperature to FDEP. The SWMD will provide at least three months of operational data to support the establishment of a higher operating temperature range for any particular landfill gas collection device. The following information will be included in this data set:

- The monthly and average oxygen content of the LFG;

- The monthly and average carbon dioxide of the LFG;

- The monthly and average methane content of the LFG;

- Well logs provided by drilling contractors during initial installation, if available;

- A carbon monoxide reading from each extraction well;

- The monthly and average temperature of the LFG; and

- Confirmation of the absence of visual indications of subsurface oxidation (smoke, excessive settlement).

5.10 WELL ABANDONMENT

The SWMD may abandon a vertical extraction well, horizontal collector, or LCRS tie-in as described below:

- Decommission the well or collector.
- Provide data to the Administrator that states the landfill will still have sufficient well field density in compliance with the NSPS.
- Provide four consecutive quarters of clean SEM events to the Administrator.
- Document that the zone of influence of the decommissioned extraction well had methane readings below 500 ppm.

The data and information submitted to the Administrator shall be certified by a Florida professional engineer.

5.11 EARLY INSTALLATION OF COLLECTION DEVICES

Per 40 CFR 60.755(b), each extraction well shall be installed no later than 60 days after the date on which the initial solid waste has been in place for a period of five years or more in active areas or two years or more if closed or at final grade. However, there may be occasions when the SWMD will decide to install extraction wells prior to the onset of NSPS requirements. Based on the foregoing regulatory citation, any extraction wells installed prior to the requirements of NSPS will not be subject to the operational, record-keeping, and reporting requirements of NSPS until the age of the initial waste placed reaches five years old if in an active area or two years old if closed or at final grade.

To make certain that the Administrator is made fully aware of these special circumstances, the SWMD will include information in the semi-annual report required by NSPS and the facility's Title V permit indicating the date of construction of new wells or collectors and the date on which the well/collector will become subject to the NSPS. Appendix D includes a copy of correspondence from U.S. EPA Region IV confirming that this approach is acceptable.

5.12 MONITORING OF LCRS RISERS

The SWMD may connect the GCCS to LCRS risers in order to help control odors, to increase the quantity of LFG available for beneficial use, or to meet other landfill operating needs beyond regulatory compliance with the rule. The GCCS described and depicted in this Design Plan has been designed to meet the required level of LFG control without collecting LFG from the LCRS. For this reason, the SWMD does not believe that the operating requirements of the Rule should be applied to voluntarily added collectors because these collectors only act to enhance the

performance of the system beyond that required by the Rule. Furthermore, because these devices are installed for purposes other than to meet the requirements of the rule, their design may preclude their ability to meet the stipulated operational requirements.

Additionally, these LCRS risers often operate with oxygen at atmospheric level (approximately 21 percent), which exceeds the 5 percent oxygen limit stipulated in the NSPS. Furthermore, LCRS pipes can be open to the atmosphere to accommodate system inspection and maintenance, or may be obstructed by liquid levels due to pump operations. Therefore, the SWMD is requesting that connections to the LCRS risers not be required to be operated and monitored in compliance with the NSPS.

5.13 HORIZONTAL COLLECTORS

5.13.1 Locations within 20 feet of Ground Surface

The SWMD may elect to install horizontal collectors in relatively close proximity to the interim ground surface prior to resuming waste disposal activities in an area of the landfill. This proactive construction will ensure that the infrastructure is in place to capture LFG from active landfill areas where vertical wells could be damaged and rendered useless. While this approach to LFG collection is desirable in some ways, the disadvantage is that oxygen exceedances are likely to occur until at least 20 feet of refuse is placed on top of the collectors. Horizontal collectors typically have a vertical zone of influence of at least 20 feet; therefore, if there is less than 20 feet of waste on top of them, ambient air can be pulled into the landfill.

To avoid air infiltration into horizontal collectors, the SWMD proposes that horizontal collectors not be subject to the pressure and oxygen operating requirements until a minimum of 20 feet of waste has been placed on top of the collector. Horizontal collectors without at least 20 feet of waste on top of them will not be considered part of the NSPS compliance network. The SWMD will monitor each installed collector on a monthly basis; however, non-negative pressure and oxygen equal to or greater than 5 percent will not be considered exceedances and remedial actions, including wellhead adjustments, will not be performed.

5.13.2 Select Installation of Horizontal Collectors

Due to the potential for air intrusion as describe above and the possibility of some horizontal collectors sitting idle for long periods of time while waste is being placed elsewhere on the site the SWMD may elect to selectively install horizontal collectors HC-01 through HC-13 as shown on Drawing 1 in Appendix A. Those collectors with vertical components will all be installed in the initial construction phase, while the SWMD may elect to delay the installation of some of the additional collectors until such time when surface emissions or wellfield monitoring indicates that additional gas collection in this area is necessary.

5.14 10-DAY SURFACE EMISSIONS REMONITORING EVENT

The SWMD is requesting a variance to the 10-day surface emissions remonitoring event window allotted for adjustments to the cover and/or GCCS. Industry experience with NSPS facilities across the Southeast U.S. suggests that this 10-day time frame may not reasonable to effect comprehensive repairs during all quarters of a typical year. For example, if the facility experiences precipitation events following a surface scan, it may take several days or even weeks for the sideslopes of the landfill to dry out enough to support construction equipment for cover repairs. If the sideslopes are not completely dry, the repair equipment could cause greater damage to the final cap (and subsequently higher emissions) than the original erosion or crack. Poor weather conditions can prevent cover maintenance, leading the follow-up surface emissions remonitoring event 10 days later to automatically fail. This can ultimately force a facility to install an unnecessary LFG collection device when all that was really required was enough time to effect a cover repair.

For this reason, the SWMD is requesting that the 10-day remonitoring event timeframe be extended by an additional two (2) weeks, in the event of bad weather conditions after a quarterly surface emissions monitoring event. The SWMD is proposing to obtain this two-week extension automatically upon providing FDEP with the following written information:

- The date of the initial quarterly surface emissions monitoring event
- The date of the inclement weather event
- Description of inclement weather event
- The name of the responsible sampling technician

Please note that a copy of this information will also be maintained in the files maintained by the SWMD.

5.15 CONTROL DEVICE: 1-HOUR AND 5-DAY STANDARDS

Section 60.755(e) states that the compliance provisions apply at all times, except during periods of startup, shut-down or malfunction provided that the duration of the start-up, shut-down or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices. The collection and control systems are designed so that when the control system is off-line, the gas moving equipment is shut-down as well, preventing gas from being vented to the atmosphere. Therefore, the entire collection system is off-line when the control system is shut-down.

It is the understanding of the SWMD that the 1-hour and 5-day downtime provisions mean that the collection system cannot be down for more than 5 days at a time. Further, the treatment and/or control system (i.e., flare) cannot be down for more than 1 hour at a time while the collection system is running, in a manner that allows uncontrolled LFG to vent to the atmosphere.

For this reason the SWMD will operate the GCCS such that control system downtime in excess of 5 days, assuming no uncontrolled LFG emissions into the atmosphere in excess of 1 hour, is

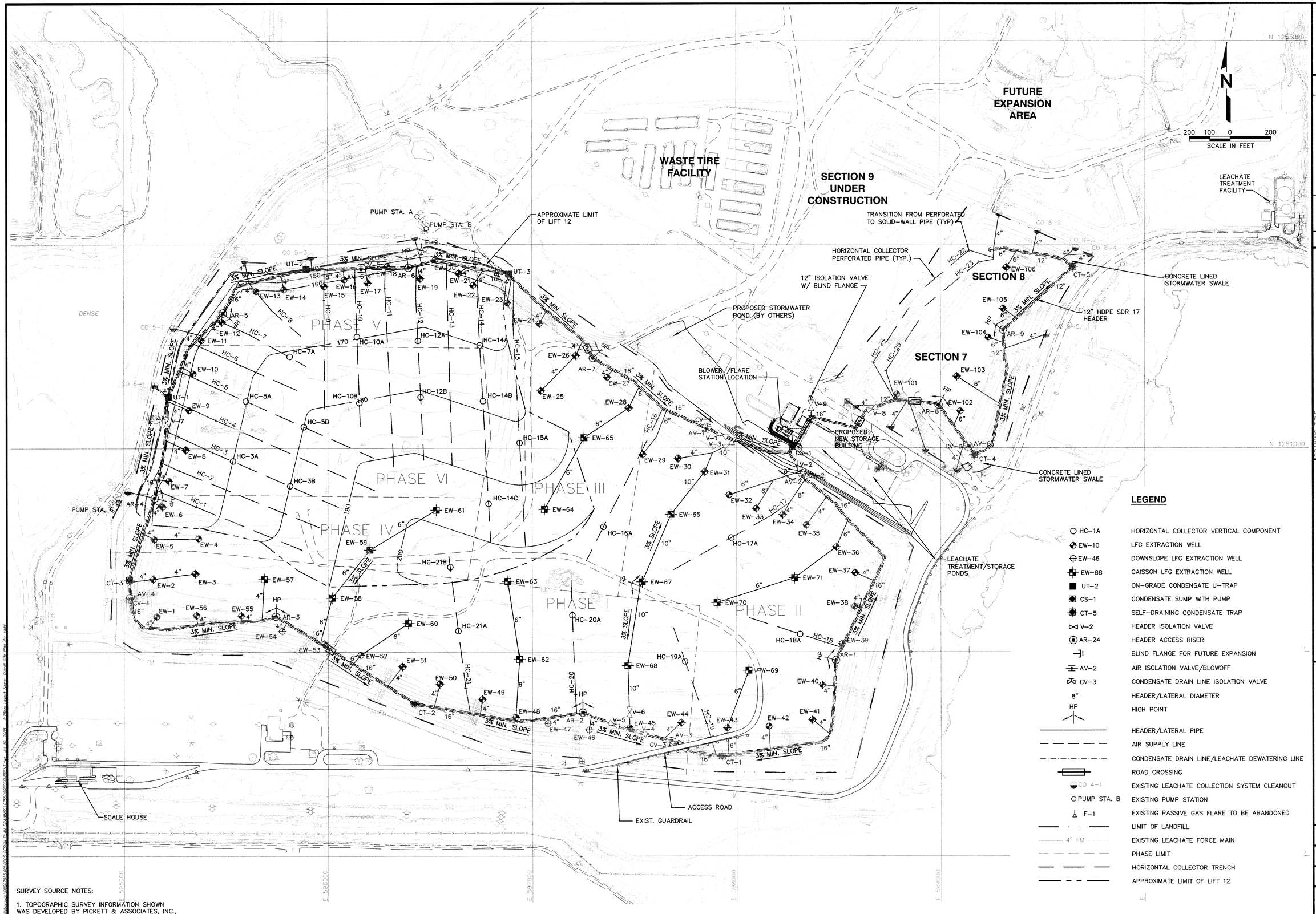
not considered an exceedance of the standard. This type of operational procedure is understood to meet the intent of the regulation. Furthermore, U.S. EPA appears to agree with this understanding of the regulation, because the proposed NSPS revision does not include the 1-hour rule as part of the regulation. This information is shown in the U.S. EPA-Solid Waste Association of North America Meeting Summary of Responses, which can be found in Appendix D.

