Stage II Landfill Gas Collection and Control System Expansion

Addendum #1

Integrated Solid Waste Management Facility
2655 Valley Drive
Bristol, Virginia 24201
276-645-7380

City of Bristol, Virginia
300 Lee Street
Bristol, Virginia 24201

SCS ENGINEERS

SCS Project #02218208.14
April 7, 2025

15521 Midlothian Turnpike, Suite 305
Midlothian, VA 23113
804-378-7440

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Section Page

Appendices

1 EXECUTIVE SUMMARY

This addendum has been prepared by SCS Engineers (SCS) for the City of Bristol, Virginia Integrated Solid Waste Management Facility for the Stage II Landfill Gas Collection and Control System (LFGCCS) Expansion. The purpose of this addendum is to provide answers to questions received thus far and provide revised and additional information about the project. This addendum includes a revised drawing set and revised documents, listed below.

2 REVISED DOCUMENTS

00 45 13 BIDDER'S QUALIFICATIONS

Replace 00 45 13 with a revised document included as Appendix A of Addendum 1.

01 11 00 SUMMARY OF WORK

Replace 01 11 00 with a revised document included as Appendix B of Addendum 1.

31 05 16 AGGREGATES

Replace 31 05 16 with a revised document included as Appendix C of Addendum 1.

44 11 20 SKID-MOUNTED LANDFILL GAS BLOWER/FLARE SYSTEM

Replace 44 11 20 with a revised document included as Appendix D of Addendum 1.

PRE-BID MEETING

Minutes

Pre-Bid Meeting minutes are included in Appendix E of Addendum 1.

Sign-In Sheet

Pre-Bid Meeting sign in sheet is included in Appendix F of Addendum 1.

3 DRAWINGS

CAD FILES

AutoCAD Civil 3D files are available upon request from the bidder. Requests should be directed to twilliams@scsengineers.com. The bidder will be required to sign an electronic file transfer agreement.

Bidders should be aware that differences may exist between the Electronic Files delivered and the data or hard copy files from which the Electronic Files are derived. It shall be the bidder's

responsibility to determine the accuracy, correctness, and completeness of the information contained in the Electronic Files and whether any conflicts exist with other data or records.

REVISIONS TO DRAWINGS

A revised drawing set is incorporated into this Addendum as an attachment. The revisions include, but are not limited to, the following:

- Existing features were revised, including edits to clarify which features are above grade or buried.
- The existing condensate drain line between the northern leachate cleanout access shaft and manhole MH-4 was revised from 6" to 4" diameter.
- The proposed condensate drain line from the new blower/flare station was adjusted, and additional protective casing pipe is required. A drain line is required from the flame arrester. A U-trap was added to the drain line from the knockout pot.
- The existing chain link fence near the top northern edge of the quarry is now shown in the drawings.
- Two new valves stations were added to the project. Each valve station includes landfill gas, force main, and air isolation valves.
- An additional three new landfill gas isolation valves were added to the project.
- A perimeter fence and access gates were added to the generator and electrical equipment staging area. The staging area size was increased, and the proposed grading was adjusted.
- A new detail sheet was added. The new details include a U-trap detail and a detail for standard chain link fencing and gates.

4 QUESTIONS

The following questions have been received to date and SCS' answers are shown below. Similar questions have been grouped together. Questions may be edited for clarity. Additional questions should be submitted to twilliams@scsengineers.com (copy Allison Worth aworth@scsengineers.com) by 5:00 PM EST on Monday, March 31st, 2025.

Question 1: I see that The Owner requires the Project to be substantially completed within 330 days and will be completed and ready for final payment within 365 days. But I have not been able to find any dates for (Start Substantial and Final Completion) are those dates TBD after the Prebid?

Answer: The dates for substantial and final completion will be set based upon the issuance date of the Notice to Proceed (section 00 55 00).

Question 2: We have an initial question regarding Section 00 11 16 Invitation to Bid. The first paragraph states, "Those wising to submit electronically may do so via the eVA procurement platform while also submitting the required paper copies to the City by the due date." Will contractors be allowed to submit all required Bid Documents on eVA and not be required to also submit same physically at the City's Procurement Department?

Answer: Electronic submission is optional per the new Virginia law for procurement. However, it is required that the bidder physically submits all documentation per the Invitation to Bid (section 00 11 16). The physical submission must be received by the bid due date to be considered responsive.

