Lee/Hendry Regional Solid Waste Disposal Facility
2024 Gas Collection and Control System

Technical Specifications

Lee-Hendry County Landfill
5500 Church Rd.
Felda, Florida 33930

SCS ENGINEERS

09223126.00 | June 2024

3922 Coconut Palm Dr, Ste 102
Tampa, FL 33619
813-621-0080

Table of Contents

Technical Specifications

Dan Copper, PE
FL PE LICENSE NO. 66440

SECTION 01 10 00

SUMMARY OF WORK

PART 1 – GENERAL

1.01 PROJECT DESCRIPTION

A. The project work to be performed by the Contractor consists of furnishing all labor, materials, equipment, tools, transportation, services, incidentals, and performing all work necessary to complete the project, in place and ready for service in accordance with the Plans and Specifications prepared therefore and entitled "Lee/Hendry Regional Solid Waste Disposal Facility (Facility) Gas Collection and Control System (GCCS)". The work generally includes but is not limited to the following items:

1. Construction staking/system layout/surveying prior to construction.

2. Installing below grade high-density polyethylene (HDPE) landfill gas (LFG) extraction wells and horizontal collectors with sumps at the low points.

3. Installing below grade high-density polyethylene (HDPE) LFG laterals and header, air supply line, and dewatering discharge line. Header appurtenances also to be installed include, but are not limited to, sumps, isolation valves, access risers, and blind flanges.

4. Installing header isolation valve, airline isolation valves, and liquid conveyance line isolation valves, cleanouts, and air release valves.

5. Contractor is responsible for procurement and cost of clean soil backfill.

6. Installing gas wellheads, including fittings, valves, tubing, hoses, clamps, regulators and filters, and related appurtenances.

7. Interconnection of electrical service and installation of new control/disconnect panels to ensure new flare and existing appurtenances have the necessary electrical required.

8. Installation of the new compressed air system including all electrical wiring and conduit required to power proposed and existing entities as outlined in the drawings.

9. Offloading and installation of new 2,500 scfm flare station skid. Installing all electrical wiring and conduit required to power proposed entities as outlined in the drawings.

10. Pouring and testing of concrete pads for Blower/flare, air compressor and propane tank and future generator.

11. Connection of all electrical wiring to new flare skid.

12. Install condensate management piping to remove condensate from proposed flare skid as shown in drawings.

13. Install lift station with submersible pump to discharge to the ponds as shown in the drawings.

14. Fencing to house flare, blower, and air compressor station with structure.

15. System start-up and testing of new system once installation has been completed by electrical and mechanical contractors including verification and technical assistance with electrical wiring and conduit required to power and operate all proposed entities as outlined in the drawings.

16. Repairing access road in areas impacted by construction activities.

17. Conformance surveying

18. Providing as-built documentation (record drawings)

1.02 WORK SEQUENCE

Construction work is to be sequenced to accommodate work with any other contractors on site or County forces.

1.03 CONTRACTOR USE OF PREMISES

A. The land available for the Contractor's use during the performance of the project will be limited to the area as shown on the Contract Drawings and identified as "Contractors Storage/Laydown Area." The exact area will be determined during the pre-construction meeting with the coordination of the County and Contractor.

B. Work Days: Allowable work times shall be Monday through Friday 7:00 a.m. to 4:00 p.m. and Saturday 7:00 a.m. to 12 p.m., excluding Sundays and County observed Holidays. Contractor shall request in writing to the County 48 hours' prior to Sunday or County observed Holiday to work.

C. Access: No later than 10 days after notice to proceed, the Contractor shall arrange with the County a sequence of procedures, means of access, space for storage of materials and equipment, and use of approaches and roadways. Contractor's use of the premises shall be confined to the areas approved by the County.

D. Smoking: Smoking is prohibited at the Landfill.

E. Contractor shall not dispose any refuse on site without approval of the County and in accordance with Section 02 41 16, Refuse Handling, Storage, and Disposal.

F. Areas outside the limits of construction that have been disturbed by the Contractor shall be returned to its original condition, or better, upon completion of the work at no additional cost to the County.

G. Contractor shall coordinate with the County for available area to locate Contractor's trailer. Non-potable water and electrical services are already available. If using the electrical service, the Contractor is responsible for coordinating with the electric company for any connections and pay for electrical services at no additional cost to the County.

1.04 WORK HOURS

A. Regular working hours are defined as Monday through Friday 7:00 a.m. to 4:00 p.m. and Saturday 7:00 a.m. to 12 p.m., excluding Sundays and County observed Holidays. Contractor shall request in writing to the County 48 hours' prior to Sunday or County observed Holiday to work.

B. Construction Quality Assurance (CQA) shall be the responsibility of the County and CQA Consultant who will act as the County's representative. The CQA Consultant is a party independent of the Contractor and is responsible for field-testing, observing, and documenting activities related to the construction and/or permit documents and the CQA Plan. The CQA Consultant will provide a full-time Construction Quality Assurance Representative (CQAR) who will observe construction activities.

C. Requests for approval by the County to work other than regular working hours must be submitted to the County at least 48 hours prior to any proposed weekend work or extended workweek hours.

D. Periodic unscheduled work hours on weekdays will be permitted provided that 24 hours notice is provided to the County. Maintenance and cleanup may be performed during hours other than regular working hours.

1.05 COUNTY OCCUPANCY AND LANDFILL OPERATIONS

The Contractor shall cooperate with the County during construction operations to minimize conflicts with County work and facilitate County usage. The Contractor shall perform the work so as not to interfere with the County's operations, maintenance, environmental monitoring, and other County activities at the site.

1.06 SITE CONDITIONS

A. Existing Grades: The existing grades may vary from those indicated on the Plans due to landfill settlement and ongoing filling operations.

B. Existing Features: The Contract Documents require the Contractor to field verify the location of existing features. Existing features include but may not be limited to the following: stormwater drainage structures and underground pipes, stormwater terraces and swales, leachate collection system cleanouts, sumps, pump stations, electrical panels, forcemain, utilities, roads, guardrails, drainage culverts, monitoring wells and piezometers, fences, and buildings.

C. Preconstruction Survey - The Contract Documents require the Contractor to prepare a preconstruction survey prior to beginning work. Refer to Section 01 50 00 Site Conditions Surveys for requirements.

D. The Contractor shall enforce safety procedures to minimize hazards to workers, the public, and the environment.

1.07 LINES AND GRADE

A. All work shall be done to the lines, grades, and elevations shown on the Contract Drawings.

B. Topographic survey information (north, the grid, and the coordinates shown) is referenced to the East Zone of the Florida State Plane Coordinate System. Basic horizontal and vertical control points have been established. These points shall be used as datum for the work. All additional survey, layout, and measurement work shall be performed by the Contractor as a part of the work.

C. The Contractor shall provide experienced instrument personnel, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, the Contractor shall furnish, without additional cost to the County, competent personnel from its force and such tools, stakes, and other materials as the Engineer may require in establishing or designating control points, checking survey, layout, and measurement of work performed by the Contractor.

1.08 ERRORS AND/OR OMISSIONS IN PLANS AND SPECIFICATIONS

The intent of the Specifications is to outline or indicate the items of work, or both, which cannot be readily shown on the Drawings and, further to indicate the types and qualities of materials. Drawings and specifications shall be considered as being complimentary and items or work mentioned or indicated in one and not in the other shall be included as if mentioned in both. Should Drawings disagree in themselves or with the Specifications the better quality or greater quantity of work or materials shall be estimated upon, and shall be provided.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 20 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall receive and accept the compensation provided in the Contract as full payment for furnishing all labor, equipment, and materials and for performing all construction/operations necessary to complete the work as described in the Contract, and in full payment for all losses or damages incurred during the work, for any discrepancies between actual and estimated quantities, or from any unanticipated difficulties which may arise during the work until final acceptance by the County.

B. Payment for the various items on the Contractor's Bid Form, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles and for all labor, operations, supervision, overhead, and profit, and incidentals appurtenant to the items of work being described as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor.

C. No separate payment will be made for any item that is not specifically set forth on the Contractor's Bid Form and all costs therefore shall be included in the prices named on the Contractor's Bid Form for the various appurtenant items of work. Payment for complying with the safety requirements for construction on the work site shall be included in the contract unit price paid for the various items of work wherein it is required, and no separate payment will be made therefore.

D. The total Bid Amount shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment and tools; including all costs and expenses for taxes, commissions, transportation charges and expenses, permit fees, patent fees, royalties, handling and tests; and performing all necessary labor and supervision to fully complete the work shall be included in the Bid. All work not specifically set forth as a pay item on the Contractor's Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the unit prices Bid and/or the lump sum prices.

E. The quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item of work has not been established by the Contractor's Form, Contractor shall include the cost for that work in some other applicable Bid Item, so that his Bid for the project does reflect his total price for completing the work in its entirety.

F. All estimated quantities stipulated on the Contractor's Bid Form are approximate and are to be used only (a) as a basis for estimating the probable cost of the work and (b) for the purpose of comparing the Bids submitted for the work. The actual amounts of work done and materials under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished unless it exceeds the estimated quantities in which case a change order must be approved prior to payment for quantities exceeding the estimated quantity.

G. The Contractor shall field verify all quantities and dimensions shown on the Drawings or contained in the Contract Specifications.

H. The Contractor shall be responsible for establishing contracts with its subcontractors, which have a measurement and payment in accordance with this Section. If the Contractor establishes a contract with its subcontractors, which is in conflict with this Section, any additional cost incurred will be borne by the Contractor.

I. Restoration is not a separate pay item but is considered to be an integral part of the work under the contract, and all contract Bid prices include the cost of restoration necessitated by the work related to that Bid item. Restoration includes existing structure and property, paving, stabilized roads, drainage piping and ditches, catch basins, head walls, yard culverts, driveways, lawns and ground areas, walkways, and irrigation systems, which are altered, removed or damaged during construction. Cleanup is an integral part of restoration.

1.02 COMPUTATION OF QUANTITIES

A. Measurement of quantities expressed as area shall be based upon a horizontal, planimetric projection to the work limits as determined by survey record drawings prepared by a surveyor licensed in the State of Florida. Cost of surveying shall be paid by Contractor, and incorporated into Bid Items, as appropriate.

B. Measurement of linear Items will be for quantities actually field installed to the specified work limits, based upon surveyed stations recorded along the straight or curved centerline of each respective Item. Measurement conducted by survey is to be conducted by the Contractor's approved surveyor licensed in the State of Florida.

C. Payment will be made to the limits as specified in the Contract Documents. If the constructed limits are less than the specified limit, payment will be made to the actual limits of construction as shown on the Record Drawings. Payment for quantities that exceed the specified contract limits will only be made with the approval of the County with acceptable supporting documentation from the Contractor. Payment for quantities that exceed the Contract quantities can only be obtained through an approved Change Order.

D. No partial payments shall be made for the installation of items which have not been tested and approved by the Engineer.

E. Payment will be made monthly until completion of each unit price item based on quantity completed by Contractor, and verified by the Engineer. Final payment will be based on quantity calculated from Record Drawings prepared by a surveyor licensed in the State of Florida and confirmed by field measurement by the Engineer.

F. Payment for Lump Sum items will be made as described for each individual lump sum Bid Item. The Contractor shall not rely on the estimated quantities given, but shall instead estimate all quantities for the item independently for the basis of their Bid. No claim shall be made by the Contractor for deviations between the Contractor's estimated quantity and the Engineer's estimated quantity including the quantity required to complete the Work. The Contractor shall base their Bid solely on the Contractor's independently estimated quantity.

1.03 VARIATIONS IN ESTIMATED QUANTITIES

A. The quantities given in the Contract Documents are approximate only, and are given as a basis for the uniform comparison of Bids. The County does not expressly, or by implication, agree that the actual amount of work will correspond therewith.

B. The Contractor must provide, for unit price work, a proposed contract price determined on the basis of estimated quantities required for each item. The estimated quantities of items are not guaranteed and are solely for the purpose of comparing Bids. Each such unit will be deemed to include an amount for overhead, profit and indirect costs for each separately defined item.

1.04 BID FORM

A. The Bid Form for the items contained within this Section can be found in the contract documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT - REQUIRED

A. Item No. 001 – Mobilization / Demobilization (Lump Sum)

Measurement. Measurement for this item shall be on a lump sum basis based on percentage of work completed. Mobilization and Demobilization should not exceed 5% of the total contract value.

Payment. Payment for this item shall be on a lump sum basis as described below. No price adjustments will be made for this item due to changes in the work. Item includes, but not limited to, performance of preparatory paperwork and construction operations, movement of personnel and equipment to the project site, safety equipment, furnishing, and installing at the beginning of the project, as well as removing and disposing at the conclusion of the project, required facilities to begin work on a substantial phase of the Contract.

The Contract Price for mobilization/demobilization shall be subject to the following provisions:

a. Partial payments for mobilization/demobilization will be made in accordance with the following schedule.

Condition or Percent of Total Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item
Submittal/completion of items listed in Section 013010 prior to construction	25
10 percent total contract amount earned	40
25 percent total contract amount earned	60
50 percent total contract amount earned	80
100 percent total contract amount earned	100

The final payment for mobilization/demobilization will not be made until all temporary facilities, excess materials, temporary erosion and sedimentation controls, equipment, and appurtenances used to perform the Work and all remaining construction debris have been removed from the site. Additionally, this shall include the submittal of all final record drawings, record survey project photos, release of liens, warranties, and other incidentals as specified as requirements of project close-out.

B. Item No. 002 – Project Survey (Lump Sum)

Measurement. Measurement for the Work specified in this item shall be based on the schedule below for payment and all Items related to survey the Work shall be included in the Lump Sum price. Project Survey shall not exceed 3% of the total contract value.

Payment. Payment for this item shall be on a lump sum basis as described below. No price adjustments will be made for this item due to changes in the work. This item will consist of all surveying and control required by the Contract Documents. Surveying shall be performed as described in the technical specifications. This work includes establishment of appropriate local site benchmarks, baseline surveys, location of utilities, stakeout of elevation and positional information required to complete the construction, progress payment surveys, and obtaining all survey information required to compile Record (As-Built) Drawings as required by the Contract Documents. As-built drawings must be signed and sealed by a surveyor licensed in the State of Florida.

The Contract Price for Project Survey shall be subject to the following provisions:

a. Partial payments for surveying will be made in accordance with the following schedule.

Condition or Percent of Total Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item
Preconstruction Survey	25
LFG System Survey	50
Final Survey - Record Drawings and As-Built signed and sealed survey as required	100

The following defines complete documents for the surveys notated above:

Preconstruction Survey: The preconstruction survey shall include a survey of the existing conditions within the limits of construction of the Gas Collection and Control System (GCCS). The survey shall note all above grade structures, piping, and features which may or will be impacted by the work. The preconstruction survey shall include proposed location of landfill gas header and lateral pipes, stub out locations for future construction, vertical wells, remote wells, access riser points, isolation valves, air release valves, sumps, road crossings, connection points to existing GCCS, sections to be abandoned and removed, and any other improvement as part of the GCCS construction. Vertical well locations to include Northing, Easting, ground surface elevation to determine any adjustments prior to drilling.

LFG System Survey: The LFG system survey shall include survey locations of the landfill gas header and lateral pipes, stub out locations for future construction, vertical wells, remote wells, access riser points, isolation valves, air release valves, sumps, road crossings, bollards, and any other improvement as part of the GCCS construction.

Final Survey - Record Drawings and As-Built: Following completion of the LFG Survey, the final survey will include all features of the project installed as part of the construction project and all existing features within the limits of construction. The final survey shall include, but not limited to, GCCS components, all above grade structures, piping, sod limits, roadways, stormwater down chutes, and features that were impacted by the work.

The Contractor shall, throughout the project, maintain a redline set of construction drawings noting deviations or actual installed conditions for the GCCS construction. As part of Final Completion, the Contractor must submit a complete set of final Record Drawings based on the redlines maintained throughout the project which identify the actual constructed conditions. These record drawings shall use the construction drawings as a base and show changes by cloud and strikethrough in electronic format (AutoCAD 2018 or newer). The record drawings shall incorporate the surveys listed above and any other changes made to the components of the GCCS into the set so to create a single Record Drawing Set for the project. A draft Record Drawing set, in both hardcopy and AutoCAD 2018 (or newer) format in accordance with the specifications, must be submitted to the County and Engineer for review in order to grant Substantial Completion. Final completion cannot be granted until certified Record Drawings (hardcopy and AutoCAD) signed and sealed by a Florida licensed Professional Engineer or Land Surveyor and the Project Record Documentation package is submitted to and approved by the County and Engineer. The Record Drawings are critical to the County and must be accurate to receive approval by the Florida Department of Environmental Protection (FDEP) for operation of the facility.

Partial Surveys of Work: It is understood that the Contractor may elect to survey each section of the GCCS system separately. Partial surveys must be submitted to the Engineer to determine that the section the Contractor is requesting to continue working in meets the design requirements. The Contractor may not continue work until the partial survey is approved. Partial surveys are not required to be signed and sealed at the time of submittal, however, the partial surveys used to compile the complete survey for each of the surveys listed above, must not deviate from the partial survey submitted and the complete survey must be certified for submittal. Payment for surveys will not be made until the complete, certified survey is submitted and approved. However, partial surveys may be used for payment of work items such as soil and piping upon review, agreement, and approval by the County, Engineer, and CQA Representative.

C. Item No. 003 – 36-inch Diameter Bore with 8-inch Diameter HDPE SDR 11 Casing (Vertical Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified landfill gas wells from existing ground surface to the bottom of the well bore as measured in the field by the Engineer.

Payment. Payment for this item will be at the contract unit price per linear foot installed. Payment will include all boring, stone, soil, bentonite, geotextile, well bore reinforcement grate, backfilling, waste relocation to working face, health and safety requirements, HDPE piping (solid and perforated), connections, fittings, and shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents. Price shall include the above-grade riser pipe at each well.

D. Item No. 004 – Boring Refusal (Vertical Foot)

Measurement. Wells that must be abandoned due to insufficient depth resulting from boring refusal shall be paid on a linear foot basis as measured in the field by the Engineer from existing ground surface to the bottom of the well bore. No boring may be abandoned without approval of the Engineer. Proper backfill of abandoned boreholes will include clean soil to surface. This item shall include all material, labor, equipment, waste relocation to working face, backfill transportation, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

Payment. Payment for this item will be at the contract unit price per linear foot of boring, and includes boring, and backfilling with clean soil.

E. Item No. 005 – 18-inch HDPE SDR 17 Landfill Gas Header Pipe (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe size wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot of installed 18-inch HDPE SDR 17 header piping. Payment includes trench excavation, loading, hauling, and unloading of excavated waste from GCCS trenches and disposing of at the active face; loading, hauling, and unloading of clean soil from adjacent borrow area and placed into GCCS trenches; placing pipe bedding, clean soil backfill, soil compaction, fittings, piping, connections, cutting and capping of pipes to be abandoned in place, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

F. Item No. 006 – 8-inch HDPE SDR 17 Landfill Gas Lateral Pipe (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot of installed 8-inch HDPE SDR 17 lateral piping. Payment includes trench excavation (5 ft deep or less), loading, hauling, and unloading of excavated waste from GCCS trenches and disposing of at the active face; loading, hauling, and unloading of clean soil from adjacent borrow area and placed into GCCS trenches; placing pipe bedding, clean soil backfill, soil compaction, fittings, piping, connections, cutting and capping of pipes to be abandoned in place, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

G. Item No. 007 – 6-inch HDPE SDR 17 Landfill Gas Lateral Pipe (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot of installed 6-inch HDPE SDR 17 lateral piping. Payment includes trench excavation (5 ft deep or less), loading, hauling, and unloading of excavated waste from GCCS trenches and disposing of at the active face; loading, hauling, and unloading of clean soil from adjacent borrow area and placed into GCCS trenches; placing pipe bedding, clean soil backfill, soil compaction, fittings, piping, connections, stub-ups for connections at wellheads, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

H. Item No. 008 – 8-inch Solid Wall HDPE SDR 11 Horizontal Collector Pipe (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot. Payment includes excavation, transportation of excavated refuse to the working face, backfill material, bentonite, backfilling, soil compaction, restoration of cover soils, fittings, piping, connections, risers for connection to wellheads, pipe location markings, quality control surveying, testing, and incidentals. Payment

shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

I. Item No. 009 – 8-inch Perforated Wall HDPE SDR 11 Horizontal Collector Pipe (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot. Payment includes excavation, transportation of excavated refuse to the working face, backfill material, rock, geotextile, bentonite, backfilling, soil compaction, restoration of cover soils, fittings, piping, connections, risers for connection to wellheads, pipe location markings, quality control surveying, testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

J. Item No. 010 – 30-inch CMP Casing for Road Crossing (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item will be at the contract unit price per linear foot installed, including excavation, backfilling, solid corrugated drainage piping installation and connections, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

K. Item No. 011 – 18-inch CMP Casing for Road Crossing (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item will be at the contract unit price per linear foot installed, including excavation, backfilling, solid corrugated drainage piping installation and connections, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

L. Item No. 012 – 3-inch HDPE SDR 11 Pipe in Separate Trench (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item will be at the contract unit price per horizontal linear foot of installed 3-inch HDPE SDR 11 Pipe in a separate trench from LS-01 to the tie-in location at the existing Class III pond. Payment includes fittings, piping, connections, blind flange for future connection, concrete pad at the pond inlet, pipe supports, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

M. Item No. 013 – 3-inch HDPE SDR 11 Condensate Discharge Line in Common Trench (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe size wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot of installed 3-inch HDPE SDR 11 Condensate Discharge Line in a common trench with the air supply line and header or lateral pipe. Payment includes fittings, piping, connections, stub-ups for connection at wellheads and isolation valves, cutting and capping of pipes to be abandoned in place, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

N. Item No. 014 – 2-inch HDPE SDR 9 Air Supply Line in Common Trench (Linear Foot)

Measurement. Measurement for this item shall be on an installed linear foot basis per specified pipe size wherein measurement will be made in the plan view from the LFG System Survey.

Payment. Payment for this item shall be at the contract unit price per horizontal linear foot of installed 2-inch HDPE SDR 9 Air Supply Line with the liquid conveyance line and header or lateral pipe. Payment includes fittings, piping, connections, stub-ups for connections at wellheads and isolation valves, pipe location markings, quality control surveying, pressure testing, and incidentals. Payment shall constitute full compensation for all material, labor, equipment and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

O. Item No. 015 – 24-inch HDPE SDR 17 Condensate Sump with Pump (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed condensate sump with pneumatic pump, including excavation, stone base support, backfilling, clean soil backfill material, concrete ballast, dewatering efforts, fittings, sump and piping installation and connections, monitoring ports, supplied pump, placement and testing of the pump, pump data modules, pump air and discharge hoses, check and ball valves, connectors for air and condensate discharge line, sump flanged lid, testing, connection to header pipe, and any other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

P. Item No. 016 – 18-inch HDPE SDR 17 Horizontal Collector Sump with Pump (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed condensate sump with pneumatic pump, including excavation, stone base support, backfilling, clean soil backfill material, fittings, sump and piping installation and connections, monitoring ports, supplied pump, placement and testing of the pump, pump air and discharge hoses, connections to air and condensate discharge stub-ups, sump flanged lid, testing, connection to horizontal collector piping, and any other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

Q. Item No. 017 – 18-inch Header Isolation Valves (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed unit, including excavation, backfilling, flanges, valves, valve stem extension controls, fittings, spacers, piping installation and connections, flexible hoses, and related component, testing, plastic wrapping and coating, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

R. Item No. 018 – 3-inch Condensate Discharge Isolation Valve with Vault Box (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed unit, including excavation, backfilling, valve with vault box, fittings, spacers, piping installation and connections, pipe supports, related component, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

S. Item No. 019 – 2-inch Air Supply Line Isolation Valves (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed unit, including excavation, backfilling, valves, fittings, spacers, piping installation and connections, pipe supports and related component, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

T. Item No. 020 – 3-inch Condensate Discharge Stub-up with Valve Fittings (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis. This item is for the pump discharge manifold at stub-ups at a new gas well and horizontal collector.

Payment. Payment for this item will be at the contract unit price per supplied unit, including valves, fittings, spacers, installation and connections, testing, and other incidentals. Contractor is to install stub-ups, valves, and valve fittings. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

U. Item No. 021 – 2-inch Air Supply Stub-up with Valve Fittings (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis. This item is only for the check and ball valve at stub-ups at new gas well and horizontal collector.

Payment. Payment for this item will be at the contract unit price per supplied unit, including valves, fittings, spacers, installation and connections, testing, and other incidentals. Contractor is to install stub-ups, valves, and valve fittings. Payment shall constitute full compensation for all material, labor, equipment, and

work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

V. Item No. 022 – 2-inch Condensate Discharge Line Air Release Valve (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed unit, including excavation, backfilling, valves, fittings, spacers, piping installation and connections, pipe supports and related component, flanges, pressure testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

W. Item No. 023 – 18-inch HDPE SDR 17 Header Access Riser (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed vacuum access risers for the 18-inch HDPE SDR 17 header pipe, including completed access riser, fittings, piping, blind flange with neoprene gaskets, connections to header line, monitoring ports, tubing for LFG sampling, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

X. Item No. 024 – 18-inch Header Blind Flange (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis. This item is only for the header blind flanges.

Payment. Payment for this item will be at the contract unit price per supplied unit. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

Y. Item No. 025 – 3-inch Condensate Discharge Dual Cleanout (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed unit, including excavation, backfilling, valves, fittings, spacers, piping installation and connections, testing, and other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

Z. Item No. 026 – Sodding (Square Yard)

Measurement. Measurement for this item shall be on a square yard basis wherein measurement will be made in the plan view from the Final Survey. Areas disturbed by the Contractor that are not required as part of the performance of the work, as determined by the County and Engineer, will not be included in the quantity of payment.

Payment. Payment for this item shall be on a square yard basis for areas which have been disturbed by the CONTRACTOR estimating a 50-foot wide section following the alignment of the LFG header and lateral pipes along the side slopes as shown on the Contract Drawings and in accordance with the Specifications. The pay item includes addition of topsoil, conditioning the topsoil with fertilizer and/or lime application, soil testing, fine grading, supplying and installing sod, anchoring/netting of sod, watering, mowing, replanting, repair of erosion, maintaining areas sodded through final acceptance of the WORK, and any other work necessary to produce a uniform stand of grass. No payment will be made for sod placed outside of the limits of construction shown on the Contract Drawings without prior approval of the ENGINEER. Payment of sod shall not relieve the CONTRACTOR of the need to maintain sod throughout warranty period.

AA. Item No. 027 – LFG Wellheads – (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item shall be at the contract unit price per supplied unit, including new QED Precision Accu-Flo wellheads with fine tune control valve and all required connections, QED well caps, Solarguard flex hose, steel clamps, fittings, monitoring/sample port covers, high liquid level indicator, and HDPE reducers. Contractor shall also include the material and labor for installing the wellheads on remotes, horizontal collectors and any required transitions and fittings. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

BB. Item No. 028 – Compressed Air System (Lump Sum)

Measurement. Measurement for this item shall be on a completed lump sum basis.