5.14 PASSIVE FLARE OPERATION

The SCLF currently has passive landfill gas flares installed at LCRS risers for the voluntary control of LFG emissions. After startup of the GCCS in the areas of the landfill required to have LFG collection and control, the SWMD may choose to relocate these flares to landfill areas that do not meet the 2-year/5-year criteria. Because the flares may be used in areas not yet subject to the LFG control requirements of the NSPS, they will not be subject to any monitoring, recordkeeping, or reporting requirements.

APPENDIX A

GCCS DESIGN PLAN DRAWINGS



SURVEY SOURCE NOTES:

1. TOPOGRAPHIC SURVEY INFORMATION SHOWN WAS DEVELOPED BY PICKETT & ASSOCIATES, INC., 475 SOUTH FIRST AVENUE, BARTOW, FL 33830. AERIAL PHOTO DATE: 01/14/08.

LEGEND

HC-1A	HORIZONTAL COLLECTOR VERTICAL COMPONENT
EW-10	LFG EXTRACTION WELL
EW-46	DOWNSLOPE LFG EXTRACTION WELL
EW-88	CAISSON LFG EXTRACTION WELL
UT-2	ON-GRADE CONDENSATE U-TRAP
CS-1	CONDENSATE SUMP WITH PUMP
CT-5	SELF-DRAINING CONDENSATE TRAP
V-2	HEADER ISOLATION VALVE
AR-24	HEADER ACCESS RISER
	BLIND FLANGE FOR FUTURE EXPANSION
AV-2	AIR ISOLATION VALVE/BLOWOFF
CV-3	CONDENSATE DRAIN LINE ISOLATION VALVE
8"	HEADER/LATERAL DIAMETER
HP	HIGH POINT
	HEADER/LATERAL PIPE
	AIR SUPPLY LINE
	CONDENSATE DRAIN LINE/LEACHATE DEWATERING LINE
	ROAD CROSSING
CO 4-1	EXISTING LEACHATE COLLECTION SYSTEM CLEANOUT
PUMP STA. B	EXISTING PUMP STATION
F-1	EXISTING PASSIVE GAS FLARE TO BE ABANDONED
	LIMIT OF LANDFILL
4" FM	EXISTING LEACHATE FORCE MAIN
	PHASE LIMIT
	HORIZONTAL COLLECTOR TRENCH
	APPROXIMATE LIMIT OF LIFT 12

7/11/08

DAVID H. PENOYER, P.E.
LICENSE NO. 56085

REV	DATE	DESCRIPTION	BY

DRAWING TITLE: GCCS DESIGN PLAN - INITIAL SITE PLAN

PROJECT TITLE: GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN SOUTHEAST COUNTY LANDFILL

CLIENT: HILLSBOROUGH COUNTY SOLID WASTE MANAGEMENT DEPARTMENT TAMPA, FLORIDA

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS
4041 PARK OAKS BLVD, SUITE 100, TAMPA, FL 33610
813 621-0080 FAX 813 623-8757
FLORIDA CERTIFICATE OF AUTHORIZATION NO. 00004892

PROJ. NO.	DWN. BY:	D/A RVW BY:	APP. BY:
09207055.00	SDA/CTN	DHP	RJD
DSN. BY:	CHK. BY:		
DRC	LEK/DHP		

CADD FILE: 075500PROP

DATE: JULY 11, 2008

SCALE: AS SHOWN

DRAWING NO. 1 of 2

PHASE I
PHASE II
PHASE III
PHASE IV
PHASE V
PHASE VI
CT-1
CT-2
CT-3
CT-4
CT-5
CT-6
CS-1
AR-1
AR-2
AR-3
AR-4
AR-5
AR-6
AR-7
UT-1
UT-2
UT-3
EW-1
EW-2
EW-5
EW-10
EW-11
EW-12
EW-13
EW-14
EW-15
EW-16
EW-18
EW-20
EW-21
EW-22
EW-24
EW-26
EW-27
EW-28
EW-33
EW-34
EW-35
EW-36
EW-38
EW-39
EW-42
EW-44
EW-45
EW-46
EW-47
EW-48
EW-49
EW-50
EW-51
EW-53
EW-54
EW-55
EW-56
EW-57
EW-58
EW-59
EW-60
EW-61
EW-62
EW-63
EW-64
EW-65
EW-66
EW-67
EW-68
EW-69
EW-70
EW-71
EW-302
EW-303
EW-304
EW-305
EW-306
EW-307
EW-308
EW-312
EW-313
EW-314
EW-315
EW-316
EW-318
EW-319
EW-323
EW-324
EW-325
EW-326
EW-327
EW-328
EW-329
EW-330
EW-331
EW-332
EW-333
EW-335
EW-336
EW-338
EW-339
EW-340
EW-341
EW-342
EW-343
EW-344
EW-346
EW-349
EW-352
EW-353
EW-354
EW-355
EW-356
EW-357
EW-358
EW-359
EW-360
EW-361
EW-362
EW-363
EW-364
EW-365
EW-366
EW-367
EW-369
EW-370
EW-371
EW-501
EW-502
EW-503
EW-504
EW-506
EW-507
EW-508
EW-509
EW-510
EW-511
EW-512
EW-513
EW-514
EW-515
EW-516
EW-517
EW-518
EW-519
EW-520
EW-521
EW-522
EW-523
EW-524
EW-525
EW-526
EW-527
EW-528
EW-529
EW-530
EW-531
EW-532
EW-533
EW-534
EW-535
EW-536
EW-537
EW-538
EW-539
EW-540
EW-541
EW-542
EW-543
EW-544
EW-545
EW-546
EW-547
EW-548
EW-549
EW-550
EW-551
EW-552
EW-553
EW-554
EW-555
EW-556
EW-557
EW-558
EW-559
EW-560
EW-561
EW-562
EW-563
EW-564
EW-565
EW-566
EW-567
EW-569
EW-570
EW-571
EW-572
EW-573
EW-574
EW-575
BLOWER/FLARE STATION LOCATION
TIRES
PIPES
SPILLWAY
PIPE STORAGE
TANK
DENSE
WAYS
W.E. 95.5
W.E. 119.1
W.E. 119.5
W.E. 134.1
130
CO 5-1
CO 6-1
FM
4" FM
N
200 100 0 200
SCALE IN FEET

LEGEND

- EW-10 — LFG EXTRACTION WELL
- EW-46 — DOWNSLOPE LFG EXTRACTION WELL
- UT-2 — ON-GRADE CONDENSATE U-TRAP
- CS-1 — CONDENSATE SUMP WITH PUMP
- CT-5 — SELF-DRAINING CONDENSATE TRAP
- AR-24 — HEADER ACCESS RISER
- HEADER/LATERAL PIPE
- AIR SUPPLY LINE
- CONDENSATE DRAIN LINE/LEACHATE DEWATERING LINE
- CO 4-1 — EXISTING LEACHATE COLLECTION SYSTEM CLEANOUT
- 4" FM — EXISTING LEACHATE FORCE MAIN
- LIMIT OF LANDFILL
- PHASE LIMIT

REV	DATE	DESCRIPTION	BY

DAVID H. PENOYER P.E.
LICENSE NO. 0065
7/11/08

DRAWING TITLE: GCCS DESIGN PLAN - FINAL BUILDOUT

PROJECT TITLE: GAS COLLECTION AND CONTROL SYSTEM DESIGN PLAN SOUTHEAST COUNTY LANDFILL

CLIENT: HILLSBOROUGH COUNTY SOLID WASTE MANAGEMENT DEPARTMENT TAMPA, FLORIDA

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT
CONSULTING ENGINEERS
4041 PARK OAKS BLVD, SUITE 100, TAMPA, FL 33610
813 621-0080 FAX 813 623-6757
FLORIDA CERTIFICATE OF AUTHORIZATION NO. 00004892

PROJ. NO.	DWN. BY:	QA/A RVW BY:
09207055.00	SDA/CTN	DHP
DSN. BY:	CHK. BY:	APP. BY:
LEK/DRC	DHP	R.C.