Question 3: SCS was asked at the pre-bid meeting about the overhead electrical lines shown on Sheet E2. The question was why there appears to be two different overhead routes to the new generator location.

Answer: The electrical utility company (BVU Authority) will install the new overhead electrical lines. The BVU Authority is considering two different routes for installing the new overhead electrical lines to the new generator location. Both routes are shown on the sheet.

Question 4: SCS was asked at the pre-bid meeting about whether a dual containment sump is required.

Answer: A dual containment sump is not required.

Question 5: SCS was asked at the pre-bid meeting about potential permitting requirements.

Answer: The City will not require a land disturbance permit from the Contractor. However, the Contractor must still maintain environmental compliance in accordance with the drawings, specifications, and documents. Air permitting requirements will be handled by the City.

Question 6: SCS was asked at the pre-bid meeting about the availability of an on-site borrow area.

Answer: An existing borrow area, located south of the scalehouse, is available for the Contractor's use. The Contractor must maintain environmental compliance as it uses the borrow area.

Question 7: SCS received a question about Callidus Technologies, which is listed as a landfill gas flare manufacturer in 44 11 20.

Answer: Callidus Technologies is no longer supplying landfill gas flare systems and should be disregarded as a potential manufacturer.

Question 8: For section 01 20 00 Measurement and Payment, paragraph 3.1.3, please confirm that all clearing and grubbing material needs to be disposed of off-site by the contractor. It was mentioned at the pre-bid meeting that the City's Dept of Public Works may handle disposal of trees and such? For section 31 10 00 Clearing, Grubbing, and Stripping, paragraph 3.3.3, please confirm that this material must be hauled off-site with disposal being paid for by the Contractor?

Answer: The Contractor does not need to dispose of all clearing and grubbing material off-site. The Contractor will coordinate clearing and grubbing efforts with the City. The Contractor will stockpile vegetation from clearing and grubbing material on-site for disposal by the City's Department of Public Works. Other materials, including rocks and boulders, may also be stockpiled on-site in a location acceptable to the City. It is anticipated that off-site disposal of clearing and grubbing material will not generally be necessary.

Question 9: For section 01 20 00 Measurement and Payment, 3.1.4, What is the cost of the Land Disturbance Permit and the amount of the E&S Bond if the Contractor is required to pay and provide?

Answer: Neither a Land Disturbance Permit nor an E&S Bond will be required.

Question 10: Detail 3 Dwg 11 Which option is to be provided Plastic or Metal Safety Fence?

Answer: The plastic safety fence is preferred. The metal safety fence has been crossed out.

Question 11: For drawing 10 (blower-flare station layout), is there a specification for the Chain Link Fence and Access Gates?

Answer: A standard detail addressing the fence and access gates has been added to the drawings.

Question 12: For section 31 00 00 Earthwork, 3.16 (second paragraph) How is Contractor to determine if waste will be encountered outside of SWP#588 Landfill? Please consider changing this requirement to a Contingent Item Unit Price?

Answer: Waste has previously been encountered outside of the permitted landfills, including near the northwestern boundary of the SWP#498 landfill. SCS cannot estimate the quantity of waste that may be encountered during excavation outside of the permitted landfill boundaries. For waste encountered during excavation outside of the permitted landfill boundaries, the City will coordinate with the Contractor to assist with the disposal of the waste. The City will provide waste haulage and pay the tipping fee for the off-site disposal of waste. The Contractor will coordinate waste disposal efforts with the City, and the Contractor will load excavated waste into the City's hauling vehicles so that no excavated waste remains at the end of a working day.

Question 13: For section 31 05 16 Aggregates, paragraph 2.1.1.3, is the Noncalcareous requirement only for perforated landfill gas pipe?

Answer: No, the specification has been edited to require noncalcareous aggregate to be used for any below grade installation within the landfill limits. The revised specification is included.

Question 14: For section 31 23 33 Trenching, Backfilling, and Compacting, paragraph 3.7.13, please confirm Trench Blasting will be permitted and if so, please define what additional requirements will be required?