Payment. Payment for this item will be on a lump sum basis for the supply and installation of a new compressor capable of supplying a minimum of 100 CFM at 125 PSI, dryer system, and storage tank including a compressor shed enclosure. This pay item shall include grading and compaction of base soils, site work, enclosure, excavation, pipe installation, backfilling, compaction, fittings, supply and installation of the new compressor, dryer, tank, and all mechanical and electrical connections, testing and start-up services. All valves, piping, and related

work to provide full functional compressor/dryer system. Payment also includes all materials, equipment, and setup, including the control panel, electrical conduit, wiring, setup of communications system, computer interface setup, and any other work necessary to provide a fully functional system. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

CC. Item No. 029 – Grading Work for Flare and Blower Skid Area (Lump Sum)

Measurement. Measurement for this item shall be on a completed lump sum basis.

Payment. Payment for this item will be on a lump sum basis for the completed grading work for the flare and blower skid area. This pay item shall include procurement of clean soil, grading and compaction of soils, placement of gravel pads and fencing in the Construction Drawings. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

DD. Item No. 030 – Concrete Pads (Lump Sum)

Measurement. Measurement for the work specified in this item will be based on Lump Sum for the concrete pads installed in accordance with the Contract Documents.

Payment. Payment for this item will be on a Lump Sum basis for a completely supplied, installed and accepted concrete pads for the flare/blower skid, air compressor, future generator and the propane tank. This item shall include full compensation for all costs associated including materials, equipment, transportation, concrete testing and analysis per the Construction Drawings, labor, appurtenances, permits, and all other incidentals necessary to construct concrete pads.

EE. Item No. 031– Flare and Blower Skid Delivery and Installation (Lump Sum)

Measurement. Measurement for the work specified in this Bid Item will be based on Lump Sum for the Flare and Blower Skid installed in accordance with the Contract Documents, Technical Specifications, and accepted by the Engineer.

Payment. Payment for this item will be on a Lump Sum basis for a completely supplied, installed and accepted Flare and Blower Skid. This item shall include full compensation for all costs associated including materials, crane unload of flare, equipment, transportation, labor, appurtenances, permits, and all other incidentals necessary to unload on site a pre-assembled flare and blower skid as indicated in Contract Documents. This work also includes, but is not limited to, unloading and placement of flare, connection of flare to system piping, valves, drain lines, couplings, labor, quality control testing, installation, startup, training, fabrication, shop drawings and all other incidentals associated with the work under this item.

FF. Item No. 032 – Electrical Supply and Grounding (Lump Sum)

Measurement. Measurement for this item shall be on a completed lump sum basis.

Payment. Payment for this item will be on a lump sum basis for the completed electrical work for the project. Procurement and Installation of new panels and complete installation of new facilities as shown on Sheet E-1 through E-5 in the Construction Drawings. This pay item shall include coordination with electric company, grading and compaction of soils after underground electrical install, excavation, electrical wire and conduit installation, backfilling, compaction, fittings, panels, site light, switches, all electrical connections, testing, startup services, and related work to provide a fully functional electrical system powering blower/flare skid, existing pump station, compressor/dryer, and lift station. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

GG. Item No. 033 – 24-inch HDPE SDR 17 Lift Station with Pump (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis.

Payment. Payment for this item will be at the contract unit price per installed lift station with submersible pump, including excavation, stone base support, backfilling, clean soil backfill material, concrete ballast, dewatering efforts, fittings, blind flange for future use, sump and piping installation and connections, monitoring ports, supplied pump, pump connections, placement and testing of the pump, pump control panel and data modules, check and ball valves, flow meter, lift station flanged lid, concrete containment and testing, startup, training by pump manufacturer and any other incidentals. Payment shall constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

HH. Item No. 034 – LFG Extraction Well Pumps (Each)

Measurement. Measurement for this item shall be on a completed and installed unit basis of a pump at a new gas well.

Payment. Payment for this item will be at the contract unit price per supplied unit, including short body QED bottom loading AP-4 pneumatic pumps, connectors for air and dewatering discharge, well seal cap, fittings, Contractor shall include up to 100 feet of cables and fittings for each of the pumps. The Contractor shall not purchase any pumps without the approval and direction of the County and Engineer. The pumps will be requested from the Contractor on an as needed basis depending on the conditions observed as the vertical gas extraction wells are installed and brought into operation. Pump installation shall require County and Engineer direction for placement and approval. Payment shall

constitute full compensation for all material, labor, equipment, and work incidental thereto, necessary to complete this item in accordance with the Contract Documents.

END OF SECTION

SECTION 01 20 10

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

This Section specifies administrative and procedural requirements for project meetings including but not limited to:

A. Pre-construction Conference

B. Progress Meetings

C. Coordination Meetings

1.02 DESCRIPTION

A. The County will schedule and administer a preconstruction conference, weekly construction progress meetings, and specially called meetings throughout the progress of work. The Engineer or County will be responsible for preparing the agenda, making arrangements, preparing the meeting summaries, and presiding at these meetings.

B. Representatives of Contractor, Subcontractor(s), and Suppliers attending these meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. The Contractor shall attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.03 PRECONSTRUCTION CONFERENCE

After award of the contract, but prior to the notice to proceed, a joint meeting shall be held with representatives of the County, Engineer, Contractor, including the Project Superintendent, and other invited parties which may be affected by the project.

This meeting is intended to introduce the various key personnel from each organization and to discuss the Contract Documents, the start of construction, order of work, labor and legal requirements, names of the major subcontractors, method of payment, shop drawing submittal schedule, protection of existing facilities and other pertinent items associated with the Project. The Contractor shall bring five (5) copies of a construction schedule, schedule of values, and shop drawing submittal log to this meeting.

The suggested agenda for the preconstruction meeting is as follows:

A. Introduction of key personnel and roles

B. Overview of project

1. Project summary

2. Contract completion time

3. Liquidated damages

4. Guarantee of work

C. Project schedule

D. Critical work sequencing

E. Labor requirements

F. Relationship and coordination with:

1. Other Contracts

2. On-going landfill operations

G. Use of premises

1. Site access and traffic control

2. Office, work and storage areas

3. Temporary facilities/utilities

4. Safety and first aid procedures

5. Security procedures

6. Posting of signs

7. Clean-up procedures

8. Other County requirements

H. Procedures and processing of:

1. Shop drawings

2. Applications for payment

3. Partial payments

4. Change orders

5. Requests for information

6. Record documents

I. Construction facilities controls

J. Staking of work

K. Equipment to be used

L. Material/manufacturers/suppliers to be used

M. Major equipment/material deliveries

N. On-site material storage requirements

O. Project inspections

P. Record documentation

1.04 PROGRESS MEETINGS

During the course of the Contract, progress meetings will be organized weekly, or as needed, and conducted by the County and/or Engineer to discuss the progress of the Work. Depending on the project progress and schedule, the County reserves the right to request meetings every other week instead of weekly. The Contractor and Project Superintendent shall attend these meetings.

The suggested agenda for these meetings:

A. Review summary of previous meeting

B. Work progress

1. Since last meeting

2. Expected progress during next work period

C. Field observations, problems, conflicts

D. Construction schedule

1. Problems which impede the construction schedule

2. Revisions to schedule

3. Critical/long-lead items

4. Off-site fabrication and delivery schedules

E. Coordination of work items with County activities

F. Shop drawing submittals

1. Status of reviews

2. Submittal requirements

3. Remaining submittals

G. Record documents

1. Well logs, pipe installation records

2. Photographs

3. Red-line mark-ups

4. Survey Notes

H. Maintenance of quality standards

I. Pending changes and substitutions

1. Effect on construction schedule and on completion date

2. Effect on other Contracts of the project

J. Other Business

1.05 COORDINATION MEETINGS

Coordination meetings will be organized as needed unless the specific subject warrants an immediate meeting and cannot wait to be discussed during the next scheduled progress meeting. The Contractor and Project Superintendent shall attend these meetings.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 10

CONTRACTOR SUBMITTALS

PART 1 - GENERAL

1.01 PRE-CONSTRUCTION MEETING SUBMITTALS

A. At the pre-construction meeting, the Contractor shall submit the following items to the Engineer for review:

1. A preliminary schedule of Shop Drawings submittals and target dates for the project prior to start of construction.

2. Schedule of values that will be used for payment applications.

3. A list of any and all permits and licenses the Contractor shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.

4. Insurance certificates.

5. Health and Safety Plan.

1.02 SHOP DRAWINGS

A. Wherever called for in the Contract Documents, or where required by the Engineer, the Contractor shall furnish to the Engineer for review, one (1) copy of each submittal. The term "submittal" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples, and similar items. Said submittals shall be submitted to the Engineer, 15 days minimum prior to planned work activity to allow review of same by the Engineer, and to accommodate the rate of construction progress required under the Contract, unless otherwise required and authorized by the Engineer. Should any submittal be a part of any schedule milestone and is considered to be unacceptable by the County, the appropriate milestone shall be considered as not having been met until a complete and properly detailed submittal is received.

B. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements.

C. Attach to the front of each submittal a title sheet stating the pertinent product information submitted and reference the appropriate Specification Section and Paragraph. Apply stamp, signed or initialed, certifying that all quantities, dimensions, field construction criteria, materials, catalog numbers, and specified

performance criteria has been reviewed in accordance with the requirements of the Work and the Contract Documents.

If this information is not provided with each submittal, the submittal shall be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.

D. All shop drawings or other submittals shall be accompanied by the form mutually agreed upon at the pre-construction meeting. Any submittal not accompanied by the approved form or if all applicable items on the form are not completed, the submittal will be returned to the Contractor without action taken by the Engineer.

E. Normally, a separate transmittal form shall be used for each specific unrelated item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that this helps speed the review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Engineer.

F. Except as may otherwise be provided herein, the Engineer will return prints of each submittal to the Contractor, with comments noted thereon, within 15 calendar days following their receipt by the Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The County reserves the right to withhold monies due the Contractor to cover additional costs of the Engineer's review beyond the second submittal.

G. If a submittal is returned to the Contractor marked "**NO EXCEPTIONS TAKEN**," formal revision and resubmission of said submittal will not be required.

H. If a submittal is returned to the Contractor marked "**MAKE CORRECTIONS NOTED**," formal revision and resubmission of said submittal will not be required. However, Contractor shall address the comments/corrections in the final Work. Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

I. If a submittal is returned to the Contractor marked "**AMEND - RESUBMIT**," the Contractor shall revise said submittal per Engineer's comments and shall resubmit the required number of copies of said revised submittal to the Engineer.

J. If a submittal is returned to the Contractor marked "**REJECTED - RESUBMIT**," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.

K. Fabrication of an item **shall not** commence before the Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "**NO EXCEPTIONS TAKEN**" or "**MAKE CORRECTIONS NOTED**." Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.

L. All Contractor submittals shall be carefully reviewed by an authorized representative of the Contractor prior to submission to the Engineer. Each submittal shall be dated, signed, and certified by the Contractor as being correct. Contractor shall use the County-approved shop drawing stamp agreed upon at the pre-construction meeting. No consideration for review by the Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. **All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the total responsibility of the Contractor**.

M. The Engineer's review of the Contractor submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in the Contractor submittals. Any fabrication or other work performed in advance of the receipt of approved submittals shall be entirely at the Contractor's risk and expense. The Contractor shall be responsible for the dimensions and the design of adequate connections and details.

N. Product Data

1. Product data includes standard printed information (e.g., specifications) on materials, products and systems, not specially prepared for this project, other than the designation of selections from among available choices printed therein. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, reference it to Specification Section and Paragraph number. Show reference standards, performance characteristics, and capacities; dimensions; and required clearances. Said submittals shall be submitted to the Engineer, minimum 15 days prior to obtaining the material to review of same by the Engineer, and to accommodate the rate of construction progress required under the Contract, unless otherwise required and authorized by the Engineer.

2. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options are applicable to project. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

3. Failure to follow the guidelines in paragraphs 1 and 2 above shall be grounds for rejection of Contractor submittals.

O. Contractor shall notify Engineer in writing, at time of submittal, of proposed deviations from requirements of Contract Documents.

1.03 CONTRACTOR'S PROJECT SCHEDULES

A. The schedule shall be comprehensive, covering both activities at the site of the Work and offsite activities such as design, procurement, and fabrication. The schedule shall be orderly and realistic and shall be revised as necessary to meet this requirement. The Contractor shall promptly advise the County and Engineer of any occurrence that may impact the schedule. No revision to the schedule can be made without approval from the County and Engineer.

B. The detailed schedule and each revision thereof shall be subject to approval by the County and Engineer for conformity with the requirements of the Contract Documents. The Contractor shall assist the County and/or Engineer in reviewing and evaluating each schedule furnished. Disapproved schedules returned to the Contractor shall be revised to correct the defects noted and shall be resubmitted to the County within five (5) calendar days after receipt.

C. When required to perform and complete the changed Work in accordance with the revised schedule, the Contractor shall provide additional labor, materials, equipment, or other factors of production in excess of those in use before the changed Work was ordered.

1.04 SAMPLES

A. Unless otherwise specified, whenever in the Specifications samples are required, the Contractor shall submit one (1) sample of each such item or material to the Engineer for approval at no additional cost to the County.

B. Samples, as required herein, shall be submitted for approval a minimum of fifteen (15) working days prior to ordering such material for delivery to the job site and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the Work.

C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and manufacturer's names for identification and submittal to the Engineer for approval.

D. Unless otherwise specified, all colors and textures of specified items will be selected by the County from the manufacturer's standard colors and standard product lines.

1.05 RECORD DRAWINGS

A. Contractor's Record Drawings shall be maintained in accordance with this Section. The Contractor shall keep and maintain at the job site one set of draft Redline Drawings.

1. On these, the Contractor shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction.

2. Special attention shall be given to recording the horizontal and vertical location of all buried header, lateral, air supply line, liquid conveyance line and utilities, that differ from the locations indicated or which were not indicated on the Contract Drawings.

3. Redline Drawings shall be supplemented by any detailed sketches or typewritten changes to the specifications, as necessary or directed, to indicate fully the Work as actually constructed.

4. These master Redline Drawings shall be the Contractor's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like.

5. Redline Drawings shall be maintained up-to-date during the progress of the Work and available for inspection by the Engineer.

B. The Contractor shall include a survey site plan and pipe route survey table with the Redline Drawings showing coordinates and elevations of all wells, condensate traps, valves, etc., and piping installed.

1. Piping shall be located every 50 feet and at grade breaks and changes in pipe slope and direction, fittings, tie-ins, appurtenances, etc., as required for the conformance survey.

2. For pipe runs of 100 feet or less, the pipe shall be located a minimum of every 20 feet.

3. Coordinates and elevations shall be included in the survey for pipe fittings, changes in pipe slope and direction, valves, buried flanges, appurtenances and other similar connections to the header piping, and the ground surface at each well and appurtenance, and for all pipe location shots.

4. All locations shall be shown in the coordinate system identical to that used for the Construction Drawings.

5. A Florida Licensed Professional Surveyor shall certify all survey work pertaining to the Record Drawings.

C. Redline Drawings shall be accessible to the Engineer at all times during the construction period and shall be delivered to the Engineer upon Substantial Completion of the Work.

D. Requests for partial payments will not be approved if the Redline Drawings are not kept current and not until the completed Redline Drawings showing all variations between the Work as actually constructed and as originally shown on the Contract Drawings or other Contract Documents have been inspected by the Engineer.

E. Final payment will not be approved until the Contractor -prepared Record Drawings have been approved by the Engineer.

F. Upon Substantial Completion of the Work and prior to final acceptance, the Contractor shall complete and deliver a preliminary set of Record Drawings and Pipe Route Survey Table to the Engineer for review, conforming to the construction records of the CONTRACTOR.

1. The Contractor shall take care in reviewing the preliminary Record Drawings and Pipe Route Survey Data Table for accuracy and completeness.

2. If more than one review of the Record Drawings and Pipe Route Survey Data Table is required, the Contractor shall reimburse the County for the time-and-materials cost for the Engineer's subsequent reviews.

3. The Record Drawings shall be generated using AutoCAD 2018 (or newer version) computer software and consist of corrected plans showing the reported location of the Work.

4. Upon the Engineer's acceptance of the Record Drawings, the Contractor shall provide two (2) complete sets of Record Drawings to the Engineer.

5. The information submitted by the Contractor will be assumed to be reliable, and the Engineer will not be responsible for the accuracy of such information, nor for any errors or omissions, which may appear on the Record Drawings as a result.

1.06 PROGRESS REPORTS

A. A progress report shall be furnished to the County with each application for progress payment. If the Work falls behind schedule, the Contractor shall submit additional progress reports at such intervals as requested.

B. Each progress report shall include sufficient narrative to describe any current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any Work reported complete, but which is not readily apparent to the Engineer, must be substantiated with satisfactory evidence.

C. Each progress report shall include a list of the activities completed with their actual start and completion dates, a list of the activities currently in progress, and the number of working days required to complete each.

1.07 SURVEY DATA

All field books, notes, as-built pipe slope calculations, photographs, sketches and other data developed by the Contractor in performing the surveys required by the Work shall be available to the Engineer for examination throughout the construction period. All locations and elevations shall be identified by qualified survey crews and tied to the Coordinate System NAD 83 in feet. Survey shall be in accordance with the respective pipeline and well installation Specifications. All such data shall be submitted to the Engineer with documentation required for final acceptance of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL

PART 1 - GENERAL

1.01 SITE INVESTIGATION AND CONTROL

A. Contractor shall verify all dimensions in the field and check field conditions continuously during construction. Contractor shall be solely responsible for any inaccuracies built into the work due to Contractor's failure to comply with this requirement.

B. CONTRACTOR shall inspect related and appurtenant WORK and report in writing to the County and Engineer any conditions which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at Contractor's sole cost and expense.

1.02 INSPECTION OF THE WORK

A. All work performed by the Contractor shall be inspected by the Contractor and designated County Project Manager and nonconforming work shall be noted and promptly corrected. The Contractor is responsible for the work conforming to the Contract Documents.

B. The WORK shall be conducted under the general observation of the designated County Project Manager and is subject to inspection by representatives of the County acting on behalf of the County to ensure compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The Project Manager or any inspector(s) shall be permitted to access all parts of the work, including plants where materials or equipment are manufactured or fabricated.

C. The presence of the Project Manager or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Project Manager or any inspector(s). Inspection of work later determined to be nonconforming shall not be cause or excuse for acceptance of the nonconforming work. The acceptance of nonconforming work shall be approved by the County when adequate compensation is offered and it is in the County's best interest.

D. All materials and articles furnished by the Contractor shall be subject to inspection, and no materials or articles shall be used in the WORK until they have been inspected and accepted by the Project Manager or other designated

representative. No work shall be backfilled, buried, hidden, or otherwise covered until it has been inspected. Any work so covered in the absence of inspection shall be subject to uncovering at the Contractor's expense. Where uninspected work cannot be uncovered, such as in concrete cast over reinforcing steel, all such work shall be subject to demolition, removal, and reconstruction under proper inspection, and no additional payment will be allowed.

1.03 TIME OF INSPECTION AND TESTS

A. Any samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. Contractor shall furnish and prepare all required test specimens at Contractor's own expense. Whenever the Contractor is ready to backfill, bury, hide, or otherwise cover any work under this Contract, the Project Manager shall be notified not less than 24 hours in advance to request inspection before beginning any such work of covering. Failure of the Contractor to notify the Project Manager at least 24 hours in advance of any such inspections shall be reasonable cause for the Project Manager to order a sufficient delay in the Contractor's schedule to allow time for such inspection, any remedial, or corrective work required, and all costs of such delays, including its impact on other portions of the work, shall be borne by the Contractor.

1.04 SAMPLING AND TESTING

A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered. However, the County reserves the right to use any generally-accepted system of inspection which, in the opinion of the Engineer, will ensure the County that the quality of the workmanship is in full accord with the Contract Documents.

B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the Engineer shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the WORK to meet any of the qualitative requirements of the Contract Documents, shall be reasonable cause for the Engineer to require the removal or correction and reconstruction of any such work.

D. In addition to any other inspection or quality assurance provisions that may be specified, the Engineer shall have the right to independently select, test, and analyze, at the expense of the County (only with prior approval by the County), additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed provided that wherever any portion of the work is discovered, as a result of such independent testing or investigation by the Engineer, which fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such work shall be borne by the Contractor.

1.05 RIGHT OF REJECTION

A. The Project Manager or designated representative, acting for the County, shall have the right at all times and places to reject any articles or materials to be furnished hereunder which, in any respect fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If the Project Manager or designated representative, through an oversight or otherwise, has accepted materials or work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected.

B. Contractor shall promptly remove or replace rejected articles or materials from the site of the work after notification of rejection.

C. All costs of removal and replacement of rejected articles or materials, as specified herein, shall be borne by the Contractor.

D. Failure to promptly remove and replace rejected work shall be considered a breach of this specification and the County may after 7 days notice, terminate the Contractor's right to proceed with the affected work and remove and replace the work and issue a back charge to cover the cost of the work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00

SITE CONDITIONS SURVEY

PART 1 GENERAL

1.01 SUMMARY

A. The CONTRACTOR shall perform, or obtain other professional subcontractors to complete surveys that meet the minimum standards of Florida Department of Transportation (FDOT) Survey Codes, to document elevations, grades, locations, maintain survey control during construction, and perform related field engineering as specified in the Contract Documents.

B. Throughout this Section, all references to "Surveyor" shall mean a professional land surveyor licensed in the State of Florida

1.02 SURVEY REFERENCE POINTS

A. The Contractor shall locate survey reference points prior to starting work and the Contractor shall protect and preserve all permanent survey reference points during construction.

1. The Contractor shall make no changes or relocate any survey reference point without prior written notice to the Engineer.

2. The Contractor shall report to the Engineer when any survey reference point is lost, destroyed, or requires relocation because of necessary changes in grades or locations.

3. The Contractor, at no additional cost to the owner, shall replace and re-survey reference points that have been lost or destroyed. The replaced survey reference point shall be surveyed by a Surveyor. Replacement will be based on original survey control.

B. Prior to any work, the Contractor shall immediately notify the Engineer and County of any discrepancies with the survey reference points from the coordinates and elevations provided.

1.03 RECORD DRAWINGS (AS-BUILT DRAWINGS)

A. All survey record documents, submitted to the Engineer for progress review, do not require the signature of a Surveyor; however, final Record Drawings shall be signed and sealed by a Surveyor.

B. Submitted record documents shall include the following:

1. As stages of the work are completed, the Contractor will submit surveys, signed and sealed by a Surveyor. The Record Drawings information shall be submitted on 24-inch by 36-inch sheets, as well as AutoCAD Drawing files (compatible with (AutoCAD r18 or later version) on a flash drive. The Contractor will submit 5 original signed and sealed hard copies by a SURVEYOR and 2 flash drives with the AutoCAD drawing files, shall be submitted.

2. AutoCAD Drawing File Requirements - Contour lines shall be continuous, unbroken polylines with a width of zero and an elevation (z-coordinate) assigned according to the elevation of the contour line. All spot elevations shall have horizontal controls with vertical z-coordinates. Contours shall be at one-foot intervals, with index contours at every fifth interval. Objects in the Record Drawings shall be drawn to scale. Unless otherwise stated, all surveys shall be at a scale of 1" = 50'.

3. Survey information (north, the grid, and the coordinates) is referenced to the East Zone of the Florida State Plane Coordinate System, NAD 83, 1999 Adjustment. The elevations are to the National Geodetic Vertical Datum of 1929 (NGVD1929).

4. All Record Drawings shall have survey control monuments shown for the purposes of orientation, both horizontally and vertically.

5. If multiple sheets are required for the Record Drawings, each sheet shall include match lines as required.

C. The Contractor understands and agrees that existing elevations and contours shown on the Contract Drawings are solely for the Engineer's information. Actual quantities of soils and other materials required to complete the work are the Contractor's responsibility. The Contractor shall determine existing elevations for the purpose of conducting the work as required by the Contract Documents. The Contractor is responsible to notify the Owner and Engineer in writing of any and all discrepancies prior to beginning work.

1.04 SUBMITTALS

A. The Contractor shall submit the name and address of the Surveyor to the Engineer prior to any work for record purposes only.

B. The Contractor shall submit documentation signed by the Surveyor that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certify as to variances from the Contract Documents.

C. The Contractor shall provide and submit to the Engineer for approval, signed and sealed drawings representing the horizontal and vertical limits, as follows:

1. Preconstruction Survey - Prior to performing any earthwork, a Preconstruction Survey of the site must be provided to the Engineer for review and approval. The Preconstruction Survey shall include:

    a. Survey of the existing conditions within the limits of construction of the Project and 50 feet beyond the limits of construction.

    b. The Preconstruction Survey shall be collected on a 50 foot by 50 foot grid, at a minimum, and note all above grade structures, piping, and stormwater features, which may or will be impacted by the work and shall include the areal extent of existing sod that must be removed in order to enable the work to proceed.

    c. Location of LFG lateral pipes, stub out locations, new and re-drill wells, isolation valves, air release valves, road crossings, blind flanges, connection points to existing Landfill Gas Collection and Control System (LFGCCS), sections of existing and LFGCCS improvements to be abandoned, and other related LFGCCS improvements.

2. Final Survey - The Final Survey will include, but is not limited to, the following:

    a. All features of the Project installed and all existing features within the limits of construction.

    b. Stormwater structures, downchutes, piping, limits of liner, underground piping, access roads, sod and/or seeding limits, and all other features related to the Project.

    c. Stormwater pipe invert elevations and locations shall be noted, at a minimum, every 50 linear feet along each pipe and at each change in pipe size, type, direction, and elevation.

    d. Final location of new LFG header and lateral pipes, stub out locations, new and re-drill wells, isolation valves, air release valves, road crossings, connection points to existing LFGCCS, sections of abandoned LFGCCS, flare station improvements, and all other related LFGCCS improvements.

    e. LFG pipe invert elevations and locations shall be noted, at a minimum, every 10 linear feet along each pipe and at each tie-in location, bend, stub-out, riser, blind flange, change in pipe size, and any grade brakes.

    f. LFG pipe route survey including coordinates and elevations of surveyed top of LFG pipe, fittings, tie-ins, appurtenances, length of pipe segments, pipe slope between each surveyed station, and

ground surface elevation. Each pipe segment shall be given a unique description. Pipe route survey data shall be provided in tabular format. Example format below.

g. LFG pipe profiles for header and lateral pipes. Profiles shall include pipe diameter, slope, grade breaks, section view of ground surface along pipe segment, location and description of existing utilities encountered, pipe crossings and vertical and horizontal scale bar.

STATION	GRID COORDINATES (north)	(east)	Surveyed Top of Pipe (ft)	Ground Elev. (ft)	Header Depth (ft)	Header Slope	Const. Notes and Fittings	Pipe Info.
Line F-F 0+00	5078.45	22997.65	1235.58	1239.66	3.8	-2.13%	Sta 0+02 Line E-E' 12"x4" Branch Saddle	31 ft of 4" Dia HDPE at 2.13%
0+04	50704.56	22997.42	1235.74	1240.40	4.47		Begin 8" CMP Road Casing	
0+26	50694.44	22977.80	1235.28	1239.09	3.8		End 8" CMP Road Casing	
0+31	50712.65	22981.02	1235.17	123.54	3.4		Sta 1+28 C-C' 4" Tee and Riser	
Lateral to EW-A								
0+00	50601.26	23272.90	1274.62	1278.90	4.3	2.00%	Sta 2+00 Line A-A' 6"x4" Branch Saddle	5 ft of 4" Dia HDPE at 2.00%
0+05	50606.27	23271.25	1274.72	1278.66	3.9		Well EW-A	
Lateral to EW-B								
0+00	50591.22	23078.87	1264.31	1268.29	4.0	2.00%	Sta 4+00 Line A-A' 6"x4" Branch Saddle	5 ft of 4" Dia HDPE at 2.00%
0+05	50595.82	23081.00	1264.41	1268.86	4.5		Well EW-B	

D. Record Drawings - The Contractor shall submit to the Engineer, for review and approval, signed and sealed Record Drawings for all work (to include any areas outside the limits of work disturbed by the Contractor) as follows:

1. The Contractor shall, throughout the Project, maintain a redline set of Construction Drawings noting deviations or actual installed conditions for the Project.