CADD FILE: 075500PROP

DATE: JULY 11, 2008

SCALE: AS SHOWN

DRAWING NO.

2 of 2

APPENDIX B

LANDFILL GAS GENERATION ESTIMATE CALCULATIONS

EXHIBIT-1. LFG RECOVERY PROJECTION
Southeast Landfill - Hillsborough County, FL

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	LFG Generation (scfm)	LFG Generation (mmcf/day)	LFG Generation (mmBtu/yr)	Collection System Efficiency (%)	LFG Recovery from Existing and Planned System (scfm)	LFG Recovery from Existing and Planned System (mmcf/day)	LFG Recovery from Existing and Planned System (mmBtu/yr)
1984	104,563	104,563	0	0.00	0	0%	0	0.00	0
1985	661,126	765,689	42	0.06	13,346	0%	0	0.00	0
1986	629,888	1,395,577	305	0.44	97,207	0%	0	0.00	0
1987	417,552	1,813,129	545	0.78	173,792	0%	0	0.00	0
1988	237,227	2,050,356	690	0.99	220,273	0%	0	0.00	0
1989	201,044	2,251,400	758	1.09	241,914	0%	0	0.00	0
1990	171,112	2,422,512	809	1.16	258,089	0%	0	0.00	0
1991	91,924	2,514,436	845	1.22	269,810	0%	0	0.00	0
1992	56,525	2,570,961	849	1.22	270,963	0%	0	0.00	0
1993	63,281	2,634,242	838	1.21	267,553	0%	0	0.00	0
1994	91,757	2,725,999	831	1.20	265,139	0%	0	0.00	0
1995	97,200	2,823,199	835	1.20	266,455	0%	0	0.00	0
1996	124,701	2,947,900	841	1.21	268,413	0%	0	0.00	0
1997	168,069	3,115,969	858	1.24	273,805	0%	0	0.00	0
1998	205,602	3,321,571	892	1.28	284,521	0%	0	0.00	0
1999	302,785	3,624,356	939	1.35	299,607	0%	0	0.00	0
2000	354,551	3,978,907	1,023	1.47	326,506	0%	0	0.00	0
2001	364,424	4,343,331	1,125	1.62	358,957	0%	0	0.00	0
2002	268,599	4,611,930	1,226	1.77	391,396	0%	0	0.00	0
2003	303,466	4,915,396	1,286	1.85	410,332	0%	0	0.00	0
2004	365,722	5,281,118	1,357	1.95	432,976	0%	0	0.00	0
2005	369,970	5,651,088	1,450	2.09	462,679	0%	0	0.00	0
2006	391,007	6,042,095	1,541	2.22	491,758	0%	0	0.00	0
2007	451,551	6,493,646	1,637	2.36	522,383	0%	0	0.00	0
2008	463,057	6,956,703	1,753	2.52	559,535	0%	0	0.00	0
2009	472,786	7,429,489	1,870	2.69	596,698	0%	0	0.00	0
2010	481,696	7,911,185	1,985	2.86	633,646	75%	1,489	2.14	475,235
2011	490,034	8,401,219	2,100	3.02	670,283	75%	1,575	2.27	502,712
2012	498,372	8,899,591	2,214	3.19	706,547	75%	1,660	2.39	529,910
2013	506,710	9,406,301	2,326	3.35	742,453	75%	1,745	2.51	556,840
2014	515,048	9,921,349	2,438	3.51	778,016	75%	1,828	2.63	583,512
2015	523,386	10,444,735	2,548	3.67	813,249	75%	1,911	2.75	609,937
2016	534,151	10,978,886	2,658	3.83	848,164	75%	1,993	2.87	636,123
2017	544,916	11,523,802	2,767	3.98	883,084	75%	2,075	2.99	662,313
2018	555,681	12,079,483	2,876	4.14	918,009	75%	2,157	3.11	688,507
2019	566,447	12,645,930	2,986	4.30	952,939	75%	2,239	3.22	714,704
2020	577,212	13,223,142	3,095	4.46	987,873	75%	2,322	3.34	740,905
2021	587,977	13,811,119	3,205	4.61	1,022,812	75%	2,404	3.46	767,109
2022	598,742	14,409,861	3,314	4.77	1,057,754	75%	2,486	3.58	793,316
2023	609,507	15,019,368	3,424	4.93	1,092,701	75%	2,568	3.70	819,525
2024	620,272	15,639,640	3,533	5.09	1,127,651	75%	2,650	3.82	845,738
2025	631,038	16,270,678	3,643	5.25	1,162,604	75%	2,732	3.93	871,953
2026	641,803	16,912,481	3,752	5.40	1,197,562	75%	2,814	4.05	898,171
2027	652,568	17,565,049	3,862	5.56	1,232,522	75%	2,896	4.17	924,392
2028	663,333	18,228,382	3,972	5.72	1,267,486	75%	2,979	4.29	950,614
2029	674,098	18,902,480	4,081	5.88	1,302,453	75%	3,061	4.41	976,840
2030	684,863	19,587,343	4,191	6.03	1,337,423	80%	3,353	4.83	1,069,938
2031	695,628	20,282,971	4,300	6.19	1,372,395	85%	3,655	5.26	1,166,536
2032	706,394	20,989,365	4,410	6.35	1,407,370	90%	3,969	5.72	1,266,633
2033	717,159	21,706,524	4,519	6.51	1,442,349	90%	4,067	5.86	1,298,114
2034	727,924	22,434,448	4,629	6.67	1,477,329	90%	4,166	6.00	1,329,596

Methane Content of LFG Adjusted to: 60%
Selected Decay Rate Constant (k): 0.0400
Selected Ultimate Methane Recovery Rate (Lo): 3,204 cu ft/ton
NMOC Concentration in LFG: 495 ppmv as Hexane

APPENDIX C

U.S. EPA APPROVAL OF ALTERNATIVE WELLHEAD OPERATING PROCEDURES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

4APT-ATMB

FEB 09 2005

L. T. Kozlov, P.E.
Program Administrator
Air Resources Management
Central District
Florida Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Dear Mr. Kozlov:

The purpose of this letter is to provide you with a written determination regarding proposed changes to the standard operating procedures for landfill gas extraction wells at the Orange County Solid Waste Management Facility. This landfill is subject to 40 CFR Part 60, Subpart WWW (Standards of Performance for Municipal Solid Waste Landfills), and in a request sent to the U.S. Environmental Protection Agency (EPA) Region 4 and to your agency, Orange County proposed changes in standard operating procedures for certain wells in the landfill's active gas collection system. These changes involve an alternative to decommissioning wells where low landfill gas generation rates make it difficult to simultaneously operate wellheads at negative pressure and maintain compliance with oxygen concentration limits. Based upon our review, the changes proposed by Orange County are acceptable. Details regarding the County's proposal and the basis for our conclusions are provided in the remainder of this letter.

Operating requirements for gas collection and control systems (GCCS) are promulgated at 40 CFR §60.753(b), (c), and (d). Under these provisions, wellheads must be operated under negative pressure, the temperature of interior wellheads must be less than 55 °C, gas quality limits for interior wells (either less than 20 percent nitrogen or less than five percent oxygen) must be met, and the methane concentration at the surface of the landfill must be less than 500 parts per million (ppm). Under provisions in 40 CFR §60.755, monitoring to verify compliance with the wellhead pressure, temperature, and gas quality limits must be conducted on a monthly basis. Monitoring to verify compliance with the 500 ppm surface methane concentration limit must be conducted on a quarterly basis.

Orange County's request for approval of changes to its standard operating procedures involves wells where gas flow rates are so low that applying even minimal vacuum results in air infiltration that causes exceedances of the applicable oxygen concentration limit. Shutting such wells down will prevent the air filtration that leads to the oxygen exceedances, but shutting a well down is likely to cause positive pressure in the wellhead as landfill gas builds up. Therefore, simultaneously complying with both

the negative pressure and oxygen concentration limits in 40 CFR §60.753 can be difficult for wells where gas flow rates have declined over time.

Under provisions in 40 CFR §60.753(b)(3), wells that experience positive pressure after being shutdown to accommodate declining landfill gas flow rates can be decommissioned if permission is granted by the Administrator. As an alternative to decommissioning wells under the provisions, Orange County has proposed to make the following changes to its standard operating procedure for wells where persistent oxygen exceedances are not the result of operations and/or maintenance issues:

1. Wells where oxygen concentrations do not decline to acceptable levels after more than one hour of reduced vacuum will be shut off until the gas quality recovers.

2. The monthly monitoring required by 40 CFR §60.755 will be conducted for wells that have been shutdown, but positive pressure or elevated oxygen concentrations will not be considered exceedances of the operating limits in 40 CFR §60.753.

3. If monthly monitoring indicates that pressure has built up in the well and the oxygen concentration still exceeds five percent, the well will be opened to relieve the pressure and will be shutdown until it is monitored the following month.

4. If the monthly monitoring indicates that gas quality has improved (i.e., the oxygen concentration has dropped below five percent), the well will be brought back on line until the gas quality declines again.