Answer: The City and SCS will consider a request from the Contractor for the use of blasting, however, the City and SCS cannot guarantee that blasting will be permitted. The Contractor's bid cannot assume that blasting will be allowed. The use of explosives will require the Contractor to submit for approval a comprehensive blasting plan which addresses safety and environmental compliance concerns. Acceleration due to blasting would need to be monitored and maintained within safe levels to prevent damage to existing infrastructure.

Question 15: Concerning section 31 00 00 Earthwork, paragraph 1.1.2, and section 01 11 00 Summary of Work, paragraph 1.2, with the amount of excavation and trenching required outside the limits of SWP#588 Landfill, please consider making Rock Excavation a Unit Price Bid Item.

Answer: The City requires lump sum pricing for the project. The site will be made accessible to interested bidders for exploratory activities, including the excavation of test pits.

Question 16: For section 00 43 10 Bid Bond – Is there a specific Bid Bond form the City wishes bidders to use, or is a standard AIA Bond form acceptable?

Answer: The City has not specified a specific Bid Bond Form. A standard AIA Bond Form would be acceptable, as would the EJCDC form and other standard forms commonly used in the industry. The bidder must fill out the Bid Guaranty information listed in section 00 43 10 Bid Bond.

Question 17: For section 44 11 20 Skid-Mounted LFG Blower/Flare System, paragraph 1.2.4 – Reads identically to above paragraph 1.2.3. Is this intentional?

Answer: Paragraph 1.2.4, Spare Parts, has been revised.

Question 18: For section 44 11 20 Skid-Mounted LFG Blower/Flare System , paragraph 1.4.1.2 – The rated capacity is listed "per blower." Is the minimum capacity also "per blower?"

Answer: The rated capacity and minimum capacity values have been revised. Both values are listed per blower.

Question 19: For section 44 11 20 Skid-Mounted LFG Blower/Flare System, paragraph 1.4.2.1 – Landfill gas flow rate is listed at a minimum of 250 scfm but blower minimum capacity is listed as 500 scfm (paragraph 1.4.1.2). Is this correct?

Answer: The blower minimum capacity has been revised (1.4.1.2).

Question 20: For 44 11 20 Skid Mounted LFG Blower/Flare System, paragraph 1.4.2.1 – "Btu loading" is listed as a range of 3.0 to 66 MM BTU/hr. Preliminary calculations show a range of 2.5 to 75 MM BTU/hr based on provided landfill gas composition and flow rate. Can you advise which is correct?

Answer: The BTU loading has been revised; see the revised specification.

Question 21: For 44 11 20 Skid Mounted LFG Blower/Flare System, paragraph 1.5 – "Underwriters Laboratories (UL)" is listed here but not mentioned elsewhere in the lobby. Should the control panel be certified UL?

Answer: The control panel must be certified Underwriters Laboratories. The Electrical General Notes on sheet E1 of the electrical drawings confirm this requirement.

Question 22: For 44 11 20 Skid Mounted LFG Blower/Flare System, paragraph 2.5.1.3.4 – What is meant by "accommodate?" Will a laptop computer often be stored within the control panel?

Answer: Paragraph 2.5.1.3.4 was edited to require room for future SCADA interface equipment. The original wording about the laptop was removed.

Question 23: Drawing 11, Detail 2 – Please confirm a Drip Trap and/or Drain Valve is required at the Flame Arrestor along with a drain line connecting to the 4" condensate drain line shown. Please clarify model/type of Drip Trap and/or Valve at the Flame Arrestor.

Answer: A drain from the Flame Arrester connecting to the new 4" drain line is required to manage condensate. Detail 2 on sheet 11 has been revised for clarity.

Question 24: For the Section 01 35 29 Health and Safety Plan, paragraph 1.2.1.6 – Please clarify what sidewall gas emissions the contractor will encounter and where on the site the contractor will encounter them.

Answer: Five-gas meter (e.g. Blackline G7 multi-gas detector or equivalent to detect Benzene) must be used by personnel working in the quarry and trenching or otherwise excavating outside of the quarry. Sidewall gas emissions are most likely to be encountered within the SWP#588 waste limits in close proximity to the sidewalls. The northernmost portion of the quarry is outside of the waste limits and sidewall gas emissions are less likely to be encountered in that area.

Question 25: Drawing 4 & Drawing 7 – Does the existing 4" LFG header connect to the leachate riser seen at approximate station 0+60? If so, will the contractor be required to reconnect the proposed 12" header. Please provide a detail and existing inverts for any connection(s).