2. As part of Final Completion, the Contractor must submit a complete set of 24 inch by 36 inch sheet Record Drawings based on the redlines maintained throughout the Project which identify the actual constructed conditions. Record Drawings shall use the Contract Drawings as a base and show changes by cloud and strikethrough in electronic format (AutoCAD r18 or later version). These drawings shall incorporate the surveys listed above and any other changes made to the Project into the set in order to create a single Record Drawings set for the Project.

3. The Contractor shall submit 2 draft copies of the completed Record Drawings, in both hardcopy and AutoCAD format, for review at Substantial Completion.

4. The Contractor shall submit 5 signed and sealed certified sets of final approved by the Engineer Record Drawings and AutoCAD files shall be submitted for final acceptance.

5. Substantial Completion cannot be granted until a draft set of Record Drawings in both hardcopy and AutoCAD file formats are submitted to the County and Engineer for review.

6. Final Completion cannot be granted until the Record Drawings signed and sealed by a Surveyor and AutoCAD files are submitted to and approved by the County and Engineer.

E. Partial Surveys - It is understood the Contractor may elect to construct the Project at different time intervals and survey each section separately. Partial Surveys must be submitted to the Engineer to determine the section the Contractor is requesting to continue working in meets the design requirements. The Contractor may not continue work until the Partial Surveys are approved. Partial Surveys are not required to be signed and sealed at the time of submittal, however, the surveys used to compile the complete survey must not deviate from the Partial Surveys submitted and the complete survey must be certified for submittal. Payment for surveys will not be made until the complete, certified survey is submitted and approved. However, Partial Surveys may be used for payment of work items upon review, agreement, and approval by the County and Engineer.

PART 2 - PRODUCTS

This Section is Not Applicable.

PART 3 - EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. The Contractor shall retain the services of a Surveyor to identify existing control points and maintain survey control during work.

B. The Contractor shall identify all survey reference points.

C. The Contractor shall provide civil, structural, or other professional engineering services specified or required to execute the Contractor's construction methods.

D. The Contractor shall be responsible for the preservation of all benchmarks, stakes, and marks. If any benchmarks, stakes, or marks are disturbed by the Contractor, the Contractor shall not proceed with any work until such points, marks, lines, and elevations as may be necessary for the work have been established.

E. The accuracy of any method of staking shall be the responsibility of the Contractor. All engineering for vertical and horizontal control shall be the responsibility of the Contractor.

F. The surveyors shall maintain a complete, accurate log of all control and survey work as it progresses. This log shall be available for periodic review by the Engineer.

G. Grades, elevations, and locations will be required periodically during the prosecution of the work. The Contractor's Surveyor will provide as-built notes and Record Drawings when construction is completed.

H. All topographic surveys shall meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code. Surveys shall include (but are not limited to) grading, elevations, structure locations, pipe inverts, piping, and other permanent structures as needed on a 50 foot by 50 foot grid.

I. The topographic information collected shall be taken on a grid (or as specified for the identified area), at a minimum, one point directly above the previous as necessary to provide an accurate representation of the contour topography (i.e., spot elevations, grade breaks, ditches, mounds, etc.) and the thickness of the material placement from previous work. For ditches and Leachate Collection and Removal System (LCRS) trenches, spot elevations shall be taken, at a minimum, every 50 linear feet to include, at a minimum, the centerline of the ditch/trench, the toe and top of ditch/trench slopes, and any grade breaks.

J. The elevation and grades shall be within an accuracy of 0.2 feet vertical and 0.5 feet horizontal as shown in the Contract Documents. Unless otherwise stated, all surveys shall be at a scale of 1" = 50', with contours at one-foot intervals.

K. For thickness verifications, **NO MINOR TOLERANCES ARE ACCEPTABLE**. The thicknesses indicated on the CONTRACT DRAWINGS are minimum thickness and **CANNOT** be less than the dimensions shown on the Contract Documents.

END OF SECTION

SECTION 01 50 10

TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. General. The CONTRACTOR shall provide facilities and equipment that are adequate for the performance of the WORK under this Contract within the time specified. All facilities and equipment shall be kept in satisfactory operating condition, capable of safely and efficiently performing the required WORK, and subject to inspection and approval by the PROJECT MANAGER at any time for the duration of the Contract. All WORK hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

B. Separate Contracts. Whenever portions of the WORK hereunder are let under separate contracts, all of the provisions of this Section shall apply to each such prime contractor, including the requirements for separate field offices and communications facilities.

1.02 POWER AND LIGHTING

A. Power. The CONTRACTOR shall provide, at the CONTRACTOR's own expense, all necessary power required for the CONTRACTOR's operations under the Contract and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.

B. Construction Lighting. All WORK conducted at night or under conditions of insufficient day light shall be suitably lighted to ensure proper WORK and to afford adequate facilities for inspection and safe working conditions.

C. Approval of Electrical Connection. All temporary connections for electricity shall be subject to approval by the PROJECT MANAGER and the power company representative and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the WORK.

D. Separation of Circuits. Unless otherwise permitted by the PROJECT MANAGER, circuits separate from lighting circuits shall be used for all power purposes.

E. Construction Wiring. All wiring for temporary electric light and power shall be properly installed and maintained and securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Standards for Construction and local code.

1.03 WATER SUPPLY

A. General. The COUNTY will allow use of surface water for general use and drilling activities. Should the surface water on site be determined not to be suitable for other construction purposes, the CONTRACTOR shall provide, at the CONTRACTOR's own expense, an adequate supply of water of a quality suitable for construction purposes.

B. The CONTRACTOR shall provide and operate all pumping facilities, pipelines, valves, hydrants, storage tanks, and all other equipment necessary for the adequate development and operation of the water supply system that the COUNTY is allowing to access. The CONTRACTOR shall be solely responsible for the adequate functioning of the CONTRACTOR's water supply system and solely liable for any claims arising from the use of same, including discharge or waste of water therefrom.

C. Potable Water. Drinking water on the site during construction shall be furnished by CONTRACTOR and shall be potable water furnished in approved dispensers. Notices shall be posted conspicuously throughout the site warning the CONTRACTOR's personnel of non-potable water sources.

D. Water Connections. The CONTRACTOR shall not make connection to or draw water from any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

E. Removal of Water Connections. Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition or better and to the satisfaction of the PROJECT MANAGER and the agency owning the affected utility.

F. Fire Protection. The construction area and all other parts of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards of Construction.

1.04 SANITATION

A. Toilet Facilities. Fixed or portable chemical toilets shall be provided by the CONTRACTOR for the use of the CONTRACTOR's employees or subcontractors. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.

B. Sanitary and Other Organic Wastes. The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of in accordance with all laws and regulations pertaining thereto. Disposal of landfill refuse from excavation associated with the work shall be handled in accordance with Section 02 41 16.

C. Waste Disposal. Disposal of all such wastes not covered in Section B above shall be at the CONTRACTOR's expense. The CONTRACTOR shall open an account with the Lee-Hendry County disposal facility for the disposal of wastes generated by the CONTRACTOR that are not associated with excavation activities. The CONTRACTOR shall take all waste except that which is generated by excavation activities across the scales at the landfill and follow landfill directions for final disposal.

1.05 COMMUNICATIONS

A. Telephone Services. The CONTRACTOR shall provide and maintain at all times during the progress of the WORK, at the CONTRACTOR's own expense, not less than one cell phone that can be provided to County for project communications.

1.06 SAFETY

A. General. Jobsite safety is the CONTRACTOR's responsibility. Appropriate first aid facilities and supplies shall be kept and maintained by the CONTRACTOR at the site of the WORK. All persons within the construction area shall be required to wear protective helmets and green/yellow safety vests. In addition, all employees of the CONTRACTOR and his subcontractors shall be provided with, and required to use, personal protective and life saving equipment as set forth in Subpart E of the OSHA Standards for Construction (29 CFR 1926) and shall comply with the "A Compilation of Landfill Gas Field Practices, and Procedures" dated August 2011 by the Solid Waste Association of North America (SWANA), and will coordinate with the local fire department.

B. Public Safety. During the performance of the WORK, CONTRACTOR shall erect and maintain temporary fences, bridges, railings, and barriers and take all other necessary precautions and place proper guards and warning signs for the prevention of accidents. CONTRACTOR shall erect and maintain suitable and sufficient lights and other signals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 30

PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 GENERAL

A. CONTRACTOR shall protect all existing utilities and improvements not designated for removal and restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements specified herein, and in accordance with the requirements of the Contract Documents.

B. CONTRACTOR shall determine the exact locations and depths of all utilities indicated on the drawings which affect the WORK. In addition to those indicated, CONTRACTOR shall make exploratory excavations of all utilities. All such exploratory excavations shall be performed as soon as practicable after award of Contract and, in any event, a sufficient time in advance of construction to avoid possible delays to CONTRACTOR's WORK. When such exploratory excavations show the utility location as indicated on the drawings to be in error, CONTRACTOR shall so notify PROJECT MANAGER.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and depth of the utility.

1.02 RIGHTS-OF-WAY

A. CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any fiber, telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall CONTRACTOR enter upon the rights-of-way involved until notified by the PROJECT MANAGER that the COUNTY has secured authority from the property owner. After authority has been obtained, CONTRACTOR shall give said owner due notice of CONTRACTOR intention to begin WORK, and shall give said owner convenient access and every facility for removing, shoring, supporting, or otherwise protecting such pipeline, transmission line, ditch, fence, or structure and for replacing same. When two (2) or more Contracts are being executed at one time on the same or adjacent land in such manner that WORK on one Contract may interfere with that on another, the COUNTY shall decide which CONTRACTOR shall have priority to perform and in what manner. When the territory of one Contract is the necessary or convenient means of access for the execution of another Contract, such privilege of access or any other reasonable privilege may be granted by the COUNTY to the CONTRACTOR so desiring, to the extent, amount, manner, and times permitted. No such decision regarding the method or time of conducting the work or the use of territory shall be made the basis of any

claim for delay or damage, except as provided for temporary suspension of the WORK in the General Conditions of the Contract.

1.03 EXISTING UTILITIES AND IMPROVEMENTS

A. General. CONTRACTOR shall protect all utilities and other improvements which may be impaired during construction operations. It shall be CONTRACTOR's responsibility to ascertain the location of all possible existing utilities and other improvements indicated on the drawings or otherwise that will be encountered in the construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall contact the COUNTY immediately upon discovery of additional utilities in the area prior to starting and during the performance of the work. CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines for uninterrupted service and such special protection as may be directed by the PROJECT MANAGER.

B. Utilities to Be Moved. In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon proper application by the CONTRACTOR, be notified by the PROJECT MANAGER to move such property within a specified reasonable time. CONTRACTOR shall not interfere with said property until after the expiration of the time stipulated.

C. County's Right of Access. The right is reserved to the COUNTY and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.

D. Known Utilities. Existing utility lines that are shown on the drawings or the locations of which are made known to the CONTRACTOR prior to excavation that are to be retained and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired by CONTRACTOR at CONTRACTOR's expense.

E. Unknown Utilities. If CONTRACTOR damages any existing utility lines that are not shown on the drawings or the locations of which are not made known to CONTRACTOR prior to excavation, or were, or could not have been verified or located by the CONTRACTOR prior to starting work, a written report thereof shall be made immediately to the PROJECT MANAGER. If directed by the PROJECT MANAGER, repairs shall be made by CONTRACTOR under the provisions for changes and extra work contained in the General Conditions.

F. Utilities to Be Removed. When utility lines that are to be removed are encountered within the area of operations, CONTRACTOR shall notify the

PROJECT MANAGER a sufficient time in advance for the necessary measures to be taken to prevent interruptions of the service.

G. Approval of Repairs. All repairs to a damaged improvement shall be inspected and approved by an authorized representative of the improvement before being concealed by backfill or other work.

H. Relocation of Utilities. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is shown on the drawings, CONTRACTOR shall at CONTRACTOR's own expense, remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the PROJECT MANAGER and the OWNER of the facility. In all cases of temporary removal or relocation, restoration to former location shall be accomplished by CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

I. Maintaining in Service. All oil and gasoline pipelines, power, telephone, or other communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall be maintained continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the PROJECT MANAGER are made with the OWNER of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, wire, or cable. CONTRACTOR shall be responsible for and shall make good all damage due to CONTRACTOR's operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.04 SUBSURFACE OBSTRUCTIONS

A. CONTRACTOR shall field determine, before pipeline trenching and associated excavations are begun, the depth and location of existing utilities. Utility locations indicated on the plans were obtained from the records available, but have not been field verified, nor have depths been measured or observed. CONTRACTOR shall submit descriptions, depths, and locations of subsurface obstructions to the PROJECT MANAGER for review.

B. In excavation, backfilling, and laying pipe, care shall be taken not to remove, disturb, or injure existing pipes, conduits, or structures. If necessary, CONTRACTOR at own expense shall sling, shore-up, and maintain such structures in operation.

C. CONTRACTOR shall obtain the permission of and give sufficient notice to the proper authorities of CONTRACTOR's intention to remove or disturb any pipe, conduit, etc., and shall abide by their regulations governing such work.

D. In the event subsurface structures are broken or damaged in the execution of the WORK, CONTRACTOR shall immediately notify the proper authorities and repair the damage at once at own expense. Repairs shall be made to the satisfaction of the PROJECT MANAGER. CONTRACTOR shall be responsible for any damage to persons or property caused by such breaks or due to own neglect in reporting and/or repairing such damages.

E. COUNTY or PROJECT MANAGER will not be liable for any claims made by the CONTRACTOR based on underground obstructions that could have been reasonably identified as being different than that indicated on the plans. CONTRACTOR shall uncover subsurface obstructions in advance of construction so that the method of avoiding same may be determined before the work reaches the obstruction.

1.05 CONFLICTS WITH OTHER UTILITIES

A. CONTRACTOR shall coordinate and cooperate with the COUNTY to ensure that no damages to existing utilities occur.

B. All temporary support or minor adjustment which does not require replacement or direct bypass connections to these existing services (such as all direct-buried telephone cables or two-inch and smaller gas lines) will be the responsibility of the CONTRACTOR.

C. COUNTY will not be responsible for any delay or inconvenience to the CONTRACTOR resulting from the existence, removal, or adjustment of any public or private utility that could have been reasonably identified. Additional costs incurred as a result thereof shall be borne by the CONTRACTOR and considered as included in the Contract Price.

1.06 EXISTING FENCE LINES

A. Any fence removed or temporarily relocated shall be restored to its original condition and location.

B. All cost for such temporary removal or replacement shall be included as indicated in the unit prices proposal. No direct payment will be made for fence replacement unless specifically noted otherwise.

1.07 UTILITY INVESTIGATION

A. Prior to commencing with trench or other excavations required for the performance of the WORK, CONTRACTOR shall conduct a field investigation for the purpose of determining existing locations of all underground utilities and facilities which are shown on the drawings. The investigation shall be made by hand or machine excavation. All such excavations shall include removal of surface material and obstructions required to perform the excavations. CONTRACTOR shall provide sheeting, shoring, and bracing, as required, to

minimize the required size of the excavation and support adjacent ground, structures, roadways, and utilities. After the data is obtained at each excavation site, CONTRACTOR shall immediately backfill each excavation site. Backfill shall be compacted clean soil for the full depth. The surface shall be returned to its original grade and condition except that paved areas may be temporarily surfaced and maintained where excavations required for the performance of the WORK coincide with the location of the investigative location. CONTRACTOR shall be responsible for all costs associated with repair of roadways, paving, structures, underground and above ground utilities and facilities damaged in conducting the investigations.

B. Findings of the investigation shall be reported to the PROJECT MANAGER. The PROJECT MANAGER shall furnish two sets of full size blueline drawings for CONTRACTOR's field use in recording the findings of the investigation and for CONTRACTOR's office use in transcribing the field investigation information onto same for submission to the PROJECT MANAGER. CONTRACTOR shall clearly designate all found utilities and facilities discovered whether or not shown on the Contract Drawings. CONTRACTOR shall provide written detailed description of any underground utility or facility conflicting with the elevation or alignment of the WORK.

C. CONTRACTOR shall describe size, material, and location of existing underground utilities and facilities. Locations and elevations shall be referenced to project stationing, distance from base line, and project bench marks.

1.08 PROTECTION OF EXISTING LANDFILL

A. The CONTRACTOR shall use extreme care during construction activities on or near the landfill to not damage unnecessarily any existing features.

B. The CONTRACTOR shall use low ground pressure equipment on final geomembrane cover areas so as to not disturb the certified final cover.

C. Assistance will be given to the CONTRACTOR in determining the toe of the landfill as needed to avoid damage to the liner and existing features. This assistance shall in no way relieve the CONTRACTOR from responsibility and liability in maintaining site conditions.

D. Any damage resulting from the CONTRACTOR's operations shall be repaired by the CONTRACTOR to original conditions or replaced with new materials at no additional cost to the COUNTY. Repairs shall be as directed by the PROJECT MANAGER with approved materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 70 10

START-UP

PART 1 - GENERAL

1.01 DESCRIPTION

A. Startup certifications are required for the condensate sumps, dewatering pumps, and air compressors. Certifications include the Manufacturer's Check-Out Certification and the Demonstration Certification. The CONTRACTOR shall satisfy the requirements of these certifications as specified herein.

B. Related Work Described Elsewhere:

1. Section 33 21 70-1: LFG Extraction Wells and Wellheads
2. Section 44 11 20: LFG Blower/Flare System

PART 2 – PRODUCTS

2.01 INSTALLATION, OPERATION, AND MAINTENANCE MANUALS

A. The CONTRACTOR shall supply an electronic copy of installation, operation, and maintenance manuals for the following equipment:

1. Pneumatic pumps and data module
2. LFG wellheads (Manufacturer's Check-Out Certification)
3. 2,500 scfm Flare and all associated equipment on skid
4. Air Compressor

B. Manuals for each piece of equipment shall include the following:

1. Manufacturer's recommended installation procedures
2. Parts list and diagrams
3. Maintenance procedures and frequency
4. Method of operation
5. Safety precautions
6. Troubleshooting guide
7. Contact information for customer service and support

8. Name, address, phone and fax numbers for supplier of equipment

PART 3 - EXECUTION

3.01 PRELIMINARY MATTERS

A. Startup Certification: Prior to system startup, successfully complete all testing required of the individual components. Complete and submit an electronic copy of the attached "Manufacturer's Check-Out Certification" form for the pumps and LFG wellheads. The submitted copies shall have signatures of the General CONTRACTOR, the Subcontractor (if involved), and the Manufacturer's representative. All copies shall be provided with the respective Operation and Maintenance (O&M) Manual. This form and the O&M Manual shall be submitted prior to providing operational training to the COUNTY and prior to conducting the Substantial Completion inspection.

B. Demonstrate to the ENGINEER all temporary jumpers and/or bypasses have been removed and that all components are operating under their own controls as designated.

C. Coordinate startup activities with the PROJECT MANAGER and with the ENGINEER at least one week prior to commencing system start-up.

3.02 START-UP OF PNEUMATIC VALVE

A. Confirm that all equipment is properly energized and that all switches are set to their normal operating condition.

B. Initiate start-up in accordance with the start-up sequence. This start-up sequence shall follow, exactly, the sequence in the submitted O&M manuals.

C. Observe individual component operations and make adjustments as necessary to demonstrate performance of the valve.

D. Coordinate with the ENGINEER before performing any adjustments that may disturb other landfill operations.

3.03 START-UP OF BLOWER/FLARE STATION

A. Confirm that all equipment is properly energized and that all switches are set to their normal operating condition.

B. Initiate start-up in accordance with the start-up sequence. This start-up sequence shall follow, exactly, the sequence in the submitted O&M manuals.

C. Observe individual component operations and make adjustments as necessary to optimize the performance of the blower/flare station and control panel.

1. Follow start-up sequence for flare.

2. Perform automatic and manual restarts.

3. Observe and document proper operation of flow meter, chart recorder, displays, gauges, valves, and warning light.

4. Perform shutdown sequence.

D. Coordinate with the ENGINEER before performing any adjustments that may disturb other landfill operations.

3.04 DEMONSTRATION AND TESTING

A. After all work components have been constructed, field tested, and started-up in accordance with the individual specifications and manufacturer requirements, perform the demonstration and testing in the presence of the ENGINEER and the PROJECT MANAGER. The demonstration shall be held upon completion of all systems concurrent with the Substantial Completion inspection. Prior to the demonstration, the CONTRACTOR shall indicate in writing to the ENGINEER that the WORK is complete, has been tested by the CONTRACTOR, and is ready for demonstration.

B. The demonstration and testing shall be conducted for five consecutive days. The WORK must operate successfully throughout the five-day testing period in the manner intended. If the WORK does not operate successfully, the problems shall be corrected, and the five-day test shall be restarted to Day 1. If more than five days are needed for the demonstration test, the CONTRACTOR shall reimburse the COUNTY for the cost of the additional costs for the ENGINEER.

C. Acceptability of the WORK's performance will be based on the WORK performing as specified in the Contract Documents, either under actual or simulated operating conditions as approved by the ENGINEER. The intent of the demonstration and testing is for the CONTRACTOR to demonstrate to the PROJECT MANAGER and the ENGINEER that the WORK will function as a completed and operable system under normal operating conditions and is ready for acceptance.

D. In conjunction with the demonstration and testing, the CONTRACTOR shall provide a training session or sessions for a minimum of 4 hours to adequately instruct designated OWNER personnel on system start-up, operations, maintenance, shutdown, and other essential features of the system equipment.

1. The training shall detail the function of the various systems and system components and their relationships to each other.

2. System operations under typical and alarm conditions shall be demonstrated; some of these alarm conditions may be simulated (e.g., via electrical jumpers) for training purposes.

3. Prior to Substantial Completion, the CONTRACTOR shall submit for approval, a detailed agenda for the training sessions and the experience of the person(s) conducting the training.

4. Training shall be conducted during the Substantial Completion inspection, following the completion of the start-up testing.

E. Demonstration Certification: Complete and submit one electronic of the attached "Demonstration Certification" form. The submitted copies shall have signatures of the General CONTRACTOR, the Subcontractor (if involved), and the Manufacturer's representative (if involved). All copies shall be provided with the respective O&M Manual.

END OF SECTION

MANUFACTURER'S CHECK-OUT CERTIFICATION

____ CLIENT: _____

____ ENGINEER: _____ Check-out

____ CONTRACTOR: _____ Memo No. _____

PROJECT DATA		**CONTRACT DATA**	
NAME:	Lee/Hendry County Landfill Gas Collection and Control System Project		
		NUMBER:	
LOCATION:	Felda, Florida	DATE:	
		DRAWING #	
		SPECIFICATION	
		SECTION:	
CLIENT:	Solid Waste Disposal Facility		

Name of equipment checked: _____

Name of manufacturer of equipment: _____

1. The equipment furnished by us has been checked on the job by us. We have reviewed (where applicable) the performance verification information submitted to us by the Contractor.
2. The equipment is properly installed, except for items noted below.*
3. The equipment is operating satisfactorily, except for items noted below.*
4. The written operating and maintenance information (where applicable) has been presented to the Contractor, and gone over with him in detail. At least four (4) copies of all applicable operating and maintenance information and parts lists have been furnished to the Contractor for insertion in each of the Equipment Brochures.

Checked By:

Name of Manufacturer's Rep.	Name of General Contractor
Address and Phone No. Of Rep.	Authorized Signature/Title/Date
Signature/Title/Person Making Check	Name of Subcontractor
Date Checked	Authorized Signature/Title/Date

* Manufacturer's Representative Notations - Exceptions noted at time of check were:

Manufacturer's Representative to note adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate adequacy of related systems or equipment):

DEMONSTRATION CERTIFICATION

____ CLIENT: _____

____ ENGINEER: _____ Check-out

____ CONTRACTOR: _____ Memo No. _____

PROJECT DATA		**CONTRACT DATA**	
NAME:	Lee/Hendry County Landfill Gas Collection and Control System Project	NUMBER:	
LOCATION:	Felda, Florida	DATE:	
		DRAWING #	
		SPECIFICATION	
		SECTION:	
CLIENT:	Solid Waste Disposal Facility		

NOTE TO CONTRACTOR:

Submit one electronic and four (4) copies of all information listed below under (a) and (b) for review at least one week before scheduled demonstration of the Work. After all information has been approved by the ENGINEER, give the COUNTY a Demonstration of Completed Systems as specified and have the COUNTY sign four (4) copies of this form. After this has been done, a written request for a final inspection of the system shall be made by the CONTRACTOR.

MEMORANDUM:

Approval of this certificate indicates that the COUNTY has been given a Demonstration of Completed Systems on the Work covered under this Specification Section. Operation of the overall system and of major equipment items were described and demonstrated. The following items were given to the COUNTY:

(a) COUNTY's four (4) copies of Operation and Maintenance Manuals for equipment or systems specified under this section containing approved submittal sheets on all items, including the following:

(1) Maintenance information published by manufacturer on equipment items.

(2) Printed warranties by manufacturers on equipment items.

(3) Check-Out Certification on equipment signed by manufacturer's representative.

(4) Written operating instructions on any specialized items.

(5) Explanation of guarantees and warranties on the system.

(b) Record documentation showing as-built conditions.

(c) A demonstration/training session presenting system operation and maintenance procedures.

_____
(Name of Contractor)

By: _____
(Authorized Signature, Title & Date)

_____
(Name of Subcontractor)

By: _____
(Authorized Signature, Title & Date)

Received the following: Operations and Maintenance manual, as-built documentation, demonstration and instructions on system operation

_____
(Solid Waste Disposal Facility)

By: _____
(Authorized Signature, Title & Date)

SECTION 01 70 30

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. The Contractor shall maintain at the site one hard copy record set of:

1. Drawings
2. Project Manual
3. Addenda
4. Change orders and other modifications to Contract
5. Project Manager field orders, written instructions or clarifications
6. Approved submittals
7. Field test records
8. Daily logs
9. Survey notes and calculations
10. Construction photographs
11. Associated permits
12. Certificates of inspection and approvals

1.02 SUBMITTALS

A. Upon Substantial Completion the Contractor shall:

Deliver two identical, complete review sets of Record Documents within 14 calendar days after Substantial Completion to the Engineer. Each set of Record Documents shall consist of: one set of 22 x 34-inch redline drawings and one copy of record documentation and vendor and material supply information. The Engineer shall comment and return one set to the Contractor. The final Record Drawings shall be generated using computer software as specified in Part 3.03 F of this Section.

B. Accompany the submittals with a transmittal letter containing the following:

1. Date
2. County project title and number
3. Contractor's name and address
4. Title of record document
5. Signature of Contractor or authorized representative

C. At County's acceptance:

Upon receipt of the Engineer's comments, Contractor shall deliver within 14 days to the Engineer four (4) complete sets of Record Drawings incorporating the

Engineer's comments. Record Drawings submitted by the Contractor shall be sealed by a Florida Licensed Professional Land Surveyor. If the second submittal of the Record Documents is deemed incomplete or does not address all of the Engineer's comments, the submittal shall be returned to the Contractor. The Contractor shall reimburse the County for the Engineer's expense for the additional reviews.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS AND SAMPLES

A. Contractor shall store documents and samples in Contractor's field office apart from documents used for construction.

1. Provide files and racks for storage of documents.

2. Provide secure storage space for storage of samples.

B. Maintain documents in clean, dry, legible condition and in good order. Record Documents shall not be used for construction purposes.