5. The quarterly methane surface concentration monitoring required under 40 CFR §60.755 will be conducted for wells that have been shutdown. Standard remediation steps, including evaluating the need to return wells to full-time service, will be followed if exceedances of the 500 ppm methane surface concentration limit are detected.

According to Mr. Daniel Morical of Orange County Utilities, the operating procedure changes outlined above would apply to approximately four or five of the 130 wells at its landfill at any one time. Mr. Morical also indicated that there is a high probability of gas quality improving to the point it would be necessary to restart wells that had been shutdown. Based upon our review, the proposed changes to Orange County's standard operating procedures are acceptable because shutting down nonproductive wells, instead of decommissioning them, has the potential to lower overall nonmethane organic compound (NMOC) emissions at the landfill. This potential increase in NMOC control system efficiency stems from the ability to quickly resume gas collection if there are improvements in the gas quality or increases in the gas production rate in an area of the landfill where wells have become nonproductive. If wells in a nonproductive area are decommissioned, instead of merely being shutdown, NMOC

emissions would not be controlled between the time an exceedance is identified and a new well is installed. One condition for approval of the proposed changes in standard operating procedures at the Orange County Solid Waste Management Facility is that facility diagrams must be updated to indicate which wells have been shutdown because landfill gas production rates are too low to permit continuous extraction.

If you have any questions about the determination provided in this letter, please contact Mr. David McNeal of the EPA Region 4 staff at (404) 562-9102.

Sincerely,

Beverly H. Banister
Director
Air, Pesticides and Toxics
Management Division

cc: Daniel Morical
Orange County Utilities – Solid Waste Division
5901 Young Pine Road
Orlando, Florida 32829

ORANGE COUNTY UTILITIES – SOLID WASTE DIVISION
5901 Young Pine Road, Orlando, Florida 32829
407-836-6600 ▪ Fax 407-836-6629

November 16, 2004

Mr. David McNeal
Air Resources Management
US EPA. Region 4
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-3104

Subject: **Orange County – AP**
Solid Waste Management Facility
FDEP Permit No. 0950113-002-AV
GCCS Design Plan Proposed Addendum

Mr. McNeal:

Please find enclosed for your consideration a proposal from our consultant to amend the Gas Collection and Control System Design Plan Standard Operating Procedure for Landfill Gas Extraction Wells for the Orange County Solid Waste Management Facility. As stated in the enclosed proposal, the standard operating procedures described are being submitted for EPA approval at the direction of the Florida Department of Environmental Protection.

Should you have any questions with regard to this letter please call me at 407-836-6616 or Dan Morrical at 407-836-6654.

Sincerely,

James W. Becker
Manager

JB/dm

Cc: L. T. Kozlov, P.E., Florida Department of Environmental Protection
Dan R. Morrical, P.E., Orange County Solid Waste Division
David H. Penoyer, P.E., SCS Engineers
Raymond J. Dever, P.E., DEE, SCS Engineers
John Sullivan, SCS Field Engineers
Rick DiGia, DTE Biomass Energy, Inc.

O:\FILE ROOM\LFG System\EPA Letter.doc

Environmental Consultants

3012 U.S. Highway 30 North
Suite 700
Tampa, FL 33619-2242

813 621-0080
FAX 813 623-6757

SCS ENGINEERS

November 9, 2004
File No. 09199036.17

Mr. Dan Morrical, P.E.
Orange County Solid Waste Division
5901 Young Pine Road
Orlando, Florida 32829

Subject: Addendum to the Gas Collection and Control System Design Plan
Standard Operating Procedure for Landfill Gas Extraction Wells
Orange County Solid Waste Management Facility, Orange County, Florida
FDEP Permit No. 0950113-002-AV

Dear Dan:

SCS Engineers (SCS) is providing you this letter for your use in petitioning the United States Environmental Protection Agency (U.S. EPA) to amend the landfill gas collection and control system (GCCS) design plan for the Orange County Solid Waste Management Facility. A similar letter was previously sent to Orange County on December 30, 2003, which was subsequently forwarded to the Florida Department of Environmental Protection (FDEP) Central District office. FDEP recently stated that they did not have the regulatory authority to approve the proposed actions included in this request, and recommended that the County forward the following proposed standard operating procedures to U.S. EPA for their approval.

As you know, in accordance with the New Source Performance Standards (NSPS) for municipal solid waste landfills, Orange County is required to operate each landfill gas (LFG) extraction well in compliance with certain criteria. Per Title 40 of the Code of Federal Regulations (CFR) Part 60.753(b), (c), and (d), Orange County is required to:

- Operate the collection system with negative pressure at each wellhead except under certain conditions such as increased well temperature, when a geomembrane cap is installed and an acceptable pressure limit is specified in the GCCS design plan, or when a landfill fire is present.

- Operate each wellhead with a LFG temperature less than 55 degrees Celsius (131 degrees Fahrenheit) and either a nitrogen level less than 20 percent or an oxygen concentration less than 5 percent by volume.

- Operate the GCCS so that the methane concentration at the surface of the landfill is less than 500 parts per million by volume (ppmv).

The first and third criteria listed above were included in the NSPS by the U.S. EPA in order to require landfill owners/operators to minimize fugitive emissions of LFG to the atmosphere. The second criterion, which is related to oxygen and nitrogen concentration in the gas at each well, is based on historical LFG industry operations and maintenance guidelines aimed at

reducing the potential for landfill fires or negatively affecting microbes involved in the anaerobic decomposition of the waste. High oxygen concentrations can occur due to operating the wellfield too aggressively, resulting in the infiltration of ambient air through the cover soils. If the oxygen concentration within a landfill exceeds five percent by volume, the possibility of a landfill fire is greatly enhanced. Note that because most field instruments measure oxygen, and not nitrogen, the method of compliance typically is based on a five percent oxygen concentration, rather than the 20 percent nitrogen requirement at each wellhead.

Unfortunately, the Rule does not provide guidance on how to address an individual criterion when it has the potential to conflict with one of the other criteria. For example, in some situations it may not be possible to maintain compliance with both the vacuum and gas quality requirements of the NSPS. This may be true in the case of a low or diminishing LFG generation rate, when the application of even a small vacuum (i.e., 0.1 to 0.5 inches of water column (in-w.c.)) to a well or collector may cause the oxygen concentration to exceed the NSPS limit of five percent. This typically occurs because LFG is not being generated at a sufficient rate to allow for continuous extraction by the GCCS.

If the LFG generation rate is so low, applying vacuum typically will only worsen the gas quality (i.e., increase the oxygen content), resulting in continued oxygen exceedances. One approach to remedying this situation is to shut down the well for a period of time until gas quality improves and the oxygen concentration declines to below five percent. Once the oxygen concentration is below this level, the well can be reopened and LFG extraction resumed. However, because this approach requires a non-negative pressure at the wellhead, this technique is not compliant with the NSPS.

Therefore, if gas quality cannot be maintained, the only alternative allowed by the NSPS is to decommission the well, provided there are no exceedances of the surface emissions monitoring limit. While such wells could be decommissioned, SCS feels it would be better to leave them in place in case future conditions render them necessary.

PROPOSED STANDARD OPERATING PROCEDURE

SCS proposes to establish the following standard operating procedure for wells at which poor gas quality is consistently recorded despite the application of minimal vacuum (i.e., less than 0.5 in-w.c.). This standard operating procedure is proposed as an addendum to the existing GCCS design plans for the site. It is not intended for wells at which normal wellfield tuning, maintenance, or repair activities can remediate the exceedances.

For wells at which oxygen exceedances are persistent and not the result of operations and/or maintenance issues, the wellhead valve will be adjusted to minimize vacuum. If after more than one hour of decreased vacuum the oxygen concentration does not decline to allowable levels, the wellhead will be shut off until the gas quality recovers. The well will continue to be monitored on a monthly basis, and the wellhead valve opened to purge any accumulated gas

and relieve any pressure that may have developed. If, during the routine monthly monitoring, the oxygen concentration is below five percent, the well will be brought back on line until the gas quality again declines.

Gas concentration and pressure will continue to be monitored and recorded during the months in which the wells are shut off. However, a zero pressure or high oxygen concentration will not be considered an exceedance of the wellhead operating criteria included in 40 CFR 60.753(b) and (c), and remedial actions including rechecks will not be required. If a positive pressure is recorded, the well will be reopened to relieve any pressure and to purge the accumulated gas from the well. If the gas quality has improved, the well will be opened and returned to service. However, if high oxygen concentrations are still present in the well, after purging the well and removing any positive pressure, the wellhead valve will again be closed and the well will not be monitored until the next round of monthly monitoring. Quarterly surface emissions monitoring will continue to be used to demonstrate the effective capture and control of LFG from the landfill. In the case of exceedance of the 500-ppmv surface emissions monitoring limit, standard remediation steps will be conducted, including evaluating the need for returning the well to full-time service.

Note that wells under this standard operating procedure will not be physically disconnected from the GCCS, which will allow the County to quickly return the wells to service if the need arises. In the future, if wells are to be permanently decommissioned, the County will submit a formal notice of well decommissioning to FDEP.

Please forward this proposed standard operating procedure/addendum to the GCCS design plan to the U.S. EPA at the following address:

Air Resources Management
United States Environmental Protection Agency, Region
Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, Georgia 30303-3104

Please copy the FDEP Central District office at the following address:

Air Resources Management
Florida Department of Environmental Protection
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Please call us if you have any questions or need additional information.