Answer: The existing LFG header does not connect to the existing leachate feature seen near station 0+60. A new connection is not required.

Question 26: Drawing 4 & Drawing 7 – Does the existing 4" LFG header connect to the existing Sump and/or Manhole seen at approximate station 7+50 thru 8+00? If so, will the contractor be required to connect the proposed 12" header. Please provide a detail and existing inverts for any connection(s).

Answer: No, the existing 4" LFG header does not connect to the existing manhole. A new connection is not required to the manhole.

Question 27: Drawing 4 – The new 4" condensate drain is noted to tie into an existing 6" leachate line. Please clarify what type of leachate line is existing, gravity or forcemain? If the existing line is a forcemain, would a check valve at the tie in location be required?

Answer: The existing condensate drain line and existing 6" leachate force main have been revised. The new 4" diameter condensate drain line will not tie into the existing 6" leachate force main. Instead, it will tie in to an existing 4" diameter condensate drain line.

Question 28: Drawing 4 – Please clarify the note regarding the existing material stockpile. What type of material is the stockpile? What is the amount of material in CY? Where must this material be relocated?

Answer: At the time the existing topography was captured, a soil stockpile was located near the new blower/flare station. The soil stockpile has since been substantially removed. An estimate of remaining material cannot be provided. Any remaining material can be relocated on-site per the City's instructions.

Question 29: Drawing 3 – Does the existing 4" LFG header (and 6" leachate line) have tracer wire and/or warning tape (metallic or plastic) installed on top of it?

Answer: The existing 4" LFG header is positioned above grade. It cannot be confirmed if there is existing tracer wire and/or warning tape for the buried existing pipes, including the existing buried 6" leachate force main and the existing buried 4" condensate drain line.

Question 30: The scale on each Drawing appears to have minor irregularities. Example – Drawing 3, the scale appears to be 1" = 49'11"; 2" = 99'9", 3" = 149' 7". Please confirm the scale is correct on each Drawing.

Answer: The plot settings were adjusted for the Addendum 1 sheet set. Please note that, where a graphical scale bar is used in place of a written scale, the graphical scale bar is to be used for exact measurements. Where written scales are included under profile views, the written scale will depend on plot size, as noted on the drawing.

Question 31: For Section 44 11 20, Skid-Mounted LFG Blower/Flare System, A blower manufacturer who has worked this particular site on numerous occasions has indicated that the max expected flow from this entire site would be up to a maximum of 1000 scfm. The sizing on the blowers as currently provided yields systems with a max flow of 2500 cfm and a minimum flow of ~ 1100 -1400 scfm depending on the selection. They have stated it would be impossible to achieve flows of 2500 cfm with Delta P of 90 in-wc AND with the same blower achieve flows of 250 cfm at any vacuum. Machines this large cannot be turned down this far, especially when sized for a large delta P of 90 in-wc. Provisions would need to be made for recirculation, which may also require some cooling. Attached are three blower scenarios provided by a manufacturer utilizing 50 Hp, 75 Hp, and 100 Hp motors. They request the Owner indicate a preferred unit. All selections were made at max temp of 140F and 50% Methane. Utilizing the max 55% Methane would yield insignificant changes to the curves. Designs at lower temperatures can provide much better Hp usage.

Answer: Section 44 11 20 has been revised, including revisions to the blower and flare operating standards. The minimum horsepower requirement for the blower was also reduced. The Delta P listed in the question is outside the range originally and currently indicated in the blower operating standards. Contractor will use only listed approved manufacturers.

Question 32: For Section 44 11 20, Skid-Mounted LFG Blower/Flare System, paragraph 1.3.2 – May additional acceptable manufacturers be added to the list for the Landfill Flare Blower Skid 'or Equal as approved by the Engineer'?

Answer: No, additional manufacturers will not be added to paragraph 1.3.2. It is unacceptable to use an unlisted manufacturer.

Question 33: Would the Owner like the blowers to alternate duty automatically any time there is a shut down? If so, what rules would you like to implement as to what constitutes a shut down or should this just remain a manual function?

Answer: Automatic alternating duty is not desired.