C. Make documents and samples available at all times for inspection by Engineer.

D. Failure to properly maintain Record Documents as stated herein may be reason to delay a portion of progress payments until the requirements of this Section are satisfied.

3.02 CONSTRUCTION PHOTOGRAPHS

A. Progress Photos: The Contractor shall provide a photographic record of construction progress every other week to the County. For each submittal, at a minimum, the photographic record shall consist of an electronic set of 12 digital color photographs, each formatted to 4 inches by 6 inches. The Engineer shall reserve the right to select the views to be photographed. The photographs shall be of good quality as determined by the Engineer, and date stamped. Each photograph will be captioned with the following items identified:

- County project name and number
- Date photograph was taken
- Detailed description identifying location and name of feature photographed
- Name of Contractor

B. Photographs shall be taken weekly or during execution of individual work items, whichever is more frequent, beginning prior to the start of construction and continuing through the completion of all construction.

C. Photographs shall be taken to document each major work item, including:

1. Pre-construction conditions.

2. Mobilization and storage of materials. Materials photographed shall include the pipe, sumps, and fittings to be used in the work.

3. Installation of landfill gas extraction wells and horizontal collectors.

4. Installation of the gas lateral and header piping, including pipe fusion.

5. Road crossing and casing.

6. Connection of gas lateral piping to header.

7. Installation of air supply line and condensate discharge line in trench, including cross-over of pipes and appurtenances.

8. Backfilling of installed pipe, including placement of warning tape and compaction.

9. Ditch crossings and stormwater swale crossings.

10. Installation of pneumatic pumps in sumps.

11. Buried blind flanges.

12. Tie-in of each condensate discharge line to traps and leachate collection risers.

13. Installation of header, lateral, air supply, and condensate discharge line isolation valves.

14. Pressure testing.

15. Flare installation including all electrical components.

16. Flare pad installation and testing.

17. Connection of condensate discharge line to existing ponds.

18. Site cleaning and demobilization.

3.03 RECORD DOCUMENTS

A. Label each document “RECORD DOCUMENTS” in large printed letters.

B. Maintain redline set of Drawings and specifications legibly annotated to show all changes made during construction.

1. Graphically depict changes by modifying or adding to plans, details, sections, elevations, or schedules.

2. Make changes on each sheet affected by changes.

C. Record information concurrently with construction progress.

D. Record Drawings shall include the following:

1. Title Sheet (includes County project name and number, site location map, site address and phone number, and names, addresses and phone numbers of design engineer and Contractor).

2. Header and Lateral Layout (as-built and drawn using surveyed horizontal and vertical coordinates) shown with most recent site topography. Site plan layout shall include existing and new features, identification of pipe locations and sizes, and callouts of all surveyed points (well locations, pipe tie-ins, fittings, appurtenances, road crossings, changes in pipe direction and slope, etc.). The header and lateral layout site plan shall be at a scale providing appropriate clarity to the drawing as approved by the Engineer.

3. Record Construction Pipe Route Survey Table showing coordinates and elevations of surveyed top of pipe, fittings, tie-ins, sumps, and appurtenances, length of pipe segments, pipe slope between each surveyed station, and ground surface elevation. Each pipe segment shall be given a unique description as approved in advance by the Engineer. Pipe Route Survey data shall be provided in a tabular format, which shall be approved by the Engineer. An example format is provided below.

STATION	GRID COORDINATES (north)	(east)	Header Invert Elev. (ft)	Ground Elev. (ft)	Header Depth (ft)	Header Slope	Const. Notes and Fittings	Pipe Info.
Line F-F 0+00	5078.45	22997.65	1235.58	1239.66	3.8	-2.13%	Sta 0+02 Line E-E' 12"x4"tie-in	31 ft of 4" Dia HDPE at 2.13%
0+04	50704.56	22997.42	1235.74	1240.40	4.47		Begin 8" CMP Road Casing	
0+26	50694.44	22977.80	1235.28	1239.09	3.8		End 8" CMP Road Casing	
0+31	50712.65	22981.02	1235.17	123.54	3.4		Sta 1+28 C-C' 4" Tee and Riser	
Lateral to EW-A								
0+00	50601.26	23272.90	1274.62	1278.90	4.3	2.00%	Sta 2+00 Line A-A' 6"x4" Branch Saddle	5 ft of 4" Dia HDPE at 2.00%
0+05	50606.27	23271.25	1274.72	1278.66	3.9		Well GEW-A	
Lateral to EW-B								
0+00	50591.22	23078.87	1264.31	1268.29	4.0	2.00%	Sta 4+00 Line A-A' 6"x4" Branch Saddle	5 ft of 4" Dia HDPE at 2.00%
0+05	50595.82	23081.00	1264.41	1268.86	4.5		Well GEW-B	

4. As-Built Typical Details.

5. Pipe profiles of all header and lateral pipes. Profiles shall include pipe diameter, slope, grade breaks, section view of ground surface along pipe segment, location and description of existing utilities encountered, pipe crossings and vertical and horizontal scale bar.

E. Project Documentation Manual:

1. Each copy of the Project Manual shall be bound, consist of clean legible copies or originals, and at the minimum consist of the following information:

   a. Cover Sheet

   b. Table of Contents

   c. List of Addenda

   d. Project Contact List - includes the names, phone numbers and address of the following:

      Project Manager
      Site Representative
      Drilling Contractor
      Pipe Contractor
      Surveyor
      Record Documenter

e. Project Vendor List including list of materials provided by each vendor, and address, phone, fax number of each vendor.

f. Project Record Drawing Summary

g. Route Survey Data Table - referencing pipeline station with appropriate grid coordinates, ground surface elevation, depth of cover soil, top of pipe elevation at a minimum of every 50-feet, slope at all major line, angle and grade change points, valves, tees, and other appurtenances, and connection locations.

h. Pressure Test Reports

i. Contractor's Daily Work Logs

j. Construction Meeting Notes/Status Reports

2. Project Document appendices shall include:

a. HDPE/PVC pipe specifications
- Pipe Installation Manual
- Engineering Characteristics Manual
- Pipe Material Data Sheet
- Manufacturer quality assurance certificates
- Fabricated fittings specification sheets

b. Valve specifications
- Isolation valves (stem extension)
- Check valves
- Ball valves

c. Photographs

F. General File Requirements:

1. Drawings shall be generated using AutoCAD Release 2018 software or newer. The Record Drawings shall be drawn to include the following:

a. 3-dimensional, 1:1 format.
b. Existing survey reference points.
c. Breaklines that define all surface features.
d. Contours and spot elevations must be at correct elevation.

2. Electronic copies of the Contract Documents drawings will only be available to the Contractor in AutoCAD Release 2018 or newer format. Neither the County nor Engineer shall be responsible for conversion of files to other file formats.

3. Use Electronic drive or CD-ROM for submittal of electronic files. Two complete copies of the Record Document electronic files shall be supplied along with each set of Record Documents.

4. Label each disk/drive with County project name and number, Contractor's name, address and phone number, date of submittal, and file reference names.

END OF SECTION

SECTION 02 41 16

REFUSE HANDLING, STORAGE, AND DISPOSAL

PART 1 - GENERAL

1.01 NOTIFICATION

A. The Contractor shall notify the County in advance of planned unloading of excavated waste at the active face.

B. No excavated materials shall be removed from the site or disposed of by the Contractor except as specified below and approved by the County.

1.02 SUBMITTALS

A. The Contractor shall submit refuse disposal log to the County representative on a weekly basis during construction.

PART 2 - REFUSE HANDLING AND DISPOSAL

2.01 REQUIREMENT

A. Excavated waste shall be loaded onto dump truck or other vehicle provided by the Contractor and moved to working face designated by the County as soon as possible after excavation for disposal.

B. In the event that waste is excavated and cannot be immediately taken to the working face the waste may be stored adjacent to the excavation until it can be taken to the working face before the end of the same working day. Waste shall remain within close proximity to the location from which it was removed. All excavated waste must be removed from all locations at the end of each working day.

C. In the event asbestos containing waste is encountered in the excavated waste, the Contractor shall notify the County immediately. Asbestos containing waste shall be maintained in a moist condition during the removal and transfer process to prevent and/or minimize emissions. Disturbed refuse (including any suspect asbestos-containing material) shall be transported to the working face of the Facility immediately for disposal and shall be buried with a minimum of six (6) inches of soil cover.

2.02 DISPOSAL OF REFUSE DAILY

A. All excavated waste shall be hauled to the working face at least 30 minutes prior to the end of daily landfill operations.

B. Excavated refuse is to be loaded and hauled by the Contractor to the working face of the landfill for disposal by the County. Contractor shall keep record of the quantity (number of loads) of refuse hauled to the working face of the landfill and provide a disposal log to the County representative on a weekly basis.

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 31 20 00

EXCAVATING, TRENCHING, BACKFILLING, AND GRADING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope: Contractor shall provide all labor, materials, and incidentals to excavate and trench designated areas, install pipe and appurtenances, haul (on-site) and install bedding and backfill material (to be supplied by **Contractor**), compact backfill, and regrade disturbed areas as shown on the Drawings, and described in this Section.

B. The work specified in this Section includes the trenching and trench backfilling activities associated with installation of the LFG lateral and header pipe, air supply pipe, dewatering discharge line, tie-ins, condensate sumps, and any other work requiring drilling, excavation, trenching, trench backfilling, or grading.

C. Work under this Section includes trenching and grading activities inside of municipal solid waste (MSW) landfill areas.

D. No classification of type of excavated materials will be made. Excavation includes all soil and refuse materials regardless of type, character, composition, moisture, or condition thereof.

E. Any damage to existing features shall be repaired as directed by the Engineer, at the Contractor's expense.

1.02 PROJECT CONDITIONS

A. Existing project conditions are shown on the Drawings or otherwise described herein.

B. Site information has been obtained from existing records. It is not guaranteed to be correct or complete and is shown for the convenience of the Contractor. The Contractor shall explore ahead of the required excavation to determine the exact location of all structures, utilities, etc.

C. Structures shall be supported and protected from damage by the Contractor. If structures are broken or damaged, Contractor shall restore structures, utilities, etc. to their original condition at no additional cost to the County as soon as possible. Any expected delay in the repair of damaged features or structures shall be notified to the County. Repair of damaged features or structures shall be approved by the Engineer and County.

1.03 SITE ACCESS

Work shall be performed so as to not block or hinder site access, except as authorized by the County.

1.04 SAFETY

A. All work shall be performed in strict accordance with the Health and Safety requirements set forth in the General Conditions of the Contract Documents.

B. All work shall be performed in strict accordance with all local, State, U.S. Occupational Safety and Health Administration (OSHA) and other applicable Federal regulations regarding trenching operations and trench safety.

C. Excavation may be made without sheeting and bracing within the limitations and requirements of the governmental agencies having jurisdiction. Failure of the Engineer to order the use of bracing or sheeting and shoring or direct changes to systems in place, shall not in any way or to any extent relieve the Contractor of any responsibility concerning the condition of excavations or of his obligations under the Contract. The Contractor shall be responsible for the condition of all excavations. All slides and caves shall be removed without extra compensation, at whatever time and under whatever circumstances that they may occur.

D. All excavation shall comply with the applicable requirements as stated in the following:

1. OSHA excavation safety standards 29 CFR, 1926 subpart P.

2. Trench safety guidelines as specified by the Landfill Gas Division of the Solid Waste Association of North America (SWANA).

E. The Contractor shall include for any excavation, temporary controls for stormwater runoff and erosion control in full conformance with all existing facility permits and/or applicable regulations. Facility's current permits will be supplied at pre-construction meeting.

1.05 SUBMITTALS

A. Health and Safety Plan.

B. Results of sieve analysis and calcium carbonate test for stone backfill.

C. Pipe slope calculations and survey notes for pre-construction layout, including lateral route, and air supply/dewatering discharge lines.

D. Pipe survey notes for installed pipe pursuant to Part 3.06 of this Section.

E. Proposed stationing and pipeline identification procedures. Prior to the start of any pipe installation, Contractor shall supply an example layout drawing showing how the header and laterals will be marked with stations for the conformance surveys. The example layout drawing and stations must be consistent with the requirements of Sections 01 30 10, 01 70 30, and 33 51 10 of the Contract Documents.

F. Contractor daily logs detailing length of trench excavated and backfilled, with reference to pipe stationing and details sufficient to properly describe the work completed to date.

G. Clean soil backfill will be the responsibility of the **Contractor**: procurement, transportation and cost.

H. The Contractor shall notify the Engineer in writing of the material source for each of the soils specified within Part 2 of this Section at least 14 calendar days prior to the date of anticipated use of such material. Notification shall include:

1. Supplier's name.

2. Borrow location.

3. Documentation confirming adequate quantities are available to complete the work.

4. Soil field-moisture, laboratory proctor-density tests, and field compaction test results as required within Part 2 of this Section.

5. Certification that the soil is not petroleum-contaminated or contaminated with other chemicals or compounds that may be deemed hazardous or harmful to human health and the environment.

PART 2 - PRODUCTS

2.01 CLEAN BACKFILL MATERIALS

A. Soil material may be reused for clean soil backfill provided it is free of sticks, roots, organic matter, MSW, and stones larger than 1-inch in any dimension. Remove any material that cannot be made to compact readily and replace with suitable material. If new material must be imported for use as clean soil backfill it must meet the criteria of this Specification and the testing requirements below and is the responsibility of the **Contractor** to provide clean soil backfill during construction.

B. Material shall be well-graded (SW) or poorly graded (SP) clayey sands (SC) as classified by the Unified Soil Classification System (USCS), or other soil as approved by the Engineer.

C. Clean backfill material (to be provided by **Contractor**) shall be used in the following areas of work and as shown on the Drawings, unless specified otherwise:

1. Pipe Bedding

2. Trench Backfill

3. Backfill in well borehole

4. Above the final cover system to ground surface in all trenches

5. Any location on Drawings that calls for "general fill" or "clean soil backfill" if excavated material is waste or is otherwise not suitable for reuse.

2.02 SUBGRADE SOIL MATERIALS

A. Subgrade soils are natural, in-place materials. Soils shall be well-drained and reasonably free of sticks, roots, debris, organic matter, and MSW. Contractor shall remove material that cannot be made to compact readily and replace with Engineer-approved soil.

B. Soils which yield or exhibit pumping due to excessive moisture shall be excavated and replaced with general fill or materials as approved by the Engineer.

2.03 NON-CALCAREOUS STONE

A. Stone backfill shall be hard, durable non-calcareous rock. Stone shall be washed as a component of the manufacturing process and be free of organics, lumps or balls of clay, and other deleterious materials.

Stone shall be FDOT No. 4 and conform to the following gradation requirements:

Sieve Size	% Passing (by weight)
2 - inch	100
1 ½ - inch	90
1 -inch	35
3/4 - inch	5
3/8 - inch	0

2.04 TOPSOIL

A. Material shall be fertile, natural soil, typical of the locality, free from MSW, stones (exceeding 2-inch in any dimension), roots or sticks (exceeding 1-inch diameter), clay, and weeds, and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth. The material shall comply with the requirements of FDOT's Standard

Specifications for Road and Bridge Construction (2017), Section 987, prepared soil layer materials.

B. Topsoil will be used as part of the restoration operations to reestablish vegetation. The Contractor shall place a minimum of four (4) inches of topsoil over all graded earthen areas and over any other areas to be seeded. Sources of topsoil shall be approved by the Soils Engineer prior to disturbance.

C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam, or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than five (5) percent or more than 20 percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to 65°C.

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities from damage.

C. Protect benchmarks, survey control points, monitoring wells, existing structures, and fences from excavating equipment and vehicular traffic.

3.02 PRE-CONSTRUCTION LAYOUT

A. Prior to trenching and pipe installation, Contractor and Contractor's surveyor shall stake out the entire proposed trench alignment. The proposed alignment must be approved by the Engineer prior to beginning excavation activities. This pipeline route staking for both header and lateral pipes must meet the minimum pipe slopes listed in this Section and on the Drawings.

B. Survey notes with proposed pipe slope calculations shall be submitted to the Engineer for approval prior to pipe installation. Notes of pre-construction survey shall identify conflicts between the proposed work and existing features.

3.03 EXCAVATION

A. Refuse materials shall be handled as directed in Section 02 41 16, Refuse Handling, Storage, and Disposal.

B. Excavate to lines, grades, and dimensions necessary to complete the work.

C. Trenching Tolerances:

1. Excavate to install pipes in straight runs at a uniform grade, without sags or humps, between vertical and horizontal control points in accordance with the Contract Drawings.

2. Minimum trench width shall be as shown on the Drawings.

3. Maintain thickness of soil cover over the top of the pipe, as shown on the Drawings, or approved by the Engineer.

D. Contractor shall not excavate trench more than it can be completely backfilled after installation of the pipe on the same day. Excavations shall not be left open overnight. In the event that a trench must be left open overnight the Contractor must get permission from the County to leave trench open and trench must be encircled in safety/warning tape attached to stakes placed along the perimeter on all edges of the trench. In the event that the trench has exposed refuse, all refuse must be covered with a tarp, or other cover material as approved by the County, which is secured on all corners and along its perimeter.

E. Contractor shall use appropriate survey/level instrumentation during excavation to ensure proper trench slope. Verification of installed pipe slope shall be as specified in Part 3.06.

F. Minimum trench slopes shall be at least 5 percent (within waste limits) as shown on the Drawings or approved by the Engineer.

3.04 DEWATERING

A. Water that enters excavations into refuse shall be considered landfill leachate and shall not be discharged to the ground or other means that are typical for stormwater. Water in trench excavations into refuse shall be pumped into sealed tanks, hauled to the leachate tanks. The Contractor must notify the County prior to discharging into leachate tanks.

B. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove water entering excavations. Contractor shall keep such excavations dry so as to obtain a satisfactory foundation condition for all work.

C. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottom and soil changes detrimental to stability of subgrades and foundations. Subgrade soils that become soft, loose, “quick”, or otherwise unsatisfactory for support of structure as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone or gravel as required by the Engineer at the Contractor’s expense. The bottom of excavations shall be firm and without standing water before placing structures or pipes. Provide and maintain pumps, well points, sumps,

suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

D. Disposal of Water Removed by Dewatering System:

1. Water conveyed away from excavations which has not contacted refuse materials shall be discharged to areas approved by the Engineer.

2. Dispose of water by procedures approved by the Engineer in such a manner as to cause no inconvenience to the County or others involved in work about the site.

3. Water conveyed away from excavations which has contacted refuse materials shall be pumped into spill-proof containers and discharged into the leachate tanks as directed by the County.

E. If pipe trench becomes watered-in after placement of pipe, but before backfilling, Contractor shall dewater the trench, demonstrate that the pipe bedding and pipe slope remain satisfactory, and upon approval by the Engineer, backfill the pipe with clean dry soil in accordance with Part 2.01 of this Section.

3.05 ROAD CROSSINGS

A. Contractor shall schedule and coordinate all road crossings with the County to minimize disruption of the County's operations.

A. HDPE pipes shall be encased in a larger diameter Corrugate Metal Pipe (CMP) casing for protection. The inner diameter of the casing shall be a minimum of five (5) inches larger than the cumulative outside diameters of the HDPE pipes encased. The CMP shall conform to AASHTO M36.

3.06 PIPE SURVEY

A. Contractor shall verify that pipe slope meets the requirements specified in this Section and on the Drawings at 10-foot intervals along LFG laterals and header and record such information in the project notes. Station numbering shall be used and marked on the pipe, as approved by the Engineer.

1. Contractor shall measure each length of installed pipe and mark the 10-foot stations. Stationing of laterals shall begin with 0+00 at the header, ending at the riser for the well.

2. Stationing of the header shall begin with 0+00 at a location approved by the Engineer. Station numbering for pipe installed each day shall be consecutive with pipe installed on previous days. The Contractor shall not restart station numbering at 0+00 for any header segment without advance approval from the Engineer.

3. Survey equipment shall be used to measure the change in relative elevation between each 10-foot station prior to burial of any pipe.

4. The surveyed elevations and calculated change in elevation and slope for each 10-foot section shall be recorded in the Contractor's project notes.

5. A trench laser will not be considered acceptable survey equipment for the purpose of verifying pipe slope.

B. The project notes detailing the required pipe slope confirmation shall be provided daily to the Engineer.

C. An as-built survey shall be conducted on all installed pipe prior to backfilling the trench.

1. The survey shall document the horizontal and vertical location of the top of the landfill gas laterals, air supply lines, condensate discharge line and drain line pipes at minimum 50-foot intervals and at each change in pipe direction, ground surface grade break, change in pipe grade, fitting; included but not limited to; valves, cleanouts, access risers, elbows, tees, etc., connection, pipe crossover, and tie-in along the entire pipeline routes.

2. If a run of pipe is 100 feet or less in length, Contractor shall provide survey shots at a 20-foot interval or less. For a run of pipe of 50 feet or less, Contractor shall provide survey shots at a 10-foot interval or less to document the pipe as-built conditions.

3. The survey shall also document the type of pipe, location (horizontal and vertical coordinate) of structures and appurtenances such as, but not limited to road crossing casing, pipe crossing, and tie-ins.

4. This surveying shall be sealed by a Florida Licensed Land Surveyor as described in Section 01 70 30, Project Record Documents.

3.07 BACKFILLING

A. Backfill materials shall be as described in Part 2 of this Section.

B. Contractor shall notify the Engineer prior to beginning backfilling. The Engineer shall inspect all pipe, fittings, and connections prior to approving backfilling. If Contractor backfills pipe without inspection of the pipe while pipe is installed in the open trench, Contractor shall uncover all uninspected buried pipe so that it may be properly inspected. This shall be done at no additional cost to the County.

C. Place bedding material in trench to the lines and grades shown on the Drawings.

D. Bedding material (clean soil) shall be placed in the trench ensuring material is placed under the haunch of the pipe. The bedding shall be poured into place, not

pushed, and shall be raked by hand or machine to level it before placement of pipe.

E. Backfilling procedures shall be modified as necessary as approved by the Engineer in order to not displace (either horizontally or vertically) piping installed in the trench during backfill or bedding placement.

F. Contractor shall compact the areas under all fitting(s) (i.e. tees, wyes, ninety, etc.), valve(s), sump(s), flange(s) prior to installing them in the trench. Contractor shall notify the Engineer after compacting the area and prior to placing the items listed above.

G. Place soil backfill in maximum 6 inch lifts above pipe bedding to the existing grade. Contractor shall compact soil backfill in 6 inch lifts with mechanical compaction such as a walk-behind vibratory compactor or excavator bucket. Compaction shall be to a density where subsequent passes with the mechanical compaction device will not reduce the surface elevation of the bedding material by more than three-quarters of an inch.

3.08 REFUSE DISPOSAL

The Contractor shall be responsible for loading and transporting refuse to the working face as specified in Section 02 41 16. No excavated waste shall be left overnight at any excavation at any time.

3.09 GRADING DISTURBED AREAS

Contractor shall regrade and return to their original condition, as determined by the Engineer, all areas disturbed by Contractor's work. This includes, but is not limited to ruts caused by construction equipment, soil stockpile areas, and landfill benches and terraces used for access.

3.10 TESTING REQUIREMENTS DURING PLACEMENT

A. The Contractor shall place backfill and fill materials to achieve an equal or "higher" degree of compaction than undisturbed materials adjacent to the work; however, in no case shall the degree of compaction fall below minimum compaction specified in this Section.

B. Where laboratory or field testing is specified herein to verify that the constructed, in-place work meets the specifications and quality control requirements herein, the Contractor shall employ and bear the expense for an independent testing laboratory to conduct such tests. The Contractor shall pay for the costs of all retests required due to the initial testing not passing the requirements herein. Selected laboratory shall be approved by the County and the Engineer.

Where laboratory testing is specified to verify that any individual material of construction or product meets certain quality control requirements (i.e. size,

gradation, mix formula, hardness, shape, inherent strength, etc.), the Contractor shall employ and bear all expenses for an independent testing laboratory to sample the material or product and to conduct such tests and retests if necessary or required by the County.

END OF SECTION

SECTION 32 90 00

SEEDING AND SODDING

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all work and services for completion of all sodding and seeding, which will occur in all Contractor disturbed areas as shown on the drawings and as specified, in accordance with provisions of the Contract Documents. Sodding is required on all disturbed areas on a side slope and staging/laydown area located on the top slope and seeding is required on other disturbed top slope.

B. The work shall include, but not necessarily be limited to soil preparation, liming, fertilizing, seeding and mulching, sodding and maintenance of all areas as shown on the drawings and as specified herein, including all areas disturbed by the Contractor.

C. Construct grassing operations in strict conformity with the drawings and specifications and in accordance with the Florida Department of Transportation (FDOT) Standard Specifications Sections 570 and 981.

D. Do not incorporate materials in construction until approved by the Engineer.

1.02 Submittals

A. Seed: Signed copies of vendor's statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Statement shall certify that each container of seed delivered is fully labeled in accord with Federal Seed Act and equals or exceeds Specification requirements.

B. Sod: Prior to placing sod out, notify the Engineer of source and permit the Engineer to inspect. Submit documentation from supplier regarding species and percentages of purity.

C. Fertilizer: Furnish duplicate copies of invoices for all fertilizer used on project, along with certification of quality and warranty.

D. Guarantee. Furnish copies of manufacturer/supplier warranties or guarantees for all products provided under this Specification.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Refer to Section 31 20 00, Excavating, Trenching, Backfilling, and Grading.

2.02 SOD

A. Sod shall be provided as required in accordance with FDOT Specifications sections 575 and 981. The Contractor shall furnish sod equal to and similar in type as that disturbed. Placement and watering requirements shall be in accordance with FDOT Specifications section 575.

2.03 SEED

A. All grassing (seeding) shall be completed in conformance with FDOT Specifications section 570 and 981. The grassed (seeded) areas shall be mulched and fertilized in accordance with FDOT Specifications.

B. Ensure each bag of seed is tagged with an analysis tag showing the results of a test made within 9 months of planting. Wet, moldy, or otherwise damaged seed shall not be used.

2.04 MULCH

A. The mulch material shall be compost meeting the requirements of FDOT Specifications section 987, hardwood barks, shavings or chips; or inorganic mulch materials as approved by the Engineer; or hydraulically applied wood fiber mulch or bonded fiber matrix (BFM).

B. Do not use mulch that contains an excessive quantity of matured seeds of noxious weeds, or other species that will grow or provide a menace to surrounding land. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

2.05 MULCH BINDER

A. Mulch on slopes exceeding 3:1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be nontoxic to plant life.

2.06 INOCULANT FOR LEGUMES

A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.07 FERTILIZER

A. Fertilize as necessary based on soil testing performed in accordance with FDOT Specifications section 162. Refer to FDOT Specifications section 982 for fertilizer rates.

2.08 LIMESTONE

A. All limestone for agricultural liming purposes shall be crushed or ground to such a degree of fineness that 90 percent of the material will pass through a 10 {2.00 mm} mesh screen and not less than 50 percent of the material will pass through a 60 {250 µm} mesh screen. All such limestone shall also have a neutralizing value of 90 percent calcium carbonate or better.