Sincerely,

No. 56065

David H. Penoyer, P.E.
Project Manager

Raymond J. Dever, P.E., DEE
Vice President
SCS ENGINEERS

cc: John Sullivan, SCS Field Services

APPENDIX D

U.S. EPA –SOLID WASTE ASSOCIATION OF NORTH AMERICA MEETING SUMMARY RESPONSES

TO: KC Hustveldt, Chief, Emission Standards Division, USEPA-OAQPS

FROM: Amy Van Kolken Banister, Waste Management

DATE: January 24, 2006

RE: Summary of November 10, 2005 Meeting to Discuss NSPS Interpretations Pertaining to MSW Landfills

KC, please find attached a summary of responses to the September 23, 2004 SWANA request letter as we discussed on November 10, 2005 with you and your staff. The responses presented are based on a compilation of industry notes from the meeting. Please let me know if there are any discrepancies with your recollection or that of your staff's.

We appreciate the time you and your staff devoted to meeting with industry representatives and look forward to continued dialogue on NSPS and MACT implementation solutions for the MSW Landfills.

Cc: Frank Caponi, SWANA and LACSD
Kerry Kelly, WM
Ed Repa, NSWMA
Pat Sullivan, SCS Engineers
Niki Wuestenberg, Allied Waste

Recommendations for Clarification and/or Additional Guidance

General Applicability

1) Clarification on the Applicability of Certain Requirements to Closed Landfills.

NSPS requirements as they relate to closed landfills are confusing and often subject to varying interpretations by regulators. SWANA believes that clarification of key definitions could resolve many of the issues.

At many Municipal Solid Waste (MSW) Landfills, phased construction of stand alone landfills occurs. In many cases, the closed landfill(s) are physically separated from, but contiguous to, the active landfill(s). Some closed landfill(s) installed collection and control systems prior to NSPS rule promulgation and therefore prior to design plan submittal. Some regulators have indicated that a landfill or phase of a landfill that is part of a larger MSW landfill, would be subject to NSPS requirements. SWANA does not believe this interpretation is reasonable.

Gas production continues to decline in the older closed landfills which are part of the MSW landfill resulting in non-producing wells and exceedances of the wellfield operating parameters. Expanding the system in the closed landfill(s) will typically not correct for the exceedances. Further it can be very costly to bring an older closed landfill into compliance with the NSPS if the older closed landfill is expected to perform like the new active landfill.

There are also situations where the closed portion of a larger MSW landfill may be covered under NSPS, but questions have arisen as to the timelines that would be applicable for the closure provisions of NSPS to come in effect, such as equipment removal. Once again, there have been varying interpretations by regulators. Some treat the entire MSW landfill as the means for triggering time lines. In the most difficult interpretation, the entire site would need to be closed in order for timelines, such as the 15-year system operational requirement for equipment removal, to kick in. SWANA's interpretation is that timelines would be triggered for each portion of the MSW landfill independently. So, for example, when one phase or landfill area closes, the 15-year clock will start regardless of whether other phases are still active. The reasoning for SWANA's position on these issues and recommendations to EPA on resolving them, are explained below.

The regulations contain key definitions that are used to direct rule requirements. These include the definitions for: "MSW landfill", "landfill", "closed landfill" and "active landfill". SWANA recommends that USEPA provide clarifications of these definitions to resolve the issues identified above. It should be made clear *that "MSW landfill"* is inclusive of both *"closed landfills"* and *"active landfills"*. However a *"landfill"* should be considered only a portion of the MSW landfill. It could be a phase, or a completely independent

operation, but physically can be treated as a stand-alone site. If this definition is made clear then a reading of the rule should indicate that many operational and procedural requirements only apply to the *"landfill"* and not the larger *"MSW landfill"*.

For example, Section 60.752(b)(1)(ii)(B) talks of closure notification if the "*landfill*" is permanently closed. Under SWANA's interpretation, this could refer only to a portion of the site, or the "*closed landfill*". Also, if a site is closed pre-NSPS and contains a control system, under the suggested interpretation of "*landfill*", no NSPS requirements should apply. As a final example, a *"closed landfill"*, which is post-NSPS and is part of a larger MSW Landfill that has an active landfill, should quality to skip to annual monitoring under §60.756 (f). In fact, it follows that by clarifying that a "*landfill*" is only a portion of the larger "*MSW Landfill*", you in effect clarify all the other definitions cited above.

USEPA Response: *Further discussions are needed. However, it appears that separate and distinct closed landfills that are a part of the stationary source (MSW Landfill) will be allowed to defer to annual surface emissions monitoring where the closed landfill meets the eligibility criteria (i.e., three consecutive quarterly events with no measured exceedances). As for relief on control system operation, additional assessment is required by USEPA.*

2) Clarification on Decommissioning a Well Versus Abandoning a Well and Flexibility to Temporarily Decommission a Well

The regulation implies that a decommissioned well remains in place and is not physically removed from the collection system. Decommissioned wells with agency approval may operate with positive pressure (See Section 60.753(b)). Does this mean that the landfill must continue to monitor the well monthly and follow the compliance schedule for correcting exceedances of oxygen, nitrogen or temperature?

There are no provisions in the regulation for abandoning a well. Further, there are no procedures specified for either decommissioning or abandoning a well. Many state agencies assume that decommissioning the well is equivalent to abandoning a well.

SWANA recommends that USEPA clarify the definitions for de-commissioned well and abandoned well. SWANA also recommends that USEPA establish guidance or procedures, in conjunction with the appropriate SWANA Committee, for de-commissioning a well and if/how the operating standards apply to decommissioned wells. The NSPS should also be clarified or policy memorandum developed to allow for temporary decommissioning of wells to address changing conditions at MSW Landfills. As the NSPS requires approval to decommission a well, the USEPA should clarify and streamline approval procedures in order to respond quickly and efficiently to such approval requests. Further, operating standards for wells should not apply to decommissioned wells.

For example, according to SWANA members, there is more of a need at MSW Landfills to decommission wells than to abandon them. Wells are often installed, especially at sites with leachate recirculation, where operations fluctuate depending on any number of unknown factors, such as age and type of the waste, liquid levels, depth of the well, etc. Operators may want to decommission a well until such time that it may again become useful. In the meantime, if a well is deemed nonproductive, then it is not efficient to monitor monthly for data. Simple notes to indicate a well is "watered in" or "air intrusion" should apply until such time that the condition changes. For example, if a well has been over pulled, then many times the appropriate corrective measure is to "temporarily decommission" the well and remove vacuum from it until it "recovers" and can safely be brought back on line. Meteorological conditions also greatly impact wellfield operations. Depending on the season, landfill operators need flexibility (i.e., temporary decommissioning of wells) to address increased water levels (spring) or freezing conditions (winter).

***USEPA response**: A decommissioned well which is not physically removed from the system or permanently rendered inoperable must be monitored monthly for pressure, temperature and oxygen. The well must comply with operating parameters for oxygen and temperature but may operate with positive pressure per 40 CFR 60.753(b). Alternatives to this standard such as cessation of monitoring specific wells due to various conditions (i.e., raising wells, active construction/filling in area, non-producing conditions, etc) may be requested and approved as part of the Design Plan.*

3) Clarification of Operation and Monitoring Requirements Applicable for Early Installation of Wells

MSW Landfills which operate gas collection and control systems may install new wells or collectors prior to the waste age requirement specified in Sections 60.753(a) and 60.755(b). Such well placement occurs for various reasons such as additional control for odor or to provide additional fuel for energy projects. SWANA recommends that USEPA clarify these wells should not be subject to operation and monitoring requirements until such time as the age of the initial waste placed in the area triggers the requirements for well installation and operation.

***USEPA Response**: Agree. Wells installed early are not be subject to operation and monitoring requirements until such time as the age of the initial waste placed in the area triggers the requirements for well installation and operation.*

Monitoring Requirements

4) Clarification on Oxygen and Nitrogen Wellhead Monitoring

Section 60.753(c) requires nitrogen or oxygen to be monitored at each wellhead, but not both. SWANA requests USEPA clarify that if both parameters are monitored using a

Gas Chromatograph (GC) and one shows an exceedance while the other is not, then this is not an exceedance requiring corrective action and follow-up monitoring. Monitoring of both parameters is common at sites that use an on-site GC to conduct this monitoring. SWANA also recommends that USEPA consider field oxygen monitoring results from Landtec GEM-500 or equivalent equipment compliant with USEPA Method 3A.

USEPA Response: *If either oxygen OR nitrogen was selected as the parameter to be monitored in the Design Plan or the permit, then the site must monitor for and comply with that parameter. If the site did not specify whether oxygen or nitrogen would be monitored, then the site must comply with both parameters where a GC is being used as measurement.*

5) Clarification on Where the Collection Wellhead Pressure is to be Measured.

Section 60.755(3) states "*...shall measure gauge pressure in the gas collection header at each individual well, monthly.*" This would seem to indicate that the pressure is to be measured on the header side of the wellhead valve instead of the well side of the wellhead valve (landfill side). Other Sections of the NSPS rule simply state "at the wellhead." Some operators have experienced confusion among regulators on this point. We recommend that USEPA clarify that the pressure be measured on the landfill side as a more conservative approach.