Question 34: For Section 44 11 20, Skid-Mounted LFG Blower/Flare System, paragraph 2.3.2.1 – Piping is called out as Sch 80 PVC which has a max working temperature of 140F. Discharge from these blowers based on 140F inlet would be at least 180F. We recommend either changing pipe spec to Sch 10 304 SS or lowering the expected inlet temp to at least 100F. This temp change would significantly affect the blower sizing.

Answer: The specification was revised to required Type 304L or approved equivalent piping.

Question 35: For Section 44 11 20, Skid-Mounted LFG Blower/Flare System, paragraph 2.4.3.2.3 – Please provide the specified max flame arrestor loss at the operating point of 2500 cfm.

Answer: The maximum flame arrester loss at the operating point of 2500 scfm will be less than 2 inches water column.

Question 36: For Section 44 11 20, Skid-Mounted LFG Blower/Flare System, paragraph 2.4.3.9 Can Sherwin Williams and Tnemic be added to the approved paint finish suppliers as long as the material provided meets the zinc content spec.

Answer: The two requested suppliers will not be added to the approved paint finish suppliers.

Question 37: Section 2.5.1.9 – If the HMI is mounted in the panel face and displays all the items in this list, is that sufficient such that additional mechanical devices will not be required other than the lights and switches specified in other sections?

Answer: Control panel must have the components listed in the specifications.

Question 38: Section 2.7.1.2 – Can the data recording be by the PLC/HMI in lieu of a separate dedicated data recorder? Accessing the data recorder is an additional step for the operator vs the on-going connection they will have with the PLC/HMI for monitoring and control.

Answer: No, a separate data recorder is required per the specifications.

Question 39: 1.Drawing 11, Note #6 mentions a "future blower" but that's the only mention. A "future blower" space is not shown on the detail. Should the skid be sized for "two blowers" or "two blowers plus a future blower".

Answer: Note #6 was revised for clarity. The skid will be sized for two included blowers.

Question 40: Please confirm BVU will provide the CT cabinet and/or Meter base for the electrical installation.

Answer: The Contractor must provide these items, as indicated on the Plan 1 on Sheet E3, the New Equipment Schedule on Sheet E4, and Detail 1 on Sheet E7. Please also refer to the power 1-Line Diagram (Detail 1 on Sheet E4) and the New Feeder Schedule on Sheet E4 for items provided by Others.

Appendix A

Revised 00 45 13 Bidder's Qualifications

SECTION 00 45 13

BIDDER'S QUALIFICATIONS[i]

1.0 GENERAL INFORMATION

1.1

Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.2

Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?	☐ Yes ☐ No ☐ Pending		
SCC Identification Number:			

1.3

Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

1.4

Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	

2.0 LICENSING

2.1

Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

3.0 DIVERSE BUSINESS CERTIFICATIONS

3.1

Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

4.0 SAFETY

4.1

Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.2

Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

5.0 FINANCIAL

5.1

Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

6.0 SURETY INFORMATION

Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	☐ Yes ☐ No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

7.0 INSURANCE

Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):	
Insurance Provider	Type of Policy (Coverage Provided)
Are providers licensed or authorized to issue policies in the Project location?	☐ Yes ☐ No
Does provider have an A.M. Best Rating of A-VII or better?	☐ Yes ☐ No
Mailing Address (principal place of business):	
Physical Address (principal place of business):	
Phone (main):	Phone (claims):

8.0 CONSTRUCTION EXPERIENCE

8.1

Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.2

Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.3

List all projects currently under contract in Schedule A and provide indicated information.

8.4 PREVIOUS EXPERIENCE WITH SIMILAR PROJECTS

List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction, including landfill gas work. The listed project experience in the last 5 years must include at least one project in which the Business was the general contractor responsible for the installation of a landfill gas blower/flare station.

8.5 KEY INDIVIDUALS

In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well. The Bidder must provide a Project Superintendent with prior experience in the installation of a landfill gas blower/flare station.

8.6 ENVIRONMENTAL COMPLIANCE HISTORY

Provide information regarding the Business's previous environmental compliance.

Has Business, or a predecessor in interest, or an affiliate identified:
Been involved in legal action due to non-compliance with environmental law in the last 5 years? ☐ Yes ☐ No
Received a Notice of Violation due to an environmental compliance issue in the last 5 years? ☐ Yes ☐ No
Received a Warning Letter due to an environmental compliance issue in the last 5 years? ☐ Yes ☐ No
Paid penalties on a Contract due to issues related to environmental compliance in the last 5 years? ☐ Yes ☐ No
If the Business answered Yes to any of these questions, describe the incident or incidents below, including the reason for non-compliance and actions taken to address the issue:

9.0 REQUIRED ATTACHMENTS

9.1

Provide the following information with the Statement of Qualifications:

9.1.1

If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.