2.09 WATER

A. The water used in the seeding and sodding operations may be obtained from any approved spring, pond, lake, stream or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalis, or any substance which might be harmful to plant growth or obnoxious to traffic. Salt water shall not be used.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Topsoil shall be placed to achieve a depth of 6 inches in all areas indicated to be sodded on the Contract Drawings and as specified herein.

B. Mulch material shall be applied uniformly over all seeded areas indicated on the Contract Drawings and as specified herein.

C. All areas within the limits of the work and all areas disturbed by the Contractor's operations, with the exception of stockpile and borrow areas, shall be sodded or seeded unless otherwise indicated on the Contract Drawings.

D. The period of sod establishment shall begin immediately after completion of sodding in an area and shall continue for a period of 1 year after the completion of sodding on the entire project unless the desired cover is established in a shorter period of time and shortening of the sod-establishment period is authorized by the Engineer.

E. Unless otherwise shown on the drawings, sod shall be placed on top of backfill material in all disturbed areas along the side slopes, and seed along the top slope. Staging/laydown area located on top slope will require sod. It has been estimated that the disturbed area will be 30 feet wide and the length of all installed piping plus the tie-in areas.

3.02 SECURING AND SOIL PREPARATION

A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by a soils engineer.

B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage, and other characteristics as to offer assurance that, when removed, the product will be homogeneous in nature and will conform to the requirements of these Specifications.

C. All areas from which topsoil is to be secured shall be cleaned of all sticks, boards, stones, lime, cement, ashes, cinders, slag, concrete, bitumen or its residue, and any other refuse which will hinder or prevent growth.

D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil, or if required by a soils engineer, the pit shall be abandoned

E. The Contractor shall, by a qualified laboratory, conduct laboratory analysis on 5 representative samples to determine pH content and nutrient levels. The rate for adding sulfur or lime shall be based upon recommendation by the laboratory.

F. All areas to receive topsoil, seed and/or sod shall be raked, and all rubbish, sticks, roots and stones larger than 1 inch shall be removed. Loosen subgrade surface immediately prior to being covered with topsoil. Subgrade shall be inspected and approved by the Engineer before topsoil is placed.

G. Topsoil shall be placed over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling the complete work will conform to the lines, grades, and elevations as indicated on the Contract Drawings. No topsoil shall be spread in water or while excessively wet.

H. Loosen topsoil surface to a minimum depth of 2 inches. Remove stones over 1 inch in any dimension and sticks, roots, rubbish and other extraneous matter.

3.03 APPLICATION OF LIMESTONE, SULFUR AND FERTILIZER

A. Sulfur and Limestone: If laboratory results indicate the addition of sulfur or lime is necessary, spread uniformly over designated areas to be seeded or sodded at the rate recommended. Thoroughly mix through upper 2 inches of topsoil.

B. After application of sulfur or lime, and prior to applying fertilizer, loosen areas to be seeded or sodded with a suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pockets or low areas, which will allow water to stand.

C. Fertilizing: Distribute fertilizer uniformly with a suitable distributor over areas to be seeded or sodded at a rate of 30 pounds per 1,000 square feet.

D. Incorporate fertilizer into topsoil to depth of at least 2 inches by disk harrowing or other approved methods. Clean surface of stones or other substances, which will interfere with, turf development or subsequent mowing operations.

E. Grade areas for seed or sod to a smooth, even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas, which can be seeded or sodded soon after preparation.

F. Fertilizer need not be incorporated in the soil when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than thirty (30) minutes when a hydraulic seeder is used.

G. Limestone shall be thoroughly mixed into the soil in accordance with the soil pH. Contractor shall notify the soil pH result to the Engineer and get approval for the lime application rate.

H. It is the responsibility of the Contractor to make one (1) application of maintenance fertilizer at one-half the rates and should be applied in early spring following initial establishment of cover.

3.04 SEEDING OPERATIONS

A. All disturbed areas that will not be reworked or sodded within 14 days maximum shall be temporarily seeded and mulched. Disturbed areas outside the “Limits of Construction” as shown on the Contract Drawings shall be sodded at no additional cost to the County.

B. Seeding shall be in accordance with FDOT Standard Specifications. Steep slope seeding shall be in accordance with FDOT Standard Specifications. Seed shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.

C. Seeds shall be uniformly sown by any approved mechanical method to suit the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power drawn seed drills. Hydroseeding and hydromulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to present segregation of the various seeds in a seeding mixture.

D. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8 inch by a cultipacker or suitable roller.

E. Plant establishment including watering shall be in accordance with FDOT Standard Specifications, section 575 and 981.

F. Protect seeded slopes against erosion with erosion control matting or other methods approved by ENGINEER.

3.05 MULCHING OPERATIONS

A. Mulching shall be in accordance with FDOT Standard Specifications, section 580.

B. Apply mulch immediately after seeding. Mulch shall be applied evenly between 3/4 inch and 1-1/2 inch deep, according to the texture and moisture content of the mulch material.

C. Apply mulch with tackifier regardless of whether using ground or hydroseeding equipment for seeding. Apply enough tackifier to the mulch to hold it in place. Do not apply mulch on windy days. Immediately replace mulch that blows away.

D. Apply walked-in-mulch on slopes ranging in steepness from 5:1 to 2:1. Immediately walk it into the soil with a cleated track dozer. Make dozer passes vertically up and down the slope.

3.06 SODDING OPERATIONS

A. The setting of sod pieces shall be staggered in such a manner as to avoid continuous seams where possible.

B. Sod shall be carefully placed by hand, edge to edge, in rows at right angles to the slope.

C. Sodding shall be in accordance with FDOT Specification section 575 and 981.

3.07 WATERING

A. The Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain an adequate water content in the soil.

B. Watering shall be accomplished by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.08 MAINTENANCE

A. The Contractor shall keep all seeded and sodded areas watered and in good condition until final acceptance.

B. The repair of any erosion or sod relocation necessary prior to the sod becoming firmly rooted to the existing soil will be the responsibility of the Contractor.

C. Begin maintenance of sodded areas immediately after each portion is planted and continue until final acceptance.

D. Maintenance shall be at a minimum, all temporary and final seeded and sodded areas, watered twice per week with a minimum of 1/4 inch water applied per watering event.

E. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris, and excess material and the premises shall be left in a neat and orderly condition.

F. The Contractor shall maintain all seeded and sodded areas without additional payment until final acceptance of the Work by the Owner, and any regrading, refertilizing, reliming, reseeding, or remulching shall be done, at Contractor's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform standard is accomplished. Damage resulting from erosion, gullies, washouts, or other causes, shall be repaired by filling with topsoil, compacting, and repeating the seeding work at Contractor's expense.

G. Engineer may require the use of Bermuda sod in areas where Bermuda sod has been disturbed during construction. Additional seeding may be required until Bermuda grass growing season is established.

3.09 FINAL ACCEPTANCE

A. All seeded and sodded area shall have a satisfactory growth and coverage at the final acceptance of the Work by the Owner. The vegetation growth will be considered satisfactory that has no bare spots larger than 1 ft^2 and bare spots comprise of no more than 1 percent of any given area.

B. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of specified grass is established, free of weeds, bare or dead spots and surface irregularities.

C. The Contractor shall maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, as may be necessary. If the planted areas must be resodded, reshaped, or otherwise repaired, regardless of cause, the Contractor shall perform such work at the Contractor's expense. The Engineer, at any time may require replanting of any areas in which the establishment of the grass stand does not appear to be developing satisfactory at no additional cost to County.

D. The period of establishment for areas that are reseeded or resodded shall extend to 1 year after the completion of reseeding or resodding unless otherwise authorized by the Owner or ENGINEER.

END OF SECTION

SECTION 32 90 20

ENVIRONMENTAL ASSESSMENT

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall evaluate the existing site environmental conditions and adjacent areas prior to commencement of work

1.02 LANDSCAPING AND VEGETATION

A. Existing landscaping and other vegetation that is to remain in place shall be protected against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, excess foot or vehicular traffic, or improper parking of vehicles on vegetation. Temporary fences, barricades or guards shall be used to protect vegetation to be left standing.

B. Any vegetation to remain within limits of contract work shall be watered as required to maintain their health during course of construction operations.

C. The CONTRACTOR shall repair or replace vegetation that will remain, which are damaged by construction operations, in a manner acceptable to the COUNTY at the CONTRACTOR's expense when deemed necessary.

1.03 PROPERTY RESTORATION

A. All landscaping and/or irrigation systems affected by work shall be restored to original condition at the CONTRACTOR's expense.

B. The CONTRACTOR shall assume all responsibility and liability for property damages, bodily injury, or financial losses and interruptions of service that may result from the construction activities which affect structures, facilities, water lines, gas lines, power lines, electric conduits, sewer lines, telephone lines, cable TV lines, cable internet lines, and all service facilities connected thereto.

C. The CONTRACTOR shall be responsible for relocation, repairing, reconstruction, and re-installation of damaged or disturbed items due to the construction activities.

D. Damaged or disturbed items shall be re-installed or restored to their original condition as soon as possible and prior to completion of work at the CONTRACTOR's expense. Restoration shall be approved by the authority having jurisdiction over the disturbed items. There shall be no extra cost to the COUNTY.

E. Items not specifically stated in the Specifications that are removed, damaged, destroyed, or defaced due to neglect or carelessness on the part of the CONTRACTOR shall be repaired or replaced by the CONTRACTOR if determined so by the COUNTY.

END OF SECTION

SECTION 33 21 70

LFG EXTRACTION WELLS AND WELLHEADS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall provide all labor, equipment, materials, and appurtenances necessary to drill, install and make ready LFG extraction wells as indicated on the Drawings.

B. The perforated pipe, gravel stone, geotextile, bentonite, and soil backfill shall be set at depths and thicknesses shown on the Drawings or as designated in the field by the Engineer. It is expected that combustible and asphyxiant gases will be venting from boreholes drilled into waste within the footprint of the landfill. The Contractor's proposal price shall include provision for all equipment and procedures necessary to safely install wells and borings under this condition. All Work shall be performed by qualified workers in accordance with the best standards and practices available.

C. Upon completion of each new extraction well or boring, Contractor shall dispose of all construction and drilling refuse materials as specified in Section 02 41 16 or as directed by the County.

D. Related Work Described Elsewhere:

1. Section 02 41 16: Refuse Handling, Storage, and Disposal
2. Section 33 51 10: Pipe and Pipe Fittings
3. Section 33 21 80: Landfill Gas Collection System Appurtenances

1.02 REFERENCES

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
STANDARD TEST METHODS/PRACTICE

ASTM D 420-98	Standard Guide to Site Characterization for Engineering, Design, and Construction Purposes
ASTM D 422-63	Standard Method for Particle-Size Analysis of Soils
ASTM D 1452-80	Standard Practice for Soil Investigation and Sampling by Auger Borings
ASTM D 2487-00	Standard Classification of Soils for Engineering Purposes (Unified Classification System)

ASTM D 2488-00	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)

1.03 SUBMITTALS

A. The Contractor shall prepare and submit to the Engineer, for review and approval, Certificates of Compliance on materials furnished, and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, and inspection of pipe and appurtenances furnished as described in Contractor Submittals.

B. The Contractor shall prepare and submit to the Engineer for review and approval, Shop Drawings showing dimensions, materials, and manufacturer's information for pipe, pipe perforations, fittings, and bentonite.

C. One week prior to well drilling, Contractor shall submit an example well boring log and construction log. The example log shall be completed with all of the required descriptions and pertinent information required under Part 3.03 of this Section.

D. At least two weeks prior to construction, the Contractor shall submit to the Engineer for review and approval, results of the sieve analysis for the soil backfill, samples of all well backfill materials (if requested), the name of the vendor(s), and source of backfill materials furnished.

E. At the end of each day, Contractor shall provide copies of the handwritten well boring and completion logs for each well drilled on that day. Information to be included on the well logs is listed in Part 3.03 of this Section.

F. Electronic (typed) copies Final boring logs based on field information shall be submitted with the Record Documents. Description of the boring and excavated material shall be according to the attached well boring log template at the end of this Section.

1.04 QUALITY ASSURANCE

A. A professional experienced in installation of LFG wells shall be responsible for observing and documenting information related to all boring and installation activities. The OWNER will contract with the quality assurance professional that will oversee and observe the extraction well installation.

B. Inspect well materials for cleanliness, deformations, and imperfections, and ensure conformance with Specifications prior to use.

PART 2 - PRODUCTS

2.01 CLEAN SOIL BACKFILL

Clean soil backfill material shall be granular material free of clay, sticks, roots, organic material, MSW, and stones larger than 1-inch in any dimension. Clean soil shall be used in any location on Drawings that calls for "clean soil backfill".

2.02 STONE

A. Stone backfill shall be hard, durable non-calcareous rock. Stone shall be washed as a component of the manufacturing process and be free of organics, lumps or balls of clay, and other deleterious materials.

Stone shall be FDOT No. 4 and conform to the following gradation requirements:

Sieve Size	% Passing (by weight)
2 - inch	100
1 ½ - inch	90
1 -inch	35
3/4 - inch	5
3/8 - inch	0

2.03 BENTONITE

A. "Bentonite Plug" as used in the Drawings, shall refer to a well seal comprised of hydrated sodium bentonite pellets or chips of a thickness as indicated on the Drawings. Bentonite material shall consist of clay greater than 85% sodium montmorillonite, without additives.

B. Bentonite shall be hydrated per manufacturer's instructions prior to backfilling with soil. Bentonite shall be hydrated in 6-inch lifts as per Paragraph 3.05 B of this Section.

C. Under no circumstances will the use of granular bentonite be permitted for the vertical extraction wells.

2.04 HDPE PIPE

A. Pipe for extraction wells shall be 8-inch HDPE SDR11 as shown on the Drawings and conforming to the requirements of Section 33 51 10 Part 2.01.

B. The perforations in the extraction well piping shall be as specified on the Drawings.

2.05 WELL IDENTIFICATION

A. Upon completion of well drilling and piping installation, Contractor to install one (1) printed yellow well identification label sticker on each well casing:

a. Identification labels must be outdoor, UV resistant, waterproof, and permanently adhered around the well casing.

b. Identification label shall contain the following information: The words Well identification "EW-#" and "Landfill Gas Extraction Well" like the example shown below. Lettering by any other means shall not be permitted.

c. Identification label shall be 6-inch tall and safety yellow with black lettering. Lettering size (EW-#) to be 2-inch tall. Contractor to provide template before ordering labels.

d. Identification labels similar to ones found in the following websites:

1. http://tufflabels.com/outdoor-durable-labels/

2. https://www.rippedsheets.com/sheet-labels/102285-outdoor-matte-waterproof-vinyl-super-permanent-labels.html

2.06 GEOCOMPOSITE "DONUT"

A. Geocomposite or geotextile ring or donut to be placed between stone and clean soil backfill in well shall be a 36-inch diameter with an 8-inch opening for traditional and 12-inch opening for dewatering LFG extraction wells.

2.07 WELLHEAD

A. Wellheads shall be QED's Precision Accu-Flow quick change orifice plate wellheads 2-inch vertical wellheads, or equivalent approved by the County's Representative, and consistent with the Drawings.

2.08 WELLHOSE

A. Wellhose shall be QED Solarguard flexible hose or kanaflex flexible hoses with power lock clamps inspected and approved by the County's Representative and consistent with the Drawings.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION SERVICES

A. The Contractor shall survey and stake the well boring locations prior to drilling. Pre-construction layout surveying shall be done by a Florida Licensed Professional Surveyor.

B. Contractor shall supply surveyed ground elevations of the proposed new extraction wells to the Engineer so that the design well depths may be confirmed at least one week prior to drilling.

C. Extraction well and boring locations must be approved and may be adjusted by the ENGINEER prior to beginning drilling.

3.02 DRILLING

A. Contractor shall stake the extraction wells locations prior to initiating drilling and coordinate the start of drilling with the Engineer.

B. The Contractor shall provide at all times a thoroughly experienced, competent driller during all operations at the drill site.

C. The Contractor must use dry drilling equipment.

D. Wells are to be drilled to the depth vertically straight and the diameter as shown on the Drawings. The boring depths shown on the Drawings may be adjusted in the field by the Engineer. Under no circumstances are the drilling depths from the well schedule on the Drawings to be exceeded unless approved by the Engineer in advance.

E. At wells located on the sloped ground, Contractor shall install a soil platform using general fill material to level the ground prior to drilling a vertical bore.

F. If wet boring conditions are observed during drilling, the Contractor shall do the following:

1. The Engineer shall be notified of wet boring conditions.

2. If water is encountered in a boring, the Contractor may be directed by the Engineer to drill beyond the point at which it was encountered. If wet conditions remain, at the direction of the Engineer, the boring may be terminated (after driller has attempted to advance boring for 2 hours) and the length of perforated pipe adjusted by the Engineer. If wet conditions cease (e.g., due to a perched water layer), then drilling will continue to the design depth.

3. If water is encountered in a boring at a shallow depth, the Engineer may decrease the well depth and length of perforated pipe, or relocate the well.

G. If a bore needs to be abandoned, the contractor shall do the following:

1. If, in the opinion of the Engineer, the borehole has not reached a sufficient depth to function as an effective extraction well, the Contractor shall abandon this borehole by backfilling it with cuttings removed during drilling. Soil shall be backfilled and compacted to ground surface. Contractor shall supply additional soil backfill to refill any settlement within the abandoned borehole, as approved by the Engineer.

2. The Contractor shall make a conscious effort to drill through the obstructions. If a no-progress obstruction is encountered and drilling

through is not possible, the Contractor shall immediately contact the Engineer and as directed install a shorter well, or relocate the well and abandon the drilled hole. If the drill rates drop below two linear feet per hour due to the presence of any obstructions, the Contractor shall immediately contact the Engineer to inform them of the situation. If the Engineer asks the Contractor to continue drilling through the obstruction, the Contractor can charge the County at the hourly drilling rate provided in the Proposal Form until the drilling rate increases above two linear feet per hour or the Engineer instructs the Contractor to stop the drilling.

3. If cuttings are unsuitable as backfill (for example, box springs, tires, etc.) the Contractor shall use soil backfill material.

4. Compensation for abandoned borings shall be at the unit price for boring refusal.

H. If asbestos is encountered, the Contractor shall notify the County and the Engineer. The Contractor shall control emissions by covering the asbestos with at least 6 inches of compacted non-asbestos-containing material or with a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion in accordance with 40 CFR 61.154(c). As needed, the asbestos shall be removed from the excavated area and transported to a designated asbestos disposal area onsite and procedures outlined above and in 40 CFR 61.154(f) shall be performed.

I. The bore for the well shall be straight and the well pipe shall be installed in the center of the borehole.

1. Following well drilling, a 5-foot by 5-foot well bore reinforcement grate shall be installed over the top of the borehole with opening sizes as shown in the drawing

2. The Contractor shall take all necessary precautions to maintain the well pipe vertically plumb during the entire backfill operation of the borehole to the satisfaction of the Engineer.

3. The grate over the borehole that is used to keep the well casing plumb shall not be removed until the borehole is backfilled to within 2 feet of ground surface.

4. If the pipe is installed out of plumb, as determined by the Engineer, the Contractor, at his own expense, shall correct the alignment.

5. The well casing shall extend above ground surface as shown on the drawing. No pipe couplings shall be installed above grade or within 10 feet of ground surface below grade

J. If for any reason the Contractor suspects that drilling may have advanced to or beyond the liner system, the Contractor shall immediately notify the County in verbal and written communication.

K. Contractor shall leave a solid well casing above the existing landfill grades at the location of the gas extraction wells and horizontal manifold, in accordance with the Drawings.

L. Contractor shall remove all working platforms constructed for the drill rig after the installation of the well. Hauling, construction, removal, and other work tasks related to well installation shall be carried out with minimal disturbance to the vegetation on the landfill. Any disturbance to the vegetation on the landfill shall be restored to original conditions by the Contractor at his own expense.

3.03 WELL LOGS

A. Contractor shall keep detailed well logs for all wells drilled. Information recorded on the well logs shall include the following:

1. Total depth of well.

2. Visual description of refuse at 10-foot intervals:

   a. Type of refuse encountered including the estimated percentage of the following components (by volume) on visual inspection:

      – Paper/Cardboard
      – Plastic
      – Yard refuse
      – Construction debris
      – Textiles
      – Tires
      – Sludge
      – Dirt

   b. Moisture content (in percentages) based on the guidelines attached to the end of this Section.

   c. State of decomposition based on the guidelines attached to the end of this Section.

   d. Temperature of excavated refuse

3. Occurrence, depth, and thickness of water-bearing zones

4. Length of slotted pipe and solid pipe below grade.

5. Thickness, description and depth from ground surface of backfill layers.

6. Length of above ground riser stick-up pipe.

B. Contractor shall use the well borings description sheet provided at the end of this Section as a guideline for describing excavated materials.

C. Field copies of the well logs shall be provided to the Engineer at the end of each day.

D. Typed final copies of the well logs shall be submitted with the Record Drawings. Handwritten logs will not be acceptable for submittal with the Record Drawings.

3.04 JOINING OF PIPES

A. Pipes shall be joined as specified in Section 33 51 10, Pipe and Pipe Fittings, Section 3.04 Part B.

1. Heat fusion joints shall be made in accordance with manufacturer's step-by-step procedures and recommendations.

2. Mechanical joining shall be accomplished with HDPE flange adapters, neoprene gaskets, and ductile iron back-up flanges, and shall be used only where shown on the Drawings.

B. At the end of each day, Contractor shall cap the ends of all joined pipes longer than 20 feet to prevent entry by animals and debris.

3.05 BACKFILLING

A. Backfilling of the well shall commence immediately after well drilling is completed and the well piping has been installed in the borehole.

1. Backfill materials shall be placed carefully within the wells to the dimensions shown on the Drawings and as approved by the Engineer.

2. Tire chip and soil backfill containing foreign material may be rejected by the Engineer on the basis of a visual examination.

3. Both well piping and backfill shall be installed with a reinforcement grate installed over the boring. The reinforcement grate shall remain in place until backfill is within 2 feet of existing ground surface.

B. Gravel pack shall be bucket-poured through the reinforcement grate at a rate that shall not endanger the integrity of the well casing. Care shall be taken during backfilling to prevent bridging. Contractor shall keep record of number of bucket fills at each well.

C. Bentonite Plug shall be backfilled and hydrated in 6-inch lifts. The Contractor shall soak each lift according to the manufacturer's instructions prior to filling the

next one. A minimum of 6 bags of bentonite shall be poured into the center of the borehole per 6-inch lift.

D. Soil backfill shall be rodded in the boring to provide even distribution and compaction.

E. All material layer thicknesses shall be verified by taking measurements before, during, and after installation of each layer.

3.06 REFUSE DISPOSAL

The Contractor shall dispose of excavated refuse as specified in Section 02 41 16-Refuse Handling, Storage, and Disposal.

3.07 TEMPORARY CAP

The Contractor shall temporarily cap the riser pipe of the vertical extraction well immediately after well pipe installation to prevent venting of LFG into the atmosphere. The Contractor or County shall remove this cap during the installation of the wellheads. Lag screws may be necessary due to the internal gas pressure within the well.

3.08 WELLHEAD INSTALLATION

A. Vertical extraction well and horizontal collector wellheads to be installed in accordance with manufacturer's recommendations. All pipe sections of the wellhead shall be air-tight. Any leaks shall be repaired by Contractor at no additional cost to the County. Refer to measurement and payment specification for applicable requirements for LFG Wellheads prior to purchasing and installing wellheads.

B. Install QED Solarguard flex hose on all wells. Hose should not have any sags, as shown on the Drawings. However, flexible hose shall not be taut. Provide enough slack to accommodate minor pipe settlement, as approved by the Engineer.

3.09 PNEUMATIC PUMPS

A. The pneumatic pumps shall be QED AutoPump bottom inlet Model Short AP4^{+}B or equivalent. Additional details for pneumatic pumps are in Section 33 21 80 - Landfill Gas Collection System Appurtenances.

B. Prior to procuring pumps, the Contractor shall contact County's representative for the approval to purchase and install.