USEPA Response: *Agree with SWANA's recommendation. Future guidance may allow measurement at the well side as well as landfill side but prefer SWANA's position that measurement be taken on the landfill side.*

6) Clarification on System Expansion Exemption for Pressure Exceedances Within 180 Days of Start-up.

Landfill gas systems are typically built in phases to accommodate for additional waste placement as well as to replace various wells from time to time due to settlement, etc. Installation of only a few additional wells can cause challenges with balancing the entire system and therefore additional time may be needed to not only achieve negative pressure in all wells but to also maintain the operating standard for oxygen, nitrogen and/or temperature.

Per Section 60.755(a)(4), the landfill is not required to expand the system during the first 180 days after gas collection system start-up where pressure exceedances were recorded at one or more wells. SWANA recommends that, given the wellfield balancing challenges, USEPA should clarify that the exemption from system expansion applies to any individual well or series of wells associated with the new well(s) upon start-up.

USEPA Response: *Request approval for alternative timeline procedure as part of the Design Plan or amendment to the Design Plan.*

7) System Expansion Exemption for Temperature and Either Oxygen or Nitrogen Exceedances Within 180 Days of Start-up

Landfill gas (LFG) systems are typically built in phases to accommodate for additional waste placement as well as to replace various wells from time to time due to settlement, etc. Installation of only a few additional wells can cause challenges with balancing the entire system and therefore additional time may be needed to not only achieve negative pressure in all wells but to also maintain the operating standard for oxygen, nitrogen and/or temperature.

Per Section 60.755(a)(4), the landfill is not required to expand the system during the first 180 days after gas collection system start-up where pressure exceedances were recorded at one or more wells. Given the wellfield balancing challenges, SWANA recommends that USEPA consider applying the exemption from system expansion during the first 180 days of operation to exceedances of temperature and either oxygen or nitrogen at individual or series of wells (see Item 6 above).

USEPA Response: *Request approval for alternative timeline procedure as part of the Design Plan or amendment to the Design Plan.*

8) Exclusion of Dangerous Areas for Wellfield Monitoring

The operational standard for surface emissions monitoring, being Section 60.753(d), allows the facility to exclude areas with steep slopes or other dangerous areas from monitoring. Currently, the regulations do not afford such exemption for wellfield monitoring. Daily site conditions exist, especially for active landfills, which pose safety concerns for field technicians such as waste filling/compacting operations, cap construction activities, raised wells, and seasonal weather-related dangers, etc. Because health and safety of personnel must be considered tantamount, companies must be given wide latitude in making dangerous area determinations.

Many wells are installed in active areas and typically landfill operators are depositing new waste around the wells. It is dangerous to operate the wells in the active filling areas until the waste placement activities in that area has stopped. The NSPS regulation often forces the installation of wells in active filling areas to meet the 5 year collection system installation requirement, yet additional capacity remains which requires periodic and repeat raising of wells.

During times of active filling, it is impossible to keep the laterals connecting the wells sloped for drainage. Also, wells have to be turned off to raise the wellheads. This operation requires removal of the wellhead, splicing of new pipe, and installing (retrenching and sloping) new laterals. It is a constant process at an active landfill.

SWANA recommends that USEPA prepare a technical correction to the rules or, at a minimum, a policy memorandum which clarifies wells may be excluded from monitoring in dangerous areas. Such unsafe areas should be documented by site personnel in the wellfield monitoring records as reasons for not monitoring well(s). Operators should be allowed a minimum of 45 days from cessation of filling activity in a designated area to bring new or disconnected/decommissioned infrastructure back on line.

USEPA Response: *Request approval for alternative monitoring procedure as part of the Design Plan or amendment to the Design Plan.*

9) Clarification on Context of Higher Operating Value Demonstrations for Temperature, Oxygen or Nitrogen.

Section 60.753(c) states that the landfill owner or operator may establish a higher operating value at a well for temperature, oxygen or nitrogen. The demonstration must show supporting data that the elevated parameter does not cause fires or inhibit anaerobic decomposition by killing methanogens. Regulators have interpreted this to mean agency approval is required. However, no where in the rule citation does it specifically use the word "approval". Other Sections of the rule do specifically state that approval is required (see Section 60.755(a) for approval of alternative timelines). The landfill owner or operator should maintain the proper documentation such as methane, temperature and carbon monoxide readings for the well(s) in question in order to support the established alternative operating value. The site should then produce the documentation upon agency request. Prior agency approval for higher operating values is therefore not warranted.

SWANA recommends USEPA clarify that a demonstration of alternate operating values does not require agency approval.

USEPA Response: *Disagree. Higher operating values for oxygen and/or temperature should require agency approval.*

10) Clarification of 5-day Corrective Action and 15-day Compliance Demonstration.

From time to time, some well exceedances cannot be corrected within the 15-day timeframe allotted in Section 60.755. For example, a well may be pinched, a boot seal may have failed or a well or lateral line may be damaged. These normal operating scenarios require time (i.e., 60 days) to complete excavation and repair activities as equipment and laborers to fix wells and laterals are generally not on site. An alternative timeline may be requested to complete the corrective measures.

SWANA recommends USEPA clarify that a facility is not required to conduct the monthly, 5-day and 15-day compliance milestones where the site personnel know the well will continue to exceed one or more parameters because the corrective action will take more than 15 days to complete. This is especially true in wintertime conditions for northern states. Monitoring would resume in accordance with the proposed alternative timelines.

USEPA Response: *USEPA agrees with SWANA's recommendation that 5-day and 15-day investigation and re-monitoring steps are not required if site requested an alternative timeline to correct the exceedance. Monthly monitoring would however still be required.*

11) Clarification as to When Alternative Timeline Requests Must Be Submitted For Agency Approval.

Per Section 60.755(b) and (c), an alternative timeline for correcting the exceedances of pressure, temperature, oxygen, nitrogen or surface emissions may be submitted to the Administrator (or delegated state/local authority) for approval. The rule citations do not specify when the request must be submitted or approval rendered. SWANA recommends USEPA clarify that the requests must be submitted within 120 days of the initial exceedance. In doing so, SWANA requests that the action will preclude an exceedance from being considered a violation of the operational requirements as stated in Section 60.753(g).

On a similar note, SWANA requests clarification as to whether agency approval is required for corrections other than collection system expansion if the corrections are more appropriate (i.e., pumping liquid levels) and the wells achieve the operating standard(s) within 120 days of the initial exceedance. In many cases, where compliance cannot be achieved within 15 days at wellheads, the most appropriate remedy is not system expansion. Such alternative remedies include: Installation of liquid pumps, additional tuning, decommissioning wells or repair of damaged wells, piping or seals.

USEPA Response: *Sites should submit written request for alternative timeline as soon as possible but before 120 days has passed. The site should submit the request when it knows after initial attempts that it cannot remedy the exceedance within 15 days.*

12) Clarification on Areas Exempted from Surface Emissions Monitoring

According to the NSPS (Section 60.755(c)), the owner or operator shall monitor surface concentrations of methane along the entire perimeter of the collection area and along a pattern that traverses the landfill at 30 meter intervals (or a site-specific established spacing) for each collection area on a quarterly basis. Some USEPA Regional offices and state air agencies are requiring monitoring of all cover penetrations even though these points clearly fall outside of the NSPS requirements. Monitoring is not required for all cover penetrations unless they lie within the monitoring path or have clear signs of distress as the NSPS rules require. Also areas outside of the waste boundary should not be subject to surface emissions monitoring (including leachate cleanout risers). SWANA recommends that USEPA provide guidance or policy memorandum to implementing authorities regarding areas exempted from monitoring.

USEPA Response: *EPA agrees there is no requirement to test on a quarterly basis. EPA does not agree that the regulatory agencies did not have the right to test the type of areas noted in our comment. USEPA will further explore the SWANA recommendation.*

Control Device Monitoring Requirements

13) Clarification of Monitoring Requirements for Reciprocating Internal Combustion Engines (RICE) and Gas Turbines (GT).

The NSPS contains monitoring requirements for "enclosed combustors" in Section 60.756 and also contains a definition for "enclosed combustor" in Section 60.751. Section 60.758(b)(2) contains a requirement to record the average combustion temperature for "enclosed combustion devices." The term "enclosed combustion device" is not explicitly defined in the rule, but we assume that USEPA intended the definition for "enclosed combustor" to apply.

By definition, "Enclosed combustor means an enclosed firebox which maintains a relative constant limited peak temperature generally using a limited supply of combustion air. An enclosed flare is considered an enclosed combustor."

As the definition reads, we believe that RICE and GT are not "enclosed combustors." "Firebox" is not a term that is used in conjunction with RICE or GT. Rather, firebox normally pertains to boilers and heaters, i.e., external combustion devices.

Second, the supply of combustion air to a GT is not limited in a manner that can be controlled or altered. Third, RICE do not have a "relative constant limited peak temperature;" instead, the temperature varies greatly with time as the engine cycles through the power and exhaust strokes. Finally, only enclosed flares are explicitly listed as enclosed combustors.

The South Coast Air Quality Management District (SCAQMD) in particular has approved

alternatives that do not require temperature monitoring for boilers, turbines or internal combustion (IC) engines. Other regulatory agencies have authorized facilities to follow manufacturer's specifications for proper operation of the RICE and GT devices in lieu of temperature monitoring.

The application of the requirement to monitor and record average combustion temperature in Section 60.758(b)(2) is problematic when applied to RICE and GT. A RICE is not normally equipped with the means to monitor temperature inside the cylinders (where combustion occurs). This capability can be added only to some RICE, but is expensive. The combustion temperature inside the combustion zone of GT is typically very hot, and will melt most if not all commercially available thermocouples.