ATTACHMENT 33 21 70 - 2 Landfill Borehole and Well Logging Guidance

ATTACHMENT 33 21 70 - 3 Well Boring Log Template

END OF SECTION

SECTION 33 21 70 - 2

LANDFILL BOREHOLE AND WELL LOGGING GUIDANCE

Moisture Content Scale

15% Dry Refuse	20-25% Normal	25-35% Damp	35-50% Wet	50% Saturated
Rock, dirt, etc; no trace of moisture paper will be fuzzed up	Newspaper, etc; still not noticeably wet but normal moisture	Paper shows dampness lawn clippings, tree branches, stiff & hold together	Paper saturated but no free water, just getting sloppy; water emanates when squeezed	Mud or free water present

Decomposition Scale

Little	Some	Moderate	Much	Severe
Newspaper readable; refuse looks new		Newspaper not legible; branches intact		Newspaper not legible; crumble; black/brown mucky material

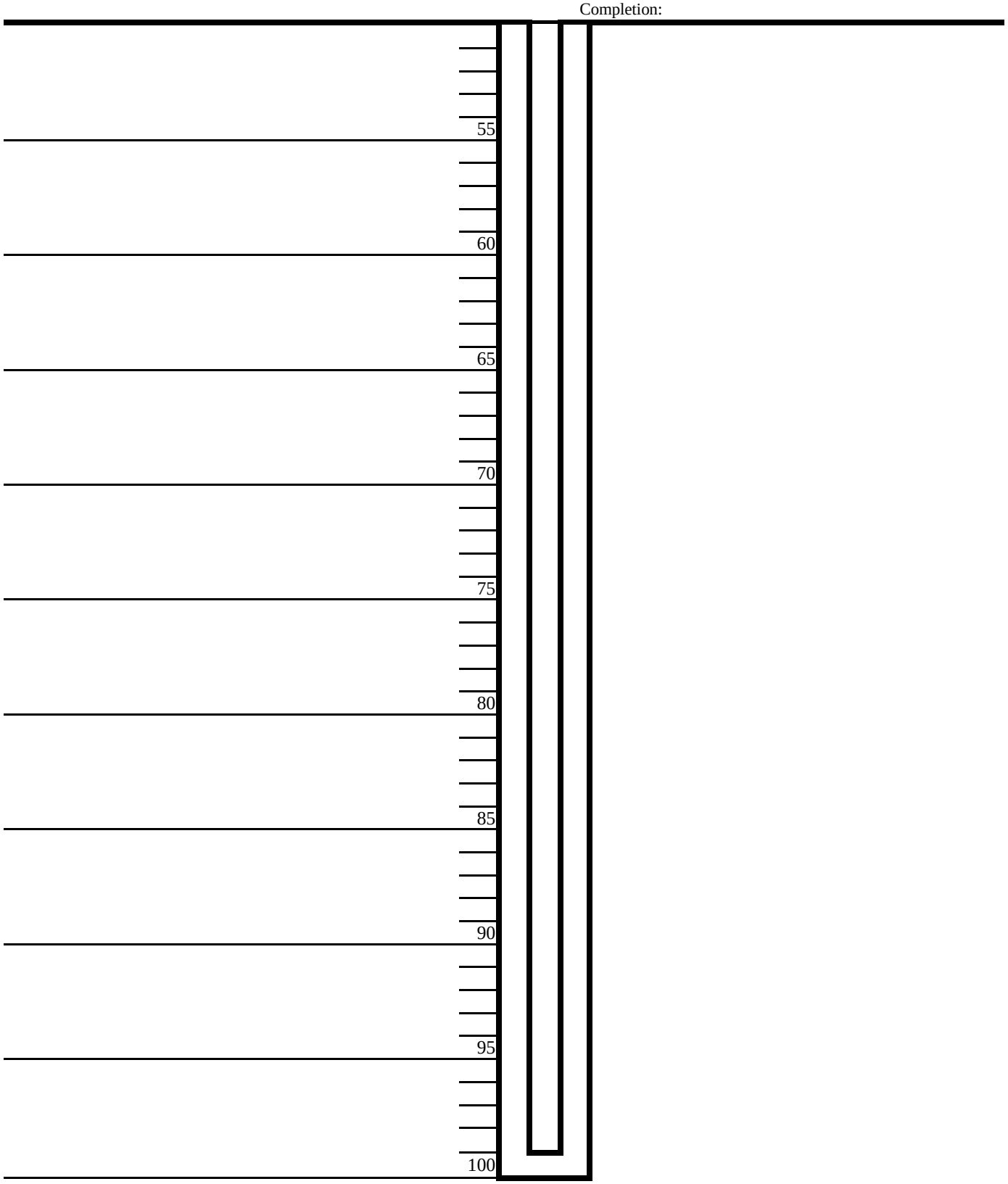
Log the following (in 10-foot intervals):

- Note apparent Intermediate cover thickness and presence of intermediate cell cover
- Ratio of refuse to cover soil
- Degree of compaction (i.e., loose, moderate, tight)
- Composition description (i.e., household, garden, commercial, demolition, sludge, medical, or other)
- Percent of refuse components (plastic, metal, yard waste, etc.)
- Note color and unusual odors or appearances
- Degree of decomposition
- Percent of moisture
- Approximate dates of refuse as an indicator (only) of dates of placement (i.e., newspaper, etc.)
- Refuse temperature
- Gas presence and relative pressure and temperature
- Presence of perched or free liquid
- Note elevations and observations of changes in refuse/soil/liquid conditions

ATTACHMENT 33 21 70 - 3

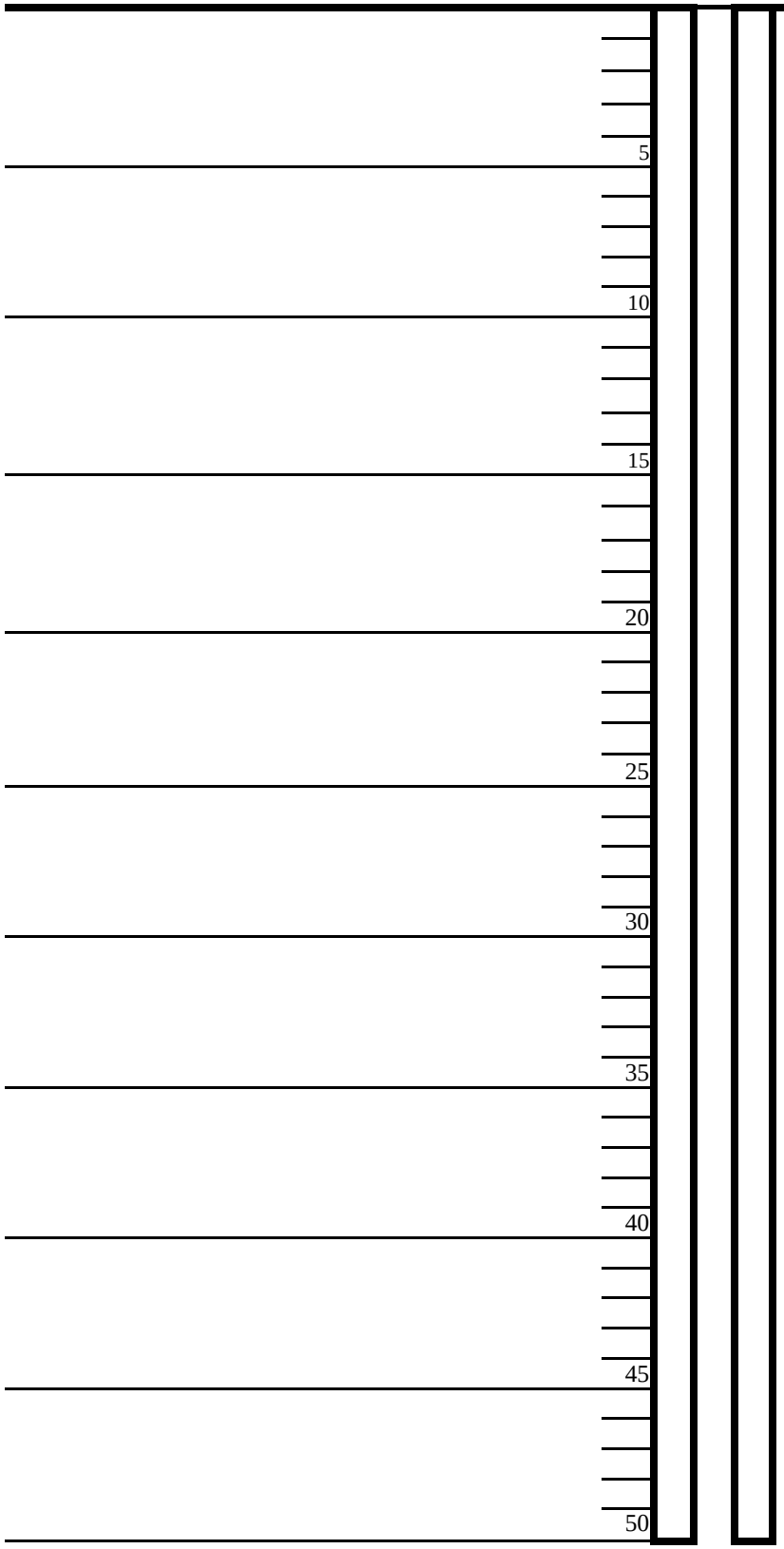
Well Log - SCS Engineers

Site Name:	Well Number:
Project #:	Coordinates:
Start Date:	Surface Elevation:
Completed:	Top of Casing Elevation:
Contractor:	Boring Diameter:
Inspector:	Pipe Material Diameter
Driller:	Total Depth Drilled:
	Completion:



Well Log - SCS Engineers

Site Name:	Well Number:
Project #:	Coordinates:
Start Date:	Surface Elevation:
Completed:	Top of Casing Elevation:
Contractor:	Boring Diameter:
Inspector:	Pipe Material Diameter
Driller:	Total Depth Drilled:
	Completion:



COMPLETION LOG	
RISER STICK UP	
RISER BELOW	
PERF. PIPE	
BACKFILL	
BENTONITE #1	
SILICA SAND 20/30	
BENTONITE #2	
BACKFILL	
GRAVEL PACK	
BACKFILL LOG	
Stone	
Structural fill	
Bentonite fill	
MATERIALS LIST	
TOP CAP	
SOLID PIPE	
PERF PIPE	
BOTTOM CAP	
BENTONITE	
BACKFILL	
STONE	

SECTION 33 21 80

LANDFILL GAS COLLECTION SYSTEM APPURTENANCES

PART 1 - GENERAL

1.01 GENERAL

A. The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all work and services for complete installation of the landfill gas (LFG) collection system appurtenances as shown on the Drawings and as specified, in accordance with provisions of the Contract Documents.

B. The work shall include, but not necessarily be limited to valves, access risers, blind flanges, installation of pipe, fittings, and connections, abandonment of gas extraction wells and piping, as specified and as shown on the Drawings.

C. Materials shall not be incorporated in construction until approved by the Engineer.

1.02 SUBMITTALS

A. The Contractor shall notify the County of the source of all materials and shall furnish a representative sample for approval, at least 15 calendar days prior to the date of anticipated use of such material.

B. Warranty package will be submitted to County and Engineer for review and approval. All equipment specified in this Section shall be warranted by Manufacturer for a period of not less than one year from the date of acceptance.

PART 2 - PRODUCTS

2.01 PNEUMATIC PUMPS

A. Pumps shall be air displacement pumps, internally controlled and designed for leachate and condensate systems. Pumps shall be bottom loading with inlet screen.

B. The pneumatic pumps shall be QED AutoPump bottom inlet model Short AP4^{+}B. The pump shall have screens, casings and fittings, and a hose and hardware package with 1-inch discharge hoses and ¾ inch air hoses.

C. Performance and Configuration Requirements:

1. Leachate and Condensate Pumps:

a. Design Condition: Minimum of 5 gpm at 140 FT Total Dynamic Head (TDH).

b. Intake Configuration: Bottom loading, screened intake.

D. Accessories:

1. Pipe/tubing: Provide supply air and liquid discharge tubing of sufficient size, strength, and capacity for the pump.

2. Fittings: Provide stainless steel fittings appropriate for tubing connections.

3. All necessary fittings, flanges, etc., to connect pump(s) gas extraction wells, including the discharge of liquids removed into the liquid conveyance line.

4. Air and liquid conveyance hose lengths outside the gas extraction wells shall be field determined and approved by the Engineer.

5. Air intake kit/Assembly: Air filter regulator, Air inlet supply pressure gauge, Pump cycle counter.

2.02 WELL CAPS

A. The well caps shall be QED 8-inch well diameter wellheads and caps as specified in the Drawings.

2.03 SOURCE QUALITY CONTROL

A. Secure from the pump manufacturer the following inspections and tests on each pump before shipment from factory:

1. Check for compliance with Specification.

2. Test pump operation.

B. Factory test of head (FT) versus flow (gpm)

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install pump in gas wells as specified by the Engineer and in accordance with pump manufacturer’s recommendations. All pump installations shall be

completed only after CONTRACTOR provides measurement of liquid level in the well and getting approval from the ENGINEER for the depth of the pump.

B. Connect to air supply line with pressure regulator.

C. Connect discharge to condensate forcemain line.

3.02 FIELD QUALITY CONTROL

A. Provide services of equipment manufacturer's field service representative(s) to:

1. Inspect equipment covered by these Specifications.

2. Supervise pre-start adjustment and installation checks.

3. Conduct initial startup of equipment and perform operational checks.

4. Provide a written statement from manufacturer stating that manufacturer's equipment has been installed properly, started up and is ready for Operation by Owner's personnel.

END OF SECTION

SECTION 33 51 10

PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall supply all materials, equipment, and labor needed to install complete and make ready for use all pipe, pipe fittings, and valves as specified herein and as indicated on the Drawings.

B. Related Work Described Elsewhere

1. Section 31 20 00 - Excavating, Trenching, Backfilling and Grading
2. Section 33 21 70 – LFG Extraction Wells and Wellheads
3. Section 33 21 80 – LFG Collection System Appurtenances
4. Section 33 51 30 – LFG Condensate Management System

1.02 SUBMITTALS

A. Prior to commencement of construction, the Contractor shall prepare and submit to the Engineer, for review and approval, all manufacturer quality assurance certificates, and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of each type of pipe, pipe fitting, and valve furnished.

B. The Contractor shall prepare and submit Shop Drawings to the Engineer for review and approval. The Shop Drawings shall show the following:

1. All dimensions, slopes, and invert elevations at connections to existing pipes.

2. All tie-ins to the existing leachate collection system shall be field-verified and shown on the Shop Drawings. This shall include pipe size and burial depth at a minimum.

3. Pipe Dimensions for each pipe size used:

   a. Average outside diameter.
   b. Average inside diameter.
   c. Minimum average wall thickness.

4. Each pipe and fitting size to be used.

C. The Contractor shall submit all field pressure testing results to the Engineer for approval.

1.03 MANUFACTURER'S QUALITY ASSURANCE

A. The pipe and fittings manufacturer shall have an established quality assurance program responsible for inspecting incoming and outgoing materials and assuring the long-term performance of materials and products.

B. The pipe and fitting manufacturer shall maintain permanent quality control and quality assurance records.

1.04 REFERENCE

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Use of the most recent version is required.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1248	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other gravity-flow applications.
ASTM D 2241	Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D 2467	Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D 2513	Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings
ASTM D 2564	Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping

ASTM D 2855	Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
ASTM F2620-19	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI B 31.8	Code for Pressure Piping, Appendix N

PART 2 - PRODUCTS

2.01 FLEXIBLE PVC PIPE ON WELLHEADS

A. Flexible PVC pipe shall be UV-Resistant Solarguard™ Flexible Hose supplied by QED Environmental.

B. Fasteners for flexible PVC pipe shall be high strength stainless steel banding kits supplied by QED Environmental.

2.02 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. General:

1. All PVC pipe and fittings as indicated on the Drawings shall be Schedule 80 Polyvinyl Chloride conforming to ASTM D 1784, ASTM D 1785 (for pipe), and ASTM D 2467 (for fittings). All pipe and fittings shall be provided by one manufacturer. Acceptable manufacturers include Plastinetics, Inc. Chemtrol, ASAHI/America, or approved equal.

2. PVC pipe and pipe fittings shall be manufactured from a compound which meets the requirements of Type 1, Grade 1, Polyvinyl Chloride PVC 1120, Class 12454-B, as outlined in ASTM D 1784. A Type 1, Grade 1 compound is characterized as having the highest requirements for mechanical properties and chemical resistance.

a. Compound from which pipe is produced shall have a design stress rating of 13,800 kPa at 23 degrees C, listed by the Plastic Piping Institute.
b. Materials from which pipe and pipe fittings are manufactured shall have been tested and approved by NSF International.
c. Pipe shall conform to the requirements of ASTM D 2241. Pipe shall be homogenous throughout and shall be free from cracks, holes, foreign inclusions, and other defects.

B. PVC Pipe Storage: PVC pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be limited to 6 feet. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris. For storage over 5 days, a location shall be chosen out of direct sunlight or the piping and fittings will be covered.

C. All pipe and fittings must be supplied by the same manufacturer.

2.03 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. General:

1. All High-density polyethylene (HDPE) pipe and fittings 6-inch diameter and greater as indicated on the Drawings shall be Standard Dimension Ratio (SDR) 17 using a 4710 type resin or equal.

2. Condensate discharge pipes and fittings shall be 2-inch or 3-inch diameter HDPE SDR 11 as specified in the CONTRACT DRAWINGS.

3. Air supply pipes and fittings shall be 2-inch diameter SDR 9 with yellow striping.

4. Pipe shall be extruded from a Type III, Class C, Category 5, Grade P36 compound as described in ASTM D 1248. It shall be classified as cell 445574C according to ASTM D 3350 and have the material designation of PE 4710. Pipes utilized for gas flow shall be manufactured to meet the requirements of ASTM D 2513. Pipes utilized for liquid flow shall conform to ASTM F714 or ASTM D3035. Manufacturer's literature shall be adhered to when "manufacturer's recommendations" are specified. All pipe and fittings shall be provided by one manufacturer. Acceptable manufacturers include Performance Pipe (800-527-0662), or equal.

5. The nominal inside diameter of the pipe shall be true to the specified pipe size. Standard laying lengths shall be 40 feet ± 2 inches. Exceptions may be made for 2-inch diameter pipes in coils if suitable strengthening devices are used.

B. HDPE Fittings

1. Fittings such as couplings, flanges, wyes, tees, etc. shall be manufactured from polyethylene compound having cell classification equal to or exceeding the compound used in the pipe.

2. All fittings 12 inches and smaller shall be molded, unless approved by the Engineer.

C. All pipe and fittings must be supplied by the same manufacturer from identical materials, unless approved by the Engineer. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

2.04 FLANGES FOR HDPE PIPE

A. Flanges for HDPE pipe shall be convoluted ductile iron back-up rings with a minimum thickness of 1-inch, as manufactured by Improved Piping Products, Inc. (800) 969-0962, of Orinda, California or equal. Hardware and fittings shall be stainless hot-dipped galvanized, finished with blue primer, and epoxy coated.

B. The studs, nuts, and washers for the flanges shall be hot-dipped galvanized. All below grade studs, nuts, and washers shall be thoroughly coated with Polyken Technologies 1027 Primer, or rubberized emulsion undercoating spray, or equal substitute, with no gaps in coverage. Below grade flanges shall be wrapped in 5-mil polyethylene sheeting just after installation and prior to backfilling to help prevent corrosion.

C. Flange gaskets shall be full-face Neoprene.

2.05 PIPE MARKINGS

All PVC and HDPE pipe shall be stamped by the manufacturer with the following information at five foot intervals:

A. Manufacturer name or trademark
B. Nominal pipe size and sizing system
C. Standard dimension ration (SDR) or Schedule (SCH) value
D. Type of plastic (e.g., PE 4710)
E. Production code
F. Manufacturing date
G. ASTM designations (i.e., ASTM D 2513)

2.06 VALVES

A. All valves shall be complete with all necessary operators and other accessories or appurtenances which are required for the proper completion of the Work. Operators and other accessories shall be sized and furnished by the valve supplier and factory mounted.

B. Valves and operators shall be suitable for the exposure they are subject to, e.g., buried and landfill gas. Valves shall have all safety features required by OSHA.

C. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

D. Valve position indicators shall be installed correctly to properly identify the valve position.

E. Valve spacers shall be used for all valves 6 inches and larger.

2.07 PIPELINE LOCATOR/WARNING TAPE

A. For LFG header and laterals as shown on the Drawings, tape shall be a standard locator/warning tape imprinted with the words "Caution Gas Line Buried Below," as supplied by Reef Industries, Inc. (800-231-6074), or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be limited to 6 feet.

B. Pipe and pipe fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidways in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

3.02 FIELD QUALITY CONTROL

A. Pipe may be rejected for failure to conform to the Specifications or for the following reasons:

1. Fractures or cracks passing through pipe wall, except single crack not exceeding 2 inches in length at either end of the pipe which could be cut off and discarded. Pipes within one shipment shall be rejected if defects exist in more than five percent of shipment or delivery.

2. Cracks sufficient to impair strength, durability or serviceability of pipe.

3. Defects indicating improper proportioning, mixing, or molding.

4. Damaged ends, where such damage prevents making a satisfactory joint.

5. Scratches or gouges of depth greater than 10 percent of pipe wall thickness.

B. Acceptance of fittings, stubs, or other specially fabricated pipe sections shall be based on visual inspection at job site and documentation of conformance to these Specifications.

C. The Engineer shall be notified by Contractor prior to burial of pipe.

D. The County designated Project Manager and Engineer reserve the right to require destructive testing of any fusion weld on HDPE pipe.

3.03 PVC PIPE INSTALLATION

A. PVC pipe installation shall conform to these Specifications, the manufacturer's recommendations, and as outlined in ASTM D 2774.

B. Field perforations are not authorized.

C. Pipe shavings from perforations shall be removed from the inside of all pipes using a method approved by and to the satisfaction of the Engineer.

3.04 JOINING OF PVC PIPE

A. Joining of pipe shall be in accordance with ASTM D 2855.

B. Preparation:

1. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used. All burrs, chips, etc. shall be removed from pipe interior and exterior.

2. The interior of the pipe shall be cleared of foreign matter; e.g., loose dirt, tape, pipe shavings, and paper. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting.

3. All pipe cuts shall be square, perpendicular to the center line of pipe. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement is not wiped off during insertion into the fitting socket.

C. Solvent Welding:

A coating of primer as recommended by pipe supplier shall be applied to the entire interior surface of the fitting socket and to an equivalent area on the exterior of the pipe prior to applying solvent cement. The solvent cement shall comply with the requirements of ASTM D 2564 and shall be applied in strict accordance with manufacturer's specifications. Pipe shall not be primed or solvent welded during precipitation or when atmospheric temperature is below 40 degrees F or above 90 degrees F.

D. Curing:

After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint setting time, use 1 hour for ambient temperatures 60-90 degrees F, or 2 hours when ambient temperature is 40-60 degrees F.

E. Alignment:

Pipe and pipe fittings shall be selected so as to minimize the linear deviation at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

3.05 FLEXIBLE PVC PIPE CONNECTIONS

Connections to pipe shall be made with clamps in accordance with manufacturer's step-by-step procedures and recommendations, and as approved by the Engineer.

3.06 HDPE PIPE HANDLING

A. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will overstress or buckle the HDPE piping or impose excessive stress on the joints.

B. Joining HDPE Pipe:

1. Only two methods shall be utilized to join HDPE pipe: heat fusion and mechanical joining.

a. Mechanical Joining shall be accomplished with HDPE flange adapters, neoprene gaskets, and ductile iron back-up flanges, and shall be used only where shown on the Drawings. Refer also to Part 3.11.

b. Heat Fusion joints shall be made in accordance with manufacturer's step-by-step procedures and recommendations.

1) Fusion equipment and a trained operator shall be provided by the Contractor. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the project.

2) Branch saddle fusions shall be made in accordance with manufacturer's recommendations and step-by-step procedures. Branch saddle fusion equipment shall be of the size to facilitate saddle fusion within the pipe trench.

3) Heat fusion shall be performed outside of the trench whenever practical.

4) Before heat fusing pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris, and any foreign material shall be completely removed.

5) At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or debris.

c. As per the manufacturer's instructions, no fusion shall be performed in precipitation unless a shelter is provided.

3.07 HDPE PIPE INSTALLATION

A. Pipe installation shall comply with the requirements of ASTM D 2321, PPI TR-31/9-79, and the manufacturer's recommendations.

B. Lengths of fused pipe to be handled as one segment shall not exceed 500 feet.

C. Inside of pipe shall be free of debris such as shavings and dirt.

D. The Engineer shall be notified prior to any pipe being installed in the trench in order to have an opportunity to inspect the following items:

1. All butt and saddle fusions.
2. Pipe integrity.
3. Trench excavation and bedding material for rocks and foreign material.
4. Proper trench slope.
5. Trench contour to ensure the pipe will have uniform and continuous support.
6. Proposed backfill sand and soil.

E. Any irregularities found by the Engineer during this inspection must be corrected before lowering the pipe into the trench. Pipe shall be allowed sufficient time to adjust to trench temperature prior to any testing, segment tie-ins, and/or backfilling.

F. Tie-ins shall be made out of the trench whenever possible. When tie-ins are to be made in a trench, a bell hole shall be excavated large enough to ensure an adequate and safe work area.

G. Below grade piping shall be marked with warning tape to be buried in the trench above the pipe as indicated on the Drawings.

H. Contractor shall collect all pipe shavings and discard in a trash receptacle. Shavings shall not be left on the ground.

I. All installed HDPE pipe shall be marked in 10-foot intervals corresponding to the stationing required for slope confirmation and conformance surveying. For main pipeline, station numbering shall be continuous and sequential. Station numbering shall be referenced in daily logs to document pipe installation progress.

3.08 FLANGED CONNECTIONS

A. For flanged connections in virgin soil, the Contractor shall wrap and tape the flanges and bolts in 5-mil polyethylene sheeting prior to backfilling to help protect the assembly from corrosion.

B. Flanges shall be joined with stainless hot-dipped galvanized studs and nuts. Stud lengths shall accommodate the required distance between flanges including valve spacers, if necessary.

C. For flanged connections within the limits of refuse, all below grade back-up rings, studs, nuts and washers shall be thoroughly coated with Polyken Technologies 1027 Primer, or rubberized emulsion undercoating spray, or equal substitute.

D. The Contractor shall wrap and tape the flanges and bolts in 5-mil polyethylene sheeting prior to backfilling.

3.09 PIPE SUPPORTS

All piping and valves shall be supported in such a manner as to prevent any stress being transmitted between sections and connected equipment and appurtenances.

3.10 SEGMENT TESTING (AIR PRESSURE)

A. The HDPE laterals and connections to LFG header, air supply lines, and condensate discharge line pipelines (both carrier and containment pipes in case of dual contained pipes) shall be subjected to pressure tests as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The Contractor shall accept the responsibility for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.

B. Polyethylene piping shall be butt welded together into testing segments. Segments shall be connected to a testing apparatus on one end and fitted with fusion-welded caps on all openings.

C. The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.

D. The test must be performed during a period when the pipe segment will be out of direct sunlight; i.e., early morning, late evening, or cloudy days. This will

minimize the pressure changes which will occur during temperature fluctuations. No testing will be allowed during the middle of the day or when pipe segments are exposed to sunlight.

E. The test pressure for LFG laterals, header, containment pipes of dual contained pipes, and condensate sumps shall be 4 psig. The test pressure for air supply and liquid conveyance pipes shall be 100 psig.

F. Pressure drop during the test shall not exceed 1 (one) percent of the testing gauge pressure over a period of one hour. (See Section 3.11 for test failures). The Engineer shall sign off on a test form to indicate test compliance.

G. The Engineer and CQA Consultant shall be notified prior to commencement of the testing procedure and shall be present during the test.

H. All equipment for this testing procedure, including an adequately sized air compressor, fittings, caps/pipe plugs, etc., shall be furnished by the Contractor. Other necessary equipment includes a flange adaptor with a steel or brass blind flange. Tapped and threaded into the blind flange will be a temperature gauge with a scale of 0 to 100 degrees C with 1-deg. intervals, a pressure gauge with a scale that spans the test pressure range with increments equal to 0.1 percent of the test pressure, an appropriate valve to facilitate an air compressor hose, and a ball valve to release pipe pressure at completion of test. Pipe reducers shall be utilized to adapt test flange to size of pipe being tested.

3.11 TEST FAILURE

A. The following steps shall be performed when a pipe segment fails the one percent/one-hour test described in Part 3.10 F, above.

1. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.

2. All blocked risers and capped ends shall be inspected for leaks.

3. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

B. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and refusing the pipe.

C. After all leaks are repaired, a retest shall be performed in accordance with Part 3.10.

3.12 TEST REPORTING

A. Each test (pass or failure) shall be reported in writing on the attached pipe testing form or another form approved by the Engineer.

B. If failure occurs, Contractor shall note the following:

1. Location of failure segment.
2. Nature of leaks.
3. Repairs performed.
4. Results of test.

ATTACHMENT 33 51 20 - 2 HDPE Pipe Pressure Protocol

END OF SECTION

PIPE AND PIPE FITTINGS

HDPE PIPE PRESSURE TEST PROCEDURE

This protocol describes the method for testing the installation of HDPE pipelines and components using a low-pressure air test.

PROCEDURE

1. Isolate the section of HDPE pipe to be tested using fusion welded caps. Cap the ends of all branches, laterals, tees, wyes, and stubs included in the test to prevent air leakage. All caps shall be securely braced to prevent blowout.

2. Contractor shall install a temperature gauge, pressure gauge and fittings for connection of an air compressor hose and a ball valve to release the pressure at the completion of the test.

    - Temperature gauge shall have a range of 0 to 100 ºC.
    - Pressure gauge shall have increments equal to 1% of the test pressure.

Contractor shall not install new holes in pipeline for the exclusive purpose of performing the air test. However, tapped holes shown on the Plans for items such as header isolation valve monitoring ports may be utilized.

3. Connect the hose to the inlet tap and portable air supply source. Add air slowly to the test section until the pressure inside the pipe reaches the required level as shown below:

    - LFG header, laterals and condensate dewatering discharge lines: 10 psig
    - Air supply line and leachate forcemain: 100 psig

4. Once pressurized and the pressure has stabilized, record the initial temperature (ºC) and pressure of the air inside the pipe on the test report form.

5. Begin timing the test. At ten-minute intervals, record the temperature (ºC) and pressure of the air inside the pipe on the test report form. Record this data for 6 intervals, until the total time equals 60 minutes.

6. For pipe segments that include an isolation valve, the pressure test must be performed to demonstrate the integrity of the valve. Contractor shall close the valve and perform pressure tests on the header segments on both sides of the valve. This will serve to identify if the valve is airtight.

CALCULATIONS

In order to determine if the section of pipe tested is acceptable, the following calculations must be made.

1. Calculate the final theoretical pressure.

$$P_{final,\,theoretical}\,(psi) = \frac{[P_{initial}\,(psi) + 14.7] * [T_{final}\,(°C) + 273]}{T_{initial}\,(°C) + 273}$$

where,

$P_{final,\,theoretical}\,(psi)$ = the theoretical acceptable gauge air pressure in the pipe at the end of the 10 min. interval

$P_{initial}\,(psi)$ = the gauge air pressure in the pipe at the start of the 10 min. interval

$T_{initial}\,(^oC)$ = the air temperature in the pipe at the beginning of the 10 min. interval

$T_{final}\,(^oC)$ = the air temperature in the pipe at the end of the 10 min. interval

2. Calculate the gauge pressure (P_c) corrected for the temperature at the end of the 10-minute interval using the following equation and the value for $P_{final,\,theoretical.}$ calculated above:

$$P_c = P_{final,\,theol}\,(psi) - 14.7\ psi$$

3. Calculate the actual Percent Pressure Drop using the following equation:

$$\text{Percent Pressure Drop} = \frac{P_c - P_{f,\,actual}}{P_c} * 100\%$$

where,

$P_{f,\,actual}$ = the final gauge pressure in the pipe at the end of the interval

4. If the percent pressure drop is less than or equal to 1%, the pipe segment passes for that particular interval. If the percent pressure drop is greater than 1%, then the following steps shall be performed.

   a) All blocked risers and capped ends shall be inspected for leaks.

b) The pipe and all fusions in the section tested shall be inspected for cracks, pinholes, or perforations.

c) Air pressure leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

d) All confirmed pipe and joint leaks shall be repaired by cutting out the leaking area and rewelding the pipe.

e) After all leaks are repaired, a retest shall be performed. This process shall be repeated until a successful test is achieved.

5. Each test (passed or failed) shall be reported in writing.

6. For each test failure, Inspector shall note the following:

a) Location of failure segment
b) nature of leaks
c) Repairs performed
d) Results of test

Upon completion of the test, open the ball valve and allow air to escape. Caps must not be removed until air pressure in all of the test sections has been reduced to atmospheric pressure.

DATA LOG

DATE: _____
TIME: _____

PROJECT NAME/NO: _____
CONTRACTOR: _____
PERSON PERFORMING TEST: _____
OWNER REPRESENTATIVE: _____

DESCRIPTION/LOCATION OF TEST SEGMENT: _____

Interval #	Time (min)	$T_{initial}$ (ºC)	T_{final} (ºC)	$P_{g,\ initial}$ (in-H_2O)	$P_{i,\ absolute}$ (in-H_2O)	$P_{theoretical}$* (in-H_2O)	P_c* (in-H_2O)	$P_{f,\ actual}$ (in-H_2O)	% Pressure Drop*	Retest?
1	10									
2	20									
3	30									
4	40									
5	50									
6	60									

* See equations in procedure

PIPE SIZE: _____
SDR: _____
LENGTH: _____

DESCRIPTION/NATURE OF LEAKS & REPAIRS OF RETEST SEGMENT:
_____
_____

SECTION 33 51 20

LFG HEADER ISOLATION VALVES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall provide all materials, equipment, and labor needed to install complete and ready-for-use all header isolation valves as specified herein and as indicated on the Plans.

B. Related Work Described Elsewhere

1. Section 33 51 10: Pipe and Pipe Fittings

1.02 SUBMITTALS

The Contractor shall prepare and submit to the Engineer, for review and approval, certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each type of valve furnished. Shop drawings shall be submitted for butterfly valve assemblies requiring spacers per paragraph 3.01 B of this Section.

PART 2 - MATERIALS

2.01 VALVES

A. All valves shall be complete with all necessary operators, actuators, handwheels, extension stems, worm gear operators, operating nuts, wrenches, and other accessories or appurtenances which are required for the proper completion of the Work. Operators and other accessories shall be sized and furnished by the valve supplier and factory mounted.

B. Valves shall be suitable for the intended service. Renewable parts including discs, packing, and seats shall be of types recommended by valve manufacturer for intended service, but not of a lower quality than specified herein.

C. Valves and operators shall be suitable for burial within a landfill.

D. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

E. Header isolation valves shall be butterfly bubble tight, wafer design, with a PVC body, polypropylene disc, nitrile seats and seals, 316 SS valve stem, and compatible with a flat face flange. Valves shall be Asahi-America Type 56 series (12-inch) and Type 57 series (8-inch).

E. Stem extensions shall be stainless steel in an epoxy coated carbon steel outer housing with a diecast aluminum alloy gear box assembly mounted on top and equipped with a removable manual operating wheel. Height of stem extensions in accordance with the Contract Drawings.

2.02 MONITORING PORTS AT VALVES

Monitoring ports shall be installed at each isolation valve and shall include the following items, or equal substitutes. Monitoring hose shall be stainless steel with outer braid Swagelok (407-894-7191) flexible metal hose, part no. SS-FM4PM4PF4, of adequate length to extend above grade as shown on the Plans. The male NPT end shall be threaded into the top of the header. Sampling end shall be Easy Port™ ¼ inch male NPT screw-capped long barb fittings as supplied by QED Environmental, model no. 40987. The hose shall be secured to the valve stem inner boring by stainless steel brackets.

2.03 IDENTIFICATION TAGS

A. CONTRACTOR shall supply and affix to each valve an adhesive sticker marked with pre-printed letters designating the valve number (e.g., V-3, V-4, V-5, etc.). Tags shall not be marked with pen or marker.

B. Tags shall be yellow adhesive sticker with black lettering as shown in the example below. The sticker shall contain the following information: Valve point ID as “V-ID number”, and the text “Header Isolation Valve”.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves shall be installed in accordance with the manufacturer’s recommendations and the following:

1. Butterfly valves shall be installed between two flanges as shown on the Drawings; care shall be taken to avoid stripping studs when tightening.

2. Flanges shall be joined with hot-dipped galvanized studs and nuts, backup rings shall be ductile iron. Stud lengths shall accommodate the required distance between flanges including spacers, if necessary.

3. All below grade back-up rings, studs, nuts and washers shall be thoroughly coated with Polyken Technologies 1027 Primer (508-261-6200).

4. The Contractor shall wrap and tape the valve, flanges, and bolts in 5 mil polyethylene sheeting prior to backfilling.

B. Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor shall install valve spacers subject to approval by the Engineer.

END OF SECTION

SECTION 33 51 30

LFG CONDENSATE MANAGEMENT SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all labor, supervision, administration, management, materials, equipment, and incidentals necessary to install the condensate sumps, pneumatic pumps and related landfill gas (LFG) collection system appurtenances as shown on the CONTRACT DRAWINGS and as specified, in accordance with provisions of the CONTRACT DOCUMENTS, TECHNICAL SPECIFICATIONS conformance with the MANUFACTURER'S recommendations, and with current industry standards.

B. All materials shall conform to the requirements of this Section and shall be of new stock of the highest grade available, free from defects, and recently manufactured.

C. All WORK shall be performed in strict accordance with the TECHNICAL SPECIFICATIONS, CONTRACT DRAWINGS, conformance with the MANUFACTURER'S recommendations, and with current industry standards

1.02 REFERENCED DOCUMENTS

A. Related WORK Described Elsewhere:

1. Section 31 20 00 Excavating, Trenching, Backfilling, and Grading

2. Section 35 51 10 Pipe and Pipe Fittings

1.03 SUBMITTALS

A. Materials shall not be incorporated in the WORK until approved by the ENGINEER.

B. The CONTRACTOR shall prepare and submit to the ENGINEER for review and approval MANUFACTURER'S literature, shop drawings, or other information pertaining to the assembly, operation, adjustments, and other maintenance and repairs of equipment to be installed under this Section, together with detailed parts lists, drawings, dimensions, and/or photographs.

C. At start-up, the CONTRACTOR shall submit Operations and Maintenance (O&M) manuals.

PART 2 - PRODUCTS

2.01 CONDENSATE SUMP

A. The condensate sump system shall be capable of handling a minimum flow rate of 5 gallons per minute (gpm) with a total dynamic head of 140 feet.

B. The sump shall be a welded, single walled HDPE assembly as shown on the CONTRACT DRAWINGS. The reservoir shall be fabricated from SDR 17 pipe and designed to withstand

a vacuum of 120 inches-w.c. and a pressure of 5 PSIG at 130 degrees F.

C. Condensate sump can be tested by MANUFACTURER. The CONTRACTOR to provide leak test report to ENGINEER. Also, the condensate sump will be tested in conjunction with all attached header piping at 4 PSIG for a duration of one hour with no more than 1 percent pressure loss.

D. The condensate pump shall have level controls. The pump shall pump condensate to a discharge line. Discharge piping from the sump to the condensate discharge line shall be of a size and material recommended by the MANUFACTURER such that the pneumatic pump can deliver the anticipated condensate load.

2.02 ACCESS PORT

A. Port shall be 1-1/2 - inch diameter black polypropylene quick connect coupling consisting of two parts: a male pipe threaded adapter and cap with steel cam locking levers.

2.03 MONITORING PORT

A. Monitoring ports shall be QED supplied Easy Port capped long barb fittings, model number 40987.

2.04 PNEUMATIC PUMP

A. Pump shall be submersible air displacement pump, internally controlled and designed for leachate and condensate systems. Pump shall be bottom-loading with fiberglass body. Major metal components shall be stainless steel, this shall include the pump head assembly, center dip tube, discharge check valve assembly, chain support harness, 3.5-inch extended inlet screen, and bottom check collar. Plastic components shall be PVDF (kynar) or UHMWPE.

B. The pneumatic pumps shall be QED AutoPump bottom inlet Model Short AP4^{+}B.

C. Pump installed in condensate sump shall include the following components:

1. Air filter/regulator

2. Air inlet supply pressure gauge

3. Pump cycle counter

4. High liquid level indicator

D. Pump shall have a minimum pumping capacity of 5 gpm with a total dynamic head of 140 feet and an air supply pressure of 60 pounds per square inch, gauge (psig).

E. Pump accessories to include are 8-inch vacuum fit cap and hose set, including the discharge hose (3/4-inch I.D. Nylon Tube) from the pneumatic pump to the HDPE forcemain and the 150 psig rated, 1/4-inch I.D. air hose to the HDPE air supply line.

F. Air and discharge hose lengths outside the sump/wells shall be field determined by CONTRACTOR and approved by the ENGINEER.

G. Each pump will include a 1/2-inch nylon support rope from pump to sealing cap. A stainless steel quick link connector will be used to attach the rope to the pump support harness.

2.05 AIR SUPPLY LINE

A. The air supply line from the compressor shall be as specified in Section 3.01 below, and as shown on the CONTRACT DRAWINGS.

2.06 CONDENSATE DISCHARGE LINE/DRAINAGE LINE

A. The condensate discharge line shall be 2-inch or 3-inch diameter HDPE SDR 11 pipe as specified in Section 33 51 10 Pipe and Pipe Fittings and shown on the CONTRACT DRAWINGS.

PART 3 - EXECUTION

3.01 AIR SUPPLY LINE

A. The air supply line from the compressor to the pneumatic pumps shall be 2-inch diameter SDR 9 HDPE pipe with yellow stripe as specified in Section 33 51 10 LFG Pipe and Pipe Fittings. Air supply line shall be located in the same trench as the header/lateral piping (where possible) at a minimum depth as shown on the CONTRACT DRAWINGS.

3.02 CONDENSATE SUMP INSTALLATION

A. CONTRACTOR shall install condensate sump in the location and to the lines shown on the CONTRACT DRAWINGS. Sump shall be installed vertically plumb.

B. HDPE pipe connections in accordance with Section 33 51 10 LFG Pipe and Pipe Fittings.

C. Caution shall be exercised when backfilling around the sump to prevent damaging air and discharge lines.

3.03 PUMP INSTALLATION

A. Pump shall be installed in accordance with MANUFACTURER'S recommendations. Pump vent line shall be installed to discharge inside the sump.

B. Install pump so bottom is suspended off bottom of sump as shown on the CONTRACT DRAWINGS, as recommended by MANUFACTURER and approved by ENGINEER.

3.04 TESTING

A. Upon completion of the installation, tests shall be performed by the CONTRACTOR with the assistance of the MANUFACTURER'S representative, in the presence of the ENGINEER. These tests shall demonstrate condensate pump, startup, shutdown, operation, and maintenance. Test shall demonstrate the pumping of test water from the sump for the full drawdown of the pump. Equipment and other requirements necessary to perform the tests shall be furnished by the CONTRACTOR.

END OF SECTION

SECTION 44 11 20

LFG BLOWER/FLARE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. The WORK described in this section consists of furnishing all labor, materials, equipment, and incidentals necessary to furnish, install, and field test a landfill gas blower/flare system, as shown on the CONTRACT DRAWINGS and as specified herein, including all appurtenances to provide a complete system ready for operation.

2. The Landfill Gas Blower/Flare System shall include the following four sub-systems:
   a. Gas Handling System.
   b. Interconnecting Piping System.
   c. Candlestick Flare System.
   d. Control System.

3. The CONTRACTOR shall be responsible for all electrical wiring connections for operation and control of all equipment related to the Landfill Gas Blower/Flare System.

4. Related Work Described Elsewhere:
   Section 33 51 10 – Pipe and Pipe Fittings

1.02 SUBMITTALS

A. All equipment and accessories shall have manufacturer's Shop Drawings approved by the ENGINEER prior to shipment and shall be tested for conformance with these Specifications prior to acceptance and final payment by the OWNER. The following materials and shop drawing information shall be submitted:

1. Certified Shop Drawings showing all-important details of the Blower/Flare Skid and Utility flare stack and all dimensions.

2. Descriptive literature, bulletins, and/or catalogs of the equipment.

3. A complete bill of materials for all equipment.

4. The total weight of the equipment, including the weight of the single largest item.

5. Complete performance data that will indicate full compliance with the Specifications; performance curves for flow and pressure/vacuum capacity; calculations showing the equipment gas flow and motor corrections required for operation at the elevation of the job site.

6. Complete control panel diagrams and elevations showing all components, wires, connections, and numbered terminals.

7. Complete electrical interconnect diagram showing all wires and terminals between the control panel and external devices.

8. Exceptions to the applicable requirements, Plans, Specifications, and applicable codes and standards.

9. Certification that the equipment furnished for this project does not exceed the sound pressure specified herein.

B. An electronic copy of a draft operation and maintenance manual shall be required four weeks prior to equipment delivery. Two copies of the final manual shall be submitted two weeks after start-up that incorporate comments of the ENGINEER and any revisions made during start-up. The manual shall be prepared specifically for this installation and shall include all required catalog cuts, drawings, equipment list, descriptions, definitions, procedures, and information necessary to instruct operating and maintenance personnel unfamiliar with such equipment. The manual shall include a list of suppliers, with phone numbers and contact, for equipment parts that may need servicing or replacement.

C. Test Procedures: Detailed outline of functional test procedures shall include a step by step description of the proposed tests, a list of all test equipment including calibration dates, and signoff sheets.

D. Spare Parts: In addition to the spare parts recommended by this Specification, a list of manufacturer's recommended spare parts shall be submitted.

1.03 QUALIFICATION

A. The Landfill Gas Blower/Flare System, including all ancillary equipment, shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed and fabricated in accordance with the best practices and methods. The manufacturer shall have experience in supplying equipment for landfill gas handling systems.

B. The Landfill Gas Blower/Flare System shall be manufactured by Perennial Energy, Inc., John Zink Company, Parnel Biogas, Inc., or approved equal.

1.04 DESIGN CRITERIA

A. Landfill Gas Blowers:

1. Equipment specified herein is intended to be standard equipment for use in a landfill gas handling system.

2. The blowers shall be designed for continuous operation in an outdoor environment and shall conform to the following, measured at standard 14.7 psia and 68 degrees F condition:

CONDITION	REQUIREMENT
No. of blowers	2
Rated capacity, scfm	1,250 each
Minimum capacity, scfm	250
Site elevation	30 feet above MSL
Landfill gas composition:	
Methane	25-50 percent
Carbon Dioxide	25-50 percent
Oxygen	0-5 percent
Traces gases (e.g., VOCs, H_2S)	0-1 percent
Blower inlet vacuum, inches of water	-60
Blower outlet pressure, inches of water	10
Landfill gas inlet pressure:	
Maximum, degrees F	120
Minimum, degrees F	30
Motor:	
Totally enclosed, fan cooled	
Horsepower	50 Min, must meet Vacuum specification
Nominal motor efficiency, percent	50
Minimum motor power factor, percent	72
Motor service factor	1.15
Noise limit	85 dbA at 3 feet
Landfill gas moisture content	100% saturated

3. When rated volumetric capacity is reduced to 40 percent of design, blowers under the specified inlet conditions shall not surge or overload the motor.

4. Each blower equipment rating shall be based upon data previously established by tests in accordance with the ASME Power Test Code for Centrifugal Blowers.

B. Candlestick Flare System:

1. The landfill gas flare system shall be designed to operate continuously at the following service conditions:

CONDITION	REQUIREMENT
Landfill gas flow rate, scfm	250-2,500
Inlet temperature, degrees F	30-120
Landfill gas moisture content	100
Site elevation	30 feet above MSL
Landfill gas composition range:	
Methane	25-50 percent
Carbon Dioxide	25-50 percent
Oxygen	0-5 percent
Traces gases (e.g., VOCs, H_2S)	0-1 percent
Control and accessories to include the following:	
Thermocouple for flame temperature confirmation	
Flare and blower control panel	
Pneumatically-operated emergency shut-off valve	
Flow meter	
Digital data recorder	
Flame arrestor	
Auto dialer	
Pilot gas system and thermocouple	

2. At maximum landfill gas flow rate of 2,500 scfm, the flare system shall require a maximum landfill gas pressure of +10 inches water column at the blower outlet.

3. The Landfill Gas (LFG) Blower / Flare System shall be capable of achieving a minimum weighted average destruction efficiency of greater than 98 percent of total non-methane organic compounds and meet the requirements of 40 CFR 60.18.

4. All on-skid flare electrical is to be included with Landfill Gas (LFG) Blower / Flare System and provided by MANUFACTURER.

1.05 APPLICABLE CODES AND STANDARDS

A. All equipment shall be manufactured in accordance with codes and guidelines as specifically detailed herein and in accordance with applicable portions of the following (latest edition):

1. Local laws and ordinances.
2. State and Federal laws.
3. National Electrical Code. National Electrical Manufacturers Association (NEMA)
4. Underwriters Laboratories (UL).
5. Uniform Building Code (UBC).
6. American National Standards Institute (ANSI).
7. American Society of Mechanical Engineers (ASME).
8. American Gas Association (AGA).
9. Institute of Electrical and Electronic Engineers (IEEE).
10. Instrument Society of America (ISA).
11. Industrial Risk Insurance (IRI).
12. Factory Mutual (FM).
13. National Fire Protection Agency (NFPA).
14. Environmental Protection Agency (EPA).
15. Occupational Safety and Health Administration (OSHA).
16. American Society for Testing and Materials (ASTM).

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. The equipment shall be delivered on site as fully assembled as transportation will allow. Factory-assembled parts and components shall not be dismantled for shipment unless approved by the ENGINEER.

C. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.07 WARRANTY AND GUARANTEES

A. The CONTRACTOR shall warrant the units being supplied to the OWNER against defects in workmanship and material for a period of one (1) year from the date of equipment acceptance by the OWNER. In the event that the equipment fails to perform as specified, the equipment manufacturer shall promptly repair or replace the defective equipment without any cost to the OWNER (including handling and shipment costs).

PART 2 – PRODUCTS

2.01 GENERAL

A. Equipment shall not have been in service, except for shop tests, at any time prior to delivery. The equipment shall be furnished factory assembled to the extent possible and ready for installation.

B. Equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and shall be especially adapted for the intended service. Ample room and facilities shall be provided for inspection, repairs, and adjustments.

C. Parts of equipment shall be amply proportioned for all stresses which may occur during operation and for any additional stresses which may occur during fabrication, transportation, handling, and erection.

D. These Specifications are intended to give a general description of what is required, but do not cover all requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, and field testing of all materials, equipment, and apparatus as required. Auxiliary equipment necessary for proper operation of the proposed Landfill Gas Blower/Flare System not mentioned in these Specifications or shown on the Drawings shall be furnished and installed.

E. At all levels of performance of the gas system, the sound pressure shall not exceed 85 dbA over a frequency range of 37.8 to 9,600 cycles per second. Measurement shall be made a distance of 3 feet from the outer face of the equipment. The manufacturer shall certify that the equipment furnished for this project does not exceed the specified sound pressure. This written certification shall be submitted with the Shop Drawings.

F. A brass or stainless steel nameplate shall be attached to each piece of equipment in a conspicuous place. The following information shall be plainly marked on the nameplate: name and address of the manufacturer, serial number, model number, pertinent information regarding electrical requirements, size and capacity and any other information necessary for complete identification.

G. If necessary, modifications shall be made in the manufacturer's standard product to make it conform to the specific requirements of the Specifications and to requirements contained in regulations issued by public agencies. Such modifications shall be noted in Shop Drawing submittals.

2.02 GAS HANDLING SYSTEM

A. Blower and Motor:

1. Blower. The blower motor assemblies shall be gas inlet driven, direct drive, multistage centrifugal type exhausts. The blowers shall be designed

for and include variable frequency drive (VFD) control. Impellers shall be mounted on one shaft supported on each end by bearings mounted in the outboard bearing housings. The blower shall be built from parts cast in patterns from which previous units have been built and tested. Each blower shall have monitoring ports factory installed in the blower housing leading to the inlet and outlet piping. Blower shall comply with the Design Criteria of Part 1.4 above.

2. Each blower motor assembly shall be plumbed and factory mounted on a steel skid and delivered to the site as a complete unit. Neoprene base pads shall be provided. A total of three blowers shall be installed at the site under this contract.

3. Blower Housings. The housings shall consist of cast iron sections held securely between cast iron inlet and outlet heads with steel tie rods.

    a. No contact shall be made between the shaft rotor and the housing, other than through the bearings. Stuffing boxes shall be used as seals to ensure no leakage of gas to the atmosphere or air into the landfill gas.
    b. The inlet and outlet connections shall be drilled and tapped flange pattern per ANSI 1316.1, 125-pound, and shall be an integral part of the heads.

4. Impellers:

    a. Impellers shall be one piece cast aluminum alloy, keyed to the shaft and held by a locknut. Hubs of the impellers shall butt against each other directly or through one piece metal spacers. There shall be ample clearance and tip speed shall not exceed 375 feet per second.

    b. Impellers shall be precisely machine balanced. Vibration shall not exceed 2 mils in the vertical plane measured at the blower bearing housings.

5. Diffusers. Diffuser sections which receive the gas from the impeller and guide the gas to the next impeller shall be provided. The diffusing vanes shall be an integral part of the sections.

6. Shaft. Each shaft shall be made of high grade carbon steel of sufficient diameter to operate below first critical speed.

7. Bearing Housings. Each blower shall be provided with two antifriction bearings. It shall be possible to replace bearings without disconnecting piping or disassembling the compressor casing. Both inlet and outlet

bearings shall be designed for a minimum expected life of 10 years of continuous operation.

8. Casing Drains. Each blower stage shall be provided with 3/8-inch diameter casing drains manifolded to a single manual shut-off valve.

9. Internal Lining. The blower internals shall be furnished with a factory applied Bisonite, Kynar, phenolic coating or approved equal, minimum 10 mils thick to provide resistance to corrosion by landfill gas. The coating shall be applied to all parts of the blower (excluding aluminum impellers) which come in contact with the landfill gas stream.

10. Motor. Each blower shall be direct-coupled to a horizontal 480V, 3-phase, 60-hertz motor. The blower manufacturer shall be responsible for selecting the proper motor size to suit this equipment, the performance requirements noted herein, and the site conditions. The motor shall be totally enclosed fan-cooled (TEFC) suitable for Class 1, Division 2, Group D, classified location, and UL-approved. Motor shall be rated at 104 degrees F ambient with not more than 131 degrees F rise. Bearings shall be of the antifriction type with an AFBMA L-10 life rating of not less than 25,000 hours.

11. Flexible Couplings and Drives. The blowers shall be connected to the drivers with a suitable flexible coupling. The CONTRACTOR shall check and adjust the alignment of the couplings and drives in accordance with the instructions of the blowers' manufacturer to a tolerance of plus or minus 2 mils. Couplings shall be covered with base-mounted aluminum or non-sparking metallic guard.

12. Bases. Hot dip galvanized or epoxy-coated steel bedplates of suitable size for mounting blowers and drivers shall be furnished by the blower manufacturer. The blower and motor shall be carefully aligned and then bolted in place. Suitable vibration isolation pads shall be provided under the steel bedplates of the units.

13. Expansion Joints. Expansion joints between the blower inlet and outlet and connected piping shall be flanged concentric reducers sized to match the blower flanges to the connecting piping or valves.

14. Valves:

    a. Butterfly valves located at the inlet of each blower shall be bubble-tight, cast iron body, wafer-type with 316 stainless steel disc and stem, Acetal stem bushing, and Teflon replaceable resilient seat. Interior of valve body and valve disc except for valve seat and stainless steel valve seat ring shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be uniformly applied with a minimum

thickness of 12 mils. Surfaces shall be clean, dry, and free from rust and grease before coating.

b. Manual operators shall be gear or lever type. Operators shall have adjustable stop limiting devices to prevent overtravel of disc. Should an adjustment of the disc be required to maintain a bubble-tight seal, this adjustment shall be made externally without removing the operator housing cover.

c. Butterfly valves shall be manufactured by Val-Matic, Bray or as approved by ENGINEER as equal.

d. Check valves on each blower outlet shall be flanged, aluminum body with aluminum flappers with a springless, seatless design as manufactured by Techno Corp. (814-838-4561) of Erie, PA, or as approved by ENGINEER as equal.

15. Variable Frequency Drive. The CONTRACTOR shall supply a VFD for control of each blower/motor assembly. The VFD shall be capable of controlling the blower motor by either a manually selected speed control or a 4-20 mA DC signal provided by the flow rate or vacuum monitoring system. The operator shall be able to select a desired flow rate or vacuum at the operator interface console, and the VFD shall automatically control the blower speed to maintain the selected flow rate or vacuum.

16. Blower Controls:

a. Blower-motor starters and controls are specified in Part 2.5. Starters and controls shall be commonly available parts. The manufacturer shall provide the OWNER with a list of known suppliers for parts not commonly available that are expected to need servicing or replacement.

17. Experience:

a. Blowers shall be manufactured in the United States. Blower manufacturers shall have a minimum of 5 years experience in the design and manufacture of this type of equipment and have a minimum of 25 operating installations on landfills in the U.S.

b. Acceptable Manufacturers:

1. Gardner Denver, Inc (Lamson Corporation)
Peachtree City, Georgia
(800) 982-3009

2. Lone Star Blower

Houston, Texas 77061
(832) 532-3112

3. Continental Blower
East Syracuse, NY 13057
(315) 451-5410

4. National Turbine Corporation
North Syracuse, NY 13212
(315) 455-5591

B. Moisture Separator Assembly (Knock-Out Pot):

1. The knock-out pot shall be completely fabricated from HDPE/ 304 stainless steel. It shall be of a vertical, cylindrical design with element removal from the top. A 10-inch flanged, covered, inspection port shall be provided in the side near the bottom for manual clean out of accumulated debris. Nozzle flanges shall meet ANSI 125-pound specifications.