Nonetheless, a USEPA Regional office and a number of state agencies have been interpreting the NSPS to require that we *directly* monitor the combustion temperature of RICE and GT burning landfill gas, and have written such provisions into Title V permits. This is neither practical nor cost effective, as other commonly used methods are readily available, such as monitoring what is normally referred to as "T5" in GT and monitoring exhaust oxygen in RICE.

Instead, the monitoring provisions for RICE and GT should be established under the alternative means of control provisions in 60.756(d).

Further, USEPA should limit the applicability of the NSPS control requirements for landfills to flares or combustors not related to energy recovery/beneficial use projects. Energy recovery projects vary widely and are infinitely more complex than flaring operations. Moreover, other existing federal and state air emissions regulations apply to energy recovery devices which operate on LFG (i.e., NSPS and NESHAPs for stationary turbines, NESHAPs for IC engines). LFG may be combined with conventional fuels such as natural gas, oil, or coal for use in a boiler or process heater. Emissions of NMOCs from these types of equipment are of no regulatory concern outside of NSPS for landfills. Such issues are handled by the construction and operating permits for the combustion device itself.

USEPA Response: *Addressed in the NSPS supplemental rule proposal. Propose to remove "combustion" from monitoring requirement so that sites have flexibility on where to measure and monitor for temperature.*

14) Clarification whether Section 60.756(b)(1) requires stack temperatures to be monitored and recorded in Degrees Celsius.

Although this Section seems to be referring to accuracy of the monitoring device, accuracy is not a function of the temperature scale.

USEPA Response: *Agree. Temperature recorded in either Celsius or Fahrenheit would be acceptable*

15) Clarification on Monitoring Requirements for Treatment System Operations

Many state agencies and USEPA Regional offices are rendering site-specific determinations to MSW Landfills for what constitutes LFG treatment at the facilities. For sites where the LFG is treated such that it meets USEPA's definition of treatment (per the May 2002 NSPS proposed technical corrections and preamble), then devices which operate on treated LFG (i.e., engines, turbines, boilers, etc) would be exempt from testing, monitoring record keeping and reporting of NSPS parameters (and inclusion in SSM Plans). The treatment system however ***is*** subject to the NSPS and NESHAPs requirements as it is considered the ***control system*** (see Section 60.752(b)(2)(iii)(C)).

SWANA understands that the USEPA and state agencies are in the process of determining what monitoring and record keeping requirements should apply to treatment systems to determine proper operation. According to several SWANA members, regulatory agencies have requested that MSW Landfills present the parameters for which they are going to demonstrate compliance.

USEPA and state agencies are exploring monitoring for dew point. SWANA does not recommend monitoring for dew point as we do not believe it is necessary or a proper gauge of compliance. Further, dew point monitoring can be challenging due to wintertime conditions. Dew point meters tend to freeze as dew point of the LFG can be higher than the air temperature.

As for dew point, the temperature at which moisture in the gas condenses, is dependent on several factors. First, LFG inlet temperature determines the amount of moisture in the LFG. It is often assumed that LFG is totally saturated, meaning a relative humidity of 100%, at the inlet to the gas processing system. The higher the inlet temperature the more water vapor in the LFG. The law of partial pressure sets the temperature at which water vapor will condense after the LFG has been pressurized. As gas pressure increases so does the temperature at which the vapor will condense. How much vapor condenses depends on the temperature at a given pressure. If the treatment system uses a multistage blower followed by an air cooled gas cooler, little, if any, vapor would condense. However, if the treatment system includes a gas compressor followed by the same air cooled gas cooler, more water vapor would condense. Use of a refrigeration unit will remove more water from the gas and the higher the pressure the more water would be removed.

To verify if the LFG is being "compressed, cooled and filtered" properly, SWANA recommends measuring temperature and/or pressure upstream of the filter. SWANA members are currently focusing on temperature as the parameter of choice and will need to work out the complexity associated with annual ambient temperature fluctuations (i.e. less cooling needed in winter, some months we may have chillers off line in northern

states, etc.). An engineer could calculate and predict what temperature above a certain point would not produce condensation. When that pre-determined temperature threshold is exceeded, the LFG may, depending on the LFG compression system, be too hot to send into the process at which point the treatment system will shutdown.

Not every treatment system is identical so flexibility in determining monitoring requirements should be allowed. Some equipment does not require that the LFG be refrigerated however other types of equipment require some level of refrigeration. Based on operational experience, Caterpillar engines seem to run fine on compressed air cooled gas; Waukesha engines won't operate well unless the LFG is refrigerated. However, in both cases, the LFG has been compressed and cooled and filtered. Therefore SWANA recommends that USEPA work with SWANA to determine appropriate monitoring parameters for treatment systems. Our membership is experienced in designing and operating LFG treatment systems as part of beneficial use projects.

USEPA Response: *Agree with SWANA recommendation. USEPA and SWANA will continue to discuss appropriate monitoring requirements for treatment systems. The NSPS supplemental rule proposal may allow for use of engine/turbine manufacturer's specifications on fuel quality. Where manufacturer's specifications are not available then parameter monitoring for temperature or pressure may be required.*

Operational Requirements

16) Clarification as to whether additional wells or collectors, voluntarily established by the landfill operator, but not specified by the Gas Collection and Control System (GCCS) Design Plan, are subject to NSPS Operational Requirements.

This issue frequently arises when "extra" collectors are added or the leachate collection system is connected to the GCCS to control odors, to increase the quantity of LFG available for beneficial use, or to meet other landfill operating needs beyond regulatory compliance with the rule. Since a professional engineer certified that the GCCS Design Plan would meet the required level of LFG control without the use of the "extra" collectors and the Administrator approved the Design Plan, SWANA does not believe that the operating requirements should be beyond that required by the NSPS rule. Further, because these devices are installed for purposes other than to meet the requirements of the NSPS rule (i.e., odor control, energy recovery projects, etc), their design may preclude their ability to meet the stipulated operation requirements.

An example of this situation is when the leachate collection system is connected to the GCCS for odor mitigation purposes. Because the leachate collection layer extends close to the landfill surface and during initial cell development portions may even be exposed directly to air, a large amount of air can be drawn directly through the leachate system

causing elevated oxygen concentrations at the wellhead. In this situation it is often impossible to limit the oxygen concentration to less than the regulatory standard of 5 percent. This, however, does not cause an operational problem as the air never moves through the waste and therefore does not increase the risk of a subsurface fire.

Another example is when LFG is collected from the leachate collection system and the leachate level rises above the perforated portion of the leachate collection riser pipe. In this situation, LFG does not move through the riser and an unrepresentative but elevated oxygen concentration can be measured if a small quantity of air accidentally enters the top of the riser.

Yet a third example is where a landfill owner or operator decides to install and operate wells in areas not yet required to have collection (i.e., initial waste placed is less than 5 years old in active fill area). There should be no obligation to collect the LFG and therefore no monitoring requirements for these wells until the age of the initial waste requires such operation.

Although the NSPS rules may allow for regulatory approval of alternative oxygen standards to resolve some of theses issues, regulatory agencies have proven extremely reluctant to grant such alternatives due to unfamiliarity with LFG control technology. A simpler solution would be to clarify in guidance that additional voluntary wells on collectors may be excluded from the performance standards used for wells to establish NSPS compliance.

USEPA Response: *If the collectors are located in an area of the landfill not yet required to have control (ie., initial waste in place is not yet 2 years in closed or final grade area or 5 years old in active areas) then the monitoring and operational requirements would not apply. If however, the collectors are located in areas of the landfill which require gas control, then the collectors must be monitored and achieve operating limits for pressure, oxygen and temperature. Alternative monitoring procedures and/or operating parameters for these collectors may be requested as part of the Design Plan or addendum to the Design Plan.*

17) How does the NSPS standard apply if GCCS is down greater than 1 hour?

Section 60.755(e) states that the compliance provisions apply at all times, except during periods of start-up, shutdown or malfunction provided that the duration of the start-up, shutdown or malfunction shall not exceed 5 days for collection systems and shall not exceed 1 hour for treatment or control devices. The collection and control systems are designed so that when the control system is off-line the gas moving equipment is shutdown as well preventing gas from being vented to atmosphere. Therefore, the entire collection system is off-line when the control system is shutdown.

SWANA membership has always interpreted the 1-hour and 5-day downtime provisions to mean that the collection system cannot be down for more than 5 days at a time. Further, the control system (i.e., flare) cannot be down for more than 1 hour at a time ***while the collection system is running, in a manner that allows uncontrolled LFG to vent to the atmosphere***. If the true meaning of the NSPS provision is that the control system cannot be down for more than 1 hour at a time even if the collection system is off, then what is the purpose of the 5-day provision?

The 1-hour downtime for control devices has been discussed among SWANA representatives and with USEPA as to its practical application and compliance implications. SWANA continues to support technical corrections to the NSPS rule to clarify that control device downtime more than 1 hour but less than 5 days is not considered a violation of the standard. SWANA further recommends that USEPA clarify the intent of Section 60.755(e) as it is confusing as to how in practice it applies.