2. The demister pad shall be made from non-corrosive mesh and shall be supported on and held down by high open area, stainless steel grid, or equivalent. It shall be mounted flush against the inside of the knock-out pot and have no gaps present. The moisture separator shall be able to remove 100 percent of droplets greater than 6 micron and shall also remove particulates having a density equal to or greater than water which are greater than 6 micron in size.

3. The moisture separator shall have a flow capacity of at least 2,500 scfm. At the design flow rates, temperatures and pressures, the moisture separator shall not have a pressure drop greater than 3 inches water column and shall be capable of withstanding no less than 4.0 pounds per square inch gauge vacuum.

4. Condensate Removal. There shall be a 2-inch IPS pipe coupling in the bottom of the assembly for condensate removal.

5. Pressure Drop Monitoring. There shall be two 1/2-inch NPT ports in the side of the unit, one upstream and one downstream of the demister element material, for the purpose of connecting differential pressure monitoring device(s).

6. High Level Sensor. A high condensate level sensor shall be installed through a ¾-inch penetration below the inlet pipe. Sensor shall be manufactured by Omega Model LVU-705 or approved equal.

7. Liquid Level Sight Glass. There shall be two (2) ¾-inch penetrations spaced at 8-inches apart in the side of the unit, below the inlet pipe, for the purpose of installing a liquid level sight glass. Sight glass shall be manufactured by Schott Duran or approved equal.

8. The moisture separator assembly shall be manufactured in the United States. Manufacturers shall have a minimum of 5 years experience in the design and manufacture of this type of equipment, and have a minimum of 10 units operating successfully on similar landfill gas installations in the U.S.

9. The moisture separator assembly shall be located, installed, and preplumbed on the gas handling system skid.

2.03 INTERCONNECTING PIPING SYSTEM

A. Valves:

1. Butterfly Valves:

a. All valve shafts shall be connected to operators by use of keys and keyways. The use of compression or friction connection will not be accepted.

b. The butterfly valves, for low-pressure/vacuum landfill gas services, shall have cast-iron wafer-style valve body with contoured 316 stainless steel disc, Type 316 stainless steel stem, Acetal stem bushing, and viton replaceable resilient seat. Valves shall be bubble-tight at 150 pounds per square inch differential pressure and shall be suitable for installation between ANSI 125-pound flanges.

c. All butterfly valves shall open left or counterclockwise when viewed from the stem. Manual valve operators shall be either worm gear or lever type. Valves installed greater than 6 feet in height from the ground or skid platform shall be provided with chain wheel operators. All operators shall have adjustable mechanical stop limiting devices to prevent overtravel of disc. Should an adjustment of the disc be required to maintain a bubble-tight seal, this adjustment shall be made externally without removing the operator housing cover. The operator shall be designed such that adjustments can be made under pressure and without the possibility of dirt getting into the operator lubricant. Adjustments through the lower shaft will not be acceptable. Operator components shall, at the extreme operator positions, withstand without damage a pull of 200 lb for handwheel or a torque of 300 ft-lb for operating nuts.

d. Interior of valve body and valve disc except for valve seat and stainless steel valve seat ring shall be coated with a fusion bonded, thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be holiday-free with a minimum

thickness of 12 mils. Surfaces shall be clean, dry, and free from rust and grease before coating.

e. All butterfly valves shall be manufactured by DeZurik, American-Darling Valves, Kennedy Valve Manufacturing Company, Clow Valve Company, ABZ Valves, or approved equal. Replacement parts and valves shall be commonly available.

f. All exterior surfaces of butterfly valves shall be clean, dry and free from rust and grease before coating. The exterior ferrous parts of all valves shall be shop primed at the factory with one coat, minimum dry film thickness 1.5 mils, of a primer with rust-inhibitive pigments and synthetic resins. Following installation, aboveground valves shall be finish painted. The color of the paint shall be selected by the OWNER.

2. Sampling Ports:

a. Gas and pressure sampling ports shall be 1/4-inch barbed fittings with rubber dust caps to match the monitoring ports on the wellheads. Parts shall be commonly available. Sampling ports shall be installed in the following locations:

1. Upstream and downstream of the flame arrestor.
2. Upstream and downstream of the moisture separator at the knock-out pot.
3. Inlet and outlet pipe of the knock-out pot.
4. Inlet pipe to blower.
5. Outlet pipe from blower.
6. Upstream of the mass flow meter.

B. Gas Handling Piping:

1. Piping on the gas handling system skid shall be appropriate diameter stainless steel or approved equal. The same specification applies to tees, elbows, wyes, flanges, and other pipe fittings. Flanges shall conform to ANSI 125-pound specifications.

2. The gaskets shall be full-face rubber, 1/16 inch to 1/8 inch in thickness, and shall meet the requirements of ANSI Specification A21.11.

3. Where shown on the CONTRACT DRAWINGS or as required, pipes and fittings shall be drilled and tapped to receive drainage or other piping or plugs. All holes shall be drilled at right angles to the axis of pipes and fittings.

C. Automatic Shut-Off Valve. The valve shall open when prompted by the flare control panel and closed by loss of electrical power, flame failure, or blower

failure. It shall be a pneumatically operated butterfly valve, bubble-tight, wafer-style, equipped with a stainless steel disk and Viton seat. The operator shall have a manual override and be equipped as a spring fail close device. It shall close when directed by the logic in less than 5 seconds. The compressed gas necessary to operate the valve shall be supplied by a nitrogen bottle.

D. Drain Line Piping:

1. The drain lines from the flare, flame arrestor and condensate knockout pot shall be 2-inch HDPE SDR 11.

2. The blower drain lines shall be stainless steel or 2-inch schedule 80 PVC pipe. They will tie-in to a common line and then transition to 2-inch HDPE SDR 11 using a Vanstone flange or transition fitting where it ties-in to the drain line from the flare.

2.04 CANDLESTICK FLARE SYSTEM

A. The Landfill Gas (LFG) Blower / Flare System shall be a unitized, modular system including all components for a complete and operational system. The flare shall comply with the Design Criteria of Part 1.4 above.

B. The Landfill Gas (LFG) Blower / Flare System shall be pre-piped and pre-wired to the extent possible, requiring minimal field assembly.

C. The Landfill Gas (LFG) Blower / Flare System shall include, but not be limited to, the following components:

1. Flame Arrester

a. Flame arrester shall have 125-pound ANSI flanged connections.

b. The housing construction shall be aluminum. The bank assembly shall be all aluminum and shall be arranged for easy removal from the housing to facilitate inspection and cleaning. The net free area through the bank assembly shall not be less than four times that of the corresponding size pipe.

c. Maximum head loss through the flame arrester shall not exceed 5 inches of water column at 2,500 scfm. All grids of the bank shall be arranged for individual removal. The flame arrester shall be UL-approved and manufactured by Whessoe Varec, Enardo, or approved equal.

2. Flare Stack. The flare stack shall be constructed from ASTM A53 steel, and shall be of sufficient length to provide an overall flare system height of approximately 25 feet. Flare construction shall consist of welds conforming to AWS D1.1 standards. The top 5 feet of the stack/burner tip shall be constructed of 304 stainless steel.

3. Burner. The burner unit shall be constructed of 304 stainless steel. It shall consist of the burner nozzle, vanes, and impingement assembly. It shall be designed such that the full range of flow rates, as specified herein, shall combust without causing either flame yellowing, flame lift-off, or flashback, and shall perform according to the destruction and reduction efficiency requirements listed earlier in this TECHNICAL SPECIFICATIONS.

4. Windshield. The flare windshield shall be constructed of 310 stainless steel. The windshield shall extend at least 2 feet above landfill gas exit.

5. Propane Pilot System. Removable pilot assembly shall include pressure regulator, pressure indicator, solenoid valve, manual shutoff valve and pilot gas pressure manometer port. CONTRACTOR shall provide connections to existing propane gas system.

6. Electronic Spark Ignition. 5,000 V electronic igniter assembly removable from outside the flare without disconnecting conduit or wiring. Igniter assembly shall be commonly available parts. The MANUFACTURER shall provide a list of parts not commonly available and known suppliers.

7. Flare Mounting System. This system shall be manufactured of ASTM A36 carbon steel members, which shall be welded to the structure using AWS D1.1 methods. Sufficient steel gusset material shall be incorporated in the structure to prevent erratic vertical alignment of the flare pipe. Flare mounting shall provide anchorage to the new foundation to prevent overturning and provide resistance against seismic or wind forces. CONTRACTOR to provide necessary structural design for all required components including the flare stack pad. All structural design shall comply with UBC 125 MPH criteria.

8. Finish. Carbon steel base of the flare stack shall be sand-blast prepared and primed. Sand blasting shall be to SP-6 guidelines. An inorganic zinc primer, solvent or water based, with a minimum of 14 lbs. metallic zinc content per gallon shall be applied. Minimum application will involve 1 coat, 4 MDFT cover. Acceptable coating suppliers include Ameron Protective Coatings (Brea, CA), DuPont Chemical Company (Wilmington, DE), Glidden Company (Cleveland, OH), and Koppers Company (Pittsburgh, PA).

9. Condensate Drains. Drain ports in the flame arrester and flare stack shall be equipped with stainless steel or SCH 80 PVC ball valves and piped to a common drain line that allows condensate to drain to CS-1.

2.05 CONTROL SYSTEM

A. Control Panel. The CONTRACTOR shall provide all labor, materials and equipment to fabricate and pre-wire the Control Panels. The CONTRACTOR shall be responsible for procuring all instrumentation integral to the construction of the panels and other instrumentation for the system. The Blower Control Panel and Flare Control Panel can be provided either as a common panel or as separate

but integrated panels. The CONTRACTOR shall provide all labor, materials, and equipment to shop test the entire blower/flare station system with control panels connected, before delivery to the site.

B. The control panel for the Landfill Gas Blower/Flare System shall be compliant with NEMA 4 specifications at a minimum. The main control panel shall be sized to accommodate the required controls and shall be provided with a swing out panel, and with a NEMA 4 compliant window in the door through which status annunciators, recorder, controller, etc. may be viewed. The panel shall include, but not be limited to, the following components:

1. Electrical connections and controls for 3 motors, outlets, fixtures, controls, and devices, etc., included with the system. The panels shall be pre-wired to receive incoming power from the electrical service equipment, and with suitable junction boxes for all outgoing conduit and cable to equipment.

2. A control center to receive all the signals from the various safeties, controls and monitoring equipment, and to automatically control all the various components of the system.

3. The control panel shall be sized to accommodate a laptop personal computer.

4. The control panel shall be air conditioned/heated to maintain the internal panel temperature between 55°F to 85°F.

5. Local touch screen, no less than 6” size. Must be Ethernet and USB ready.

6. Control of the flare shall be achieved using a Programmable Logic Controller (PLC).

    a. Approved PLC manufacturers are:

        1. Koyo/Automation Direct (DL260 only)
        2. AB (SLC505E-Ethernet Enhanced

    b. PLC HARDWARE

        1. All control circuits will use 24VDC unless otherwise specified.
        2. Minimum of 2 Racks with 9 slot count.
        3. RACK1 will be used for Analog IO ONLY.

    c. Minimum 8 channel analog input and output cards are required. Mixed input/output cards will be accepted, but the combined inputs and outputs must be equal to or greater than 10 points.

d. All analog channels are required to be wired through analog isolators. The only acceptable isolators are Automation Direct part numbers:

1. FC-11
2. FC-33

e. If the first rack is filled to capacity then the 2nd rack can be used to accommodate the additional analog cards.

1. The inputs cards will be installed before the output cards.
2. RACK2 will be used for Discrete IO ONLY. Minimum 16 point input and output cards are required.

f. ZIP link modules will be required for both input and output cards.

g. All input Cards will be connected to ZIPLINK: ZL-CM16L24

h. All output cards will be connected to ZIPLINK: ZL-CM16RL24A

i. The inputs cards will be installed before the output cards.

1. All analog IO will be terminated to terminal blocks. Minimum of 20% spare slot space will be required.

2. The H2ECOM-100 is the only approved Ethernet card. It will be installed in the last slot of the CPU rack.

3. CPU rack will contain at least 2 empty slots.

4. Remote call-in modem.

5. D2-FILL will be used to fill spare slots.

7. COMMUNICATION PROTOCOL

a. The PLCs will communicate via the H2ECOM-100 card using ECOM. The contractor will provide windows based drivers by Kepware (KepServer EX) for the Koyo family of PLCs.

8. FUNCTIONALITY

a. The operator will have remote start/stop and alarm reset ability from 3rd party SCADA via Windows based PC communications driver (XP/2003).

1. The contractor will provide a licensed copy of KepServer EX.

2. The software at a minimum should be capable of providing remote access/control/reset capabilities for all items mention in this section.

b. The PLC shall be programmed to attempt four (4) restarts before a call out is initiated.

c. The PLC shall be programmed to allow only 4 hours/day of flare manual mode operation.

d. The PLC program shall be written to allow the operator to:

1. Select flow or vacuum control.
2. The operator shall have the ability to adjust the set points.
3. System shall monitor all points and provide control as required by the OWNER.

9. All control power shall be 24 VDC. Where applicable, a 24 VDC relay shall be used to interface with other control voltages.

10. An operator control panel to allow either manual or automatic selection for the control of the operating components of the system.

a. Flare controls shall include trouble light contacts, automatic start/stop for pilot ignition, controllers, spark plugs, ultraviolet (UV) scanner, flame safeguard controller, thermocouples, timers, and other components necessary for a complete, operational automatic system. Automatic operation shall be achieved through adjustable timers, relays, and switches activated by the thermocouples and UV scanners.

b. Blower Controls. The flare manufacturer shall provide the blower controls for three blowers mounted on a common skid with the control panel. Blower controls shall include ITE Type ETI, or as approved by the ENGINEER as equal motor circuit protectors, motor starters, voltage monitors, dual set point ammeter switch gauges with flow indication (obtained from blower manufacturer), running time meters, hand-off-automatic switches, and green push-to-test run lights housed in a NEMA 4 enclosure. A time delay will prevent blower restart until sufficient time has elapsed for the shaft to stop spinning (approximately 8 minutes)

c. The blower controls shall provide for 1 or 2 blower operation through a selector switch (Blower 1, Blower 2, or any combination thereof). During automatic startup of more than one blower, a time delay will prevent multiple blowers from starting simultaneously.

11. The control system shall be designed and manufactured as an outdoor system.

12. Safeties. The system shall be equipped with the following safeties as a minimum:

    a. Blower-motor overcurrent shall cause system shutdown.
    b. Blower-motor undercurrent (surge) shall cause system shutdown.
    c. Flame failure shall cause system shutdown.
    d. High temperature shutdown.
    e. Low temperature shutdown.
    f. High temperature flashback shutdown.
    g. High blower bearing temperature shutdown.
    h. High liquid level in knock-out pot shutdown.
    i. Inlet valve failure.
    j. Low methane content shutdown.

13. Control Panel Face-Mounted Devices. The system shall be equipped with the following control panel face-mounted devices or displays as a minimum:

    a. Alarm and shutdown indicating lights.
    b. Blower motor current meter.
    c. LFG and supplemental fuel flowmeters.
    d. Hand/off/auto switches for the blowers.
    e. Hand/off/auto switches for the flare.
    f. Run indicators for the blower.
    g. Total elapsed run time for each blower.
    h. Flame failure indicator for the flare.
    i. Automatic shut-off valve failure indication.
    j. Inlet Valve Failure Indication.
    k. Safety Shutoff Switch.
    l. Blower Bearing Temperature Gauges.
    m. Supplemental Gas Flow Indication.
    n. Paper data chart recorder.
    o. Digital data recorder.

C. Auxiliary Equipment

1. Local alarm light shall be provided and mounted near the control panel in a location where it is highly visible.

2. Four outdoor receptacles (120V) with ground fault protection shall be provided at the flare/blower control panel rack.

3. Three phase surge suppression system.

4. 3 ea. Appropriate sized motor starters with thermal overloads.

5. 480:240/120 VAC single phase transformer

6. 240/120 VAC single phase protected load center w/distribution breakers.

7. Fully wired control panel system (requires connection to field devices).

8. 120 VAC surge suppression system.

9. 24 VDC surge suppression system.

10. RS-232/Communications surge suppression system.

11. UL panel construction.

12. PLC supervision and logical control system, both digital and analog.

13. "Touch Screen" operator interface system.

14. SCADA system from 3rd Party Vendor.

D. Automatic Telephone Dialer:

1. General. The system shall receive input from the various monitored items in the form of a change in the status of a dry contact. Upon such change, the system shall automatically dial up to sixteen pre-selected phone numbers. When answered, the system shall send voice messages reporting the specific alarm condition. The system shall also be capable of reporting the status of all monitored items upon receipt of an inquiry phone call. The system shall be initially programmed by the CONTRACTOR with the numbers provided by the OWNER.

2. The System shall make provisions for the following input alarms:

   a. Blower-motor over-current (3).
   b. Blower-motor undercurrent (surge) (3).
   c. Flame failure (1).
   d. High Temperature (1).
   e. Low Temperature (1).
   f. High temperature flashback (1).
   g. High blower bearing temperature (6).
   h. Inlet valve failure (1).
   i. High liquid level in the knock-out pot (1).
   j. Low methane content (1).
   k. Pilot failure (1).

3. Equipment Description:

a. The automatic dialer shall be an advanced microprocessor and synthesized voice technology capable of dialing up to 16 phone numbers, 60 digits each, maximum. Phone numbers and standard tone dialing shall be used on standard phone lines.

b. The unit shall permit the user to program, right from the keyboard or remotely via touch tone telephone, the following functions:

1. Each fault channel to a normally open or closed mode.
2. Alarm response delay: 0.1 to 999.9 seconds, with different delays being assignable to different alarms.
3. Delay between alarm call outs: 0.1 to 99.9 minutes.
4. Alarm reset time: 0.1 to 99 hours, or "No Reset".
5. Incoming ring response (answer) delay: 1 to 20 rings.
6. Number of message repetitions: 1 to 20 repetitions.
7. Autocall test: allows the unit to place a round of test calls when enabled and also at subsequent intervals until this function is disabled.
8. Remote system microphone activation.
9. Remote arming and disarming of system.
10. Dialing and re-dialing up to sixteen separate pre-determined telephone numbers and delivering a synthesized voice message.

c. Normal power shall be 105-135 volts AC, 15 watts, nominal. The unit shall contain its own gel cell rechargeable battery which shall automatically be kept charged when AC power is present. The system shall operate on battery power for a minimum of 20 continuous hours in the event of AC power failure.

d. The unit shall be provided with a NEMA 4 enclosure, which shall be mounted inside the blower/flare main control panel.

e. Automatic dialer shall be Raco Verbatim Modular Series VSS or approved equal.

E. Pushbutton/Selector Switches, Control Units, and Panel Lights.

1. Manufacturers:
Square D
a. Cutler-Hammer
b. Allen Bradley
c. Or equal

2. Construction:
Heavy Duty
a. Oiltight

b. Base mounted or
c. Flush panel mounted

3. Pushbuttons
Flush head unless otherwise specified elsewhere
a. Control blocks:

1. Double break silver contacts
2. AC ratings: 7200 va make, 720 va break
3. Single-pole-double-throw or double-pole-double-throw
4. Up to six (6) tandem blocks

b. Maintained Contact unless otherwise specified elsewhere
c. Non-illuminated
d. Legend plates as required for type of operation or as specified elsewhere

4. Selector Switches:
a. Maintained position unless otherwise specified elsewhere.
b. Contact blocks:

1. Double break silver contacts
2. AC ratings: 7200 va make, 720 ma break
3. Single-pole-double-throw or double-pole, single-throw
4. Up to six (6) tandem blocks

c. Operators:

1. Number of positions as required or specified elsewhere
2. Standard knob type of operation unless otherwise specified elsewhere

5. Panel lights:
a. Transformer type
b. LED
c. Colored lenses as specified elsewhere
d. Interchangeable lenses
e. Legend plates as required or as specified elsewhere
f. Press-to-test feature.

6. Nameplates
a. Engraved laminated plastic
b. Letters 3/16- in. high
c. White letters on black background
d. Identity per equipment controlled

F. Power Supplies

1. 120 vac 60HZ power input

2. Integral PI filter

3. On/off circuit breaker

4. 0.2% load regulation

5. Short-circuit limit protection

6. Crowbar overvoltage protection

G. Control Relays

1. Manufacturers:
   a. Potter and Brumfield
   b. IDEC
   c. Or equal

2. Operating Data:
   a. Pickup time: 13 ms maximum
   b. Dropout time: 10 ms maximum
   c. Operating Temperature: -45 deg to 70 deg C

3. Contacts:
   a. Gold flashed fine silver, gold diffused
   b. Form C
   c. 110 vac
   d. Minimum 2 amp rating

4. Rated at 10 million operations

5. Plug-in sockets

H. Programmable Logic Controllers

1. Manufacturers
   a. General Electric Fanuc 30-70/30-90
   b. Allen Bradley, any model
   c. Koyo DL260 only
   d. Or equal

2.06 IGNITION PROCEDURE

A. The pilot and main flame shall be controlled by ultraviolet (UV) scanner (optional), thermocouples, solenoids, relays, and timers to perform the following functions:

1. Spark ignition of propane gas creates pilot flame that ignites LFG main flame.

2. When pilot is successfully ignited, blower(s) and actuator valve on skid inlet are activated.

3. When main flame is successfully ignited (as detected by a UV scanner or thermocouple), pilot propane gas is shut off.

4. If pilot is not ignited after three attempts within the pre-selected time interval (as set on the timer), the pilot is shut off, a trouble light is illuminated and alarm sent (via the autodialer).

5. If main flame is not ignited within the pre-selected time interval, the pilot is shut off, and the trouble light is illuminated and alarm sent.

6. If the main flame fails, the blower(s) is turned off, and the inlet valve is closed and alarm sent.

7. In the event of loss of flame, the flare and blower(s) shall automatically restart after an adjustable time delay of 5 to 15 minutes.

8. In the event of a power failure, the flare and blowers shall automatically restart when power resumes after an adjustable time delay of 5 to 15 minutes.

B. In the event of a power failure, the flare and blowers shall automatically restart when power resumes after an adjustable time delay of 5 to 15 minutes.

2.07 AUXILIARY EQUIPMENT

A. Gas Mass Flow Meter.

1. Flow Meter. The mass flow meter shall consist of a single point drive system and remote electronics. The method of operation shall utilize a varying delta P signal. The flow meter shall have a digital LCD readout showing instantaneous flow located at the unit and at the flare control panel and provide a record of gas flow to the flare continuously or at maximum intervals of 15 minutes. Flow shall be indicated on the same paper and digital chart recorders as temperature. The unit shall be pressure and temperature corrected. The gas mass flow meter shall be manufactured by: Veris, Inc. or approved equal. The flow meter shall be installed per manufacturer's recommendation with a minimum of 10 diameters of straight piping with no obstructions upstream and 5 diameters downstream. The flow meter shall provide data to a remote recorder.

2. Digital Data Recorder. The digital data recorder shall continuously record temperature, flow and knock-out pot inlet vacuum at a minimum. It shall

have USB flash drive capabilities and a minimum of 6 input channels. The digital recorder shall be manufactured by Yokogawa Model DX Advanced DX 1000. It shall be installed in the control panel unit.

3. A flow totalizer shall be included in the touch screen control panel.

B. Gauges. The system shall be equipped with the following gauges as a minimum:

1. Pressure, Vacuum, and Differential Gauges: Gauges shall be Capsuhelic gauges as manufactured by Dwyer Instruments, Inc., Marietta, Georgia, or equal. Gauges shall read "INCHES OF WATER." Graduations shall be at intervals of 1 inch of water.

a. Flame arrester pressure drop indicator. Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

b. Moisture separator pressure drop indicator. Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

c. Blower vacuum and pressure indicators. Vacuum gauges shall be capable of measuring 0 to 80 in-w.c. Pressure gauges shall be capable of measuring 0 to 30 in-w.c.

d. System vacuum indicator. A vacuum gauge shall be mounted upstream of the knock-out pot as indicated on the Plans. It shall be capable of measuring 0 to 80 in-w.c.

e. System pressure indicator. A pressure gauge shall be mounted downstream of the blowers' outlet valves as indicated on the Plans. It shall be capable of measuring 0 to 30 in-w.c.

2. Blower inlet and outlet temperature indicators.

a. Dial-type temperature gauges shall be provided at the inlet and outlet of each blower. The gauges shall range from 0 to 200 degrees F.

2.08 SPARE PARTS

A. The Vendor shall provide the following spare parts:
1. 20 ounces of LAMSON No. 5 Grease, if Lamson blower is used, or equal.
2. One each vacuum, pressure and temperature gauge.
3. One shaft coupling.
4. Two thermocouples.
5. Indicator light package.
6. 1 ultraviolet scanner.
7. One set fuses/relays.

8. Two igniter assemblies.
9. One extra bank assembly for the flame arrestor
10. Two Nitrogen Bottles for operation of Automatic Shut-Off Valve.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The manufacturer/supplier shall install the following items on the main skid:
   1. Blower-Motor Assemblies.
   2. Moisture Separator Assembly (knock-out pot).
   3. Piping and fittings.
   4. Valves.
   5. Control Panels.

B. The flame arrester shall be installed on the flare inlet pipe and pipe supports shall be used.

C. All equipment shall be installed in strict accordance with the manufacturer's recommendations and codes and standards.

D. All skid-mounted equipment shall be installed plumb and perpendicular to piping.

E. Marred or abraded surfaces of equipment shall be cleaned and refinished to match original finish.

F. The CONTRACTOR shall coordinate the electrical work with the equipment manufacturer and panel fabricator to provide a complete, integrated, and automatic system.

3.02 START-UP AND TESTING

A. Factory Test. Prior to shipment, the entire station equipment and all circuits, control systems and devices, including all alarm signals, shall be tested. All apparatus shall be cleaned, adjusted and made ready for shipment after testing. Complete test reports shall be provided to the ENGINEER which show that all system controls operated correctly prior to shipment.

B. A factory representative with complete knowledge of proper operation and maintenance shall be provided for a minimum of two (2) 8-hour days to instruct representatives of the OWNER and/or the ENGINEER on proper operation and maintenance of the blower/flare system. If there are difficulties in operation of the equipment due to CONTRACTOR’s or manufacturer’s design or fabrication, additional service shall be provided at no cost to the OWNER.

C. Functional and Validation Tests. Upon completion of the installation, functional and validation tests shall be performed by the CONTRACTOR with the assistance of the supplier's representative, in the presence of the ENGINEER.

3.03 DEMONSTRATIONS

A. Demonstrations shall be separate from the installation, startup, and equipment adjustment services described in 3.2 above. System operations under all alarm conditions shall be demonstrated. Some of these alarm conditions may be simulated (e.g., via electrical jumpers) for demonstration purposes.

B. The Demonstration Test shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:

1. That the system has been properly installed and all parts are in correct alignment.

2. That the system performs satisfactorily during continuous operation for at least 3 consecutive days.

3. That there are no mechanical or electrical defects in any of the parts.

4. That the controls perform satisfactorily, including automatic starting and stopping, manual operation, safety shutdowns, call out/notification operation, and under all alarm conditions.

3.04 CLEANING

A. The CONTRACTOR shall clean exposed surface of all greases, dirt, and other foreign materials.

B. The CONTRACTOR shall touch up all marred or abraded surfaces as specified herein.

END OF SECTION