USEPA Response: *USEPA is proposing to remove the 1 hour downtime limitation from the NSPS Rule as part of the proposed supplemental rule change. USEPA further proposed to remove the 5-day time limit for the GCCS and then defer to the Startup Shutdown and Malfunction Plans to dictate appropriate downtime for the control devices and collection system. Industry representatives were concerned that state and local regulatory agencies would have too much discretion absent a definitive time limit which could cause widely varying time limits across the nation. Based on discussions with industry representatives, USEPA will likely retain the 5-day shutdown provision for the GCCS.*

18) Agency Approval of GCCS Design Plans.

Per the NSPS, a GCCS Design Plan must be submitted within one year of the first NMOC report showing the landfill exceeds 50 Mg/yr NMOC. Subsequent to this deadline, a gas system must be installed and operating within 30 months of the first NMOC report showing the landfill exceeds 50 Mg/yr NMOC.

In the NSPS background information document ("Air Emissions from Municipal Solid Waste Landfills - Background Information for Final Standards and Guidelines," EPA-453/R-94-021) USEPA states:

> *"After the 1-year described above, a landfill will have 18 months to install an approved collection system. Collection system design plans should require 180 days for review and revisions; therefore 1 year is allowed for installation of the collection system."*

Clearly from this language, USEPA anticipated that state/local agencies would approve design plans within 180 days, and certainly within one year. To date, many GCCS Design Plans have not been approved by the regulatory authority although the regulation

requires agency approval of the GCCS Design Plan as stated in Section 60.752(b)(2)(i)(D). Landfills have included various alternatives as allowed per Section 60.752(b)(2)(i)(B) in the GCCS Design Plans for which agency approval/concurrence is necessary. Absent such approval, facilities have installed and began operating the collection and control systems by the regulatory deadline in accordance with the GCCS Design Plans. Landfills are therefore unsure of their compliance status with the standard, specifically where facilities have implemented the alternatives discussed in the GCCS Design Plan.

SWANA recommends that absent agency approval of the GCCS Design Plans, a de facto approval of a GCCS Design Plan should be implemented where the approving agency fails to render an approval or disapproval of the GCCS Design Plan prior to the deadline for the collection and control system installation.

USEPA Response: *This issue requires additional consideration perhaps as a discussion point in the Preamble to the NSPS supplemental rule changes being proposed.*

19) Clarification of System Monitoring Start Date for Existing Gas Systems Once NMOC Emission Rate Exceeds 50 Megagrams per Year

Various landfills with documented NMOC emission rates of less than 50 Mg per year voluntarily operate collection and control systems. Such landfills may exceed the 50 Mg per year threshold at some point in the future requiring that a GCCS Design Plan be submitted and operation of the gas system commence in accordance with NSPS. These systems may require upgrading to achieve the NSPS standard however other systems may already meet the NSPS requirements. Regulatory agencies are inconsistent in their interpretation of when the operational and monitoring requirements would apply to the system.

SWANA recommends that USEPA clarify the date upon which NSPS monitoring would be applicable. We believe it should be no earlier than the approval date of the Design Plan where no upgrades of the GCCS are required. Where upgrades of the system are required, then the facility should be allotted the entire compliance timeline prescribed in the regulation (within 30 months after the first annual report in which the NMOC emission rate equals or exceeds 50 Mg per year).

USEPA Response: *USEPA agrees with SWANA's recommendation that NSPS monitoring would be applicable no earlier than the approval date of the Design Plan where no upgrades of the GCCS are required. Where upgrades of the system are required, then NSPS monitoring would be applicable no earlier than the entire compliance timeline prescribed in the regulation (within 30 months after the first annual report in which the NMOC emission rate equals or exceeds 50 Mg per year).*

Testing Requirements

20) Tier 3 Testing – Alternatives to Method 2E:

The NSPS provides for site-specific gas generation estimates in determining total NMOC emissions for compliance purposes (Tier III procedure, 40 CFR 60.754(a)(4)). The Tier 3 procedure requires Method 2E of appendix A for determining site-specific methane generation rates. Method 2E involves measuring the background LFG pressure, then pumping a gas extraction well at a known, measured flow rate, monitoring the gas quality in the probes to ensure that significant surface leakage is not occurring as a result of the pumping, and measuring the steady-state pressure drawdown at monitoring probes completed at various distances from the extraction well (Method 2E Section 8.7). The pressure drawdown at a monitoring probe is computed as the difference between background LFG pressure and the pressure attained during pumping. A radius of influence (ROI) is estimated, defined as the distance from the extraction well that the drawdown becomes zero within measurement error (Section 8.7.5). The measurement error specified in Method 2E is 0.02 mm Hg. The assumption is then made that all the gas flowing to the well is generated within the cylindrical refuse volume defined by the ROI and the depth of the landfill refuse, and that the LFG extraction rate is equal to the rate of gas generation within that volume. The total LFG generation rate for the landfill is calculated by dividing the gas extraction rate by the fraction of the total refuse volume represented by the cylindrical volume (Section 8.9).

Several fundamental flaws in Method 2E make it impossible to determine the LFG generation rate using this methodology:

1. The ROI concept violates basic principles of gas flow to wells. Based on well-established principles of fluid dynamics, the pressure effects of subsurface sources and sinks are additive and independent of each other. The LFG generation rate and, therefore, the background LFG pressure are considered to be constant during the test. Thus any pressure drawdown associated with gas extraction is independent of the LFG generation rate, as is the ROI. As a result drawdown, computed as the difference between background landfill pressure and that attained during pumping, will be the same regardless of whether the background landfill pressure is high due to a high LFG generation rate, low due to a small LFG generation rate, or zero in the extreme case of no LFG being produced. The ROI and the LFG generation rate estimated by Method 2E will be the same for each of these cases. These principles of gas flow and this conclusion are provided in more quantitative detail in Walter (2003)[1].

1 Walter, G. R., 2003. Fatal flaws in measuring landfill gas generation rates by empirical well testing. J. of Air & Waste Management Assn. 53 p 461.

2. Independent of the theoretical validity of Tier 3 measurements, in practice the ROI (and the predicted LFG generation rate) is affected by the cover and landfill refuse gas permeabilities, neither of which are directly associated with LFG generation. A given gas well extraction rate will result in a larger ROI if the gas permeability of the cover is small or the vertical anisotropy (ratio of horizontal to vertical gas permeability) is large. Thus a landfill equipped with a low permeability cover will exhibit a smaller Tier 3 LFG generation rate than the same landfill equipped with a high permeability cover.

3. The ROI is also affected by the pressure measurement sensitivity, which also is independent of the actual LFG generation rate. The computed ROI will increase with the sensitivity of the pressure measurements because the calculation of smaller and smaller measurable (non-zero) drawdowns will be possible. Therefore, the more sensitive the pressure measurements, the larger the computed ROI, and the smaller the calculated total gas generation rate.

Given the conceptual and practical problems inherent in Method 2E, it is recommended that USEPA reconsider requiring Method 2E as the obligatory method to be used in measuring gas generation rate. It is recommended that the rule be modified to allow approved states to permit the use of alternate gas generation rate estimation methods to be used as long as they are demonstrated to be equally or more protective of human health and the environment.

USEPA Response: *This issue was tabled for future discussions. Follow-up with Foston Curtis directly if want to pursue changes to test method.*

21) Revisions to Performance Testing Requirements for Open Flares

40 CFR 60.18 is applicable to open (utility) flares. The regulation requires the use of Method 18 to determine waste gas composition for purposes of determining the heat value of the gas stream. For landfills, the methane value is routinely monitored, and a vast amount of historical data shows that the composition is typically around 50% methane, which results in a heat value of about 500 Btu/scfm. A preferred approach would be to allow collection of a LFG sample from a flare header into either a SUMMA canister or a Tedlar bag and laboratory analysis of a sample by EPA Method 3C or ASTM D3588. This would avoid the costly effort needed to set up and operate a formal Method 18 sample train and gas chromatograph in the field.

The USEPA Emission Measurement Center routinely grants site-specific approvals for using Method 3C or ASTM D3588 in place of Method 18, however SWANA members have experienced difficulty with state and local air agencies accepting the approvals.

Some regulators require a modification to the Title V Operating Permit or Construction Permit before the alternative is authorized for use at the facility. SWANA recommends that USEPA revise 40 CFR 60.18 to allow for alternative methods and procedures approved by the Administrator. In the interim, SWANA recommends that USEPA issue a policy memorandum or guidance document which clarifies that Method 3C or ASTMD 3588 are approved alternatives to the methods prescribed in 40 CFR 60.18.

USEPA Response: *A proposed rule change on test methods and procedures should be published December 2005 or January 2006 which will amend 40 CFR 60.18 to allow for Method 3C in lieu of Method 18. Method 25.3 will not be addressed in this rules package.*

22) Clarify Performance Test for LFG Fueled Pilot For Standby Flares.

There are situations where an enclosed flare is used as standby for an energy recovery plant. During the standby period, a continuous LFG fueled pilot may be utilized and a flame scanner or thermocouple is used to confirm the presence of a flame on the pilot. In this standby mode there is no way for the enclosed flare stack to maintain the minimum stack temperature established during the performance test, yet regulatory agencies may deem this unacceptable. In any case, the resulting emissions are certainly de minimis, and this practice avoids the need to buy auxiliary fuels off site to maintain the pilot. SWANA recommends that USEPA clarify in guidance that such standby pilot systems do not need to meet the temperature requirements of an NSPS flare.

USEPA Response: *Agree with SWANA recommendation. Standby pilot systems do not need to meet the temperature requirements of an NSPS flare.*