9.1.2

Diverse Business Certifications if required by Paragraph 3.1.

9.1.3

Certification of Business's safety performance if required by Paragraph 4.1.

9.1.4

Financial statements as required by Paragraph 5.1.

9.1.5

Attachments providing additional information as required by Paragraph 8.2.

9.1.6

Schedule A (Current Projects) as required by Paragraph 8.3.

9.1.7

Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.4.

9.1.8

Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.

9.1.9

Additional items as pertinent.

This Statement of Qualifications is offered by:

Business: _____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____
(typed or printed)

Date: _____
(date signed)

(If Business is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____
Email: _____

Schedule A—Current Projects

Name of				
Project Owner		Project		
General Description of				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction					

Project Owner		Project		
General Description of				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction					

Project Owner		Project		
General Description of				
Project Cost		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager
Name				

Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)

	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction					

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project Completed		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager		Quality Control Manager
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Environmental, Health, and Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

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Appendix B

Revised 01 11 00 Summary of Work

SECTION 01 11 00

SUMMARY OF WORK

1.0 GENERAL

1.1 SECTION INCLUDES

- Work summary
- Owner supplied products
- Contractor's use of site and premises.
- Owner Occupancy
- Progress Meetings

1.2 WORK SUMMARY

The work to be performed under these contract documents includes, but is not limited to, the following:

- Mobilization and demobilization
- Providing temporary field offices, storage, sanitary facilities, and communication equipment as needed.
- Environmental, health and safety planning accommodations
- Establishment and maintenance of erosion and sediment control throughout the project
- Construction layout and surveying, investigate/locate existing site features including buried landfill gas pipe, Construction Quality Control (CQC) testing, record drawings and related documentation
- Clearing, grubbing, and stripping; to include removal of existing debris, rocks, boulders, trees, shrubs, etc.
- Construction of temporary access roads/construction entrances as needed for access for the work. Location of the roads, if any, to be coordinated with the OWNER.
    - Contractor will control dust generated by the Contractor's operations
- Earthwork to prepare site area as shown in plans and specifications, which will include excavation and removal of rock per Design Drawing details and specifications.
- Maintenance and restoration of stockpiles and borrow areas associated with the work including appropriate erosion and sediment controls.
- Installation of the new quarry landfill access road within the Solid Waste Permit (SWP) No. 588 landfill, including the following:
    - Installation and compaction of soil fill
    - Construction of road surface
- Installation of landfill gas system piping, portions of which are within the SWP. No. 588 landfill, including the following:
    - Trenching, placement, testing, and backfilling for new landfill gas header and removal and stockpiling of existing LFG header

  - Installation of new landfill gas header down the quarry sidewall per Design Drawing details.
  - Trenching, placement, testing, and backfilling for new air and force main lines
  - Construct tie-ins and all necessary connections for new landfill gas features' connections to existing system components
  - Installing new landfill gas isolation valves, isolation valve stations, and other valves
  - Connecting new landfill gas header to new leachate cleanout wellheads
- Installation of the new landfill gas force main cleanouts along the existing lines within and outside of the SWP No. 588 landfill, including:
  - Excavate and expose existing force main lines
  - Furnish and install new force main cleanouts by splicing into existing lines
  - Backfilling and compaction
- Installation of two new landfill gas condensate sumps, one of which will be within the SWP No. 588 landfill, and the other located near the northwest corner of the closed SWP No. 498 landfill outside of the landfill limits, including:
  - Construction of condensate sump structures
  - Excavation, placement, testing, backfilling, and compaction for sump installation
  - Installation of all fittings, valves, pumps, ports, level sensor, tubing, base plate, and all other necessary components
- Installation of the backup generator system, including:
  - Clearing area, grading, and pouring concrete pads for installation of equipment
  - Installation and connection of various electrical equipment, including diesel backup generator, automatic transfer switch, panels, fixtures, cable runs, etc.
- Installation of electrical service to backup generator and landfill gas blower/flare station, including:
  - Connect backup generator system to new overhead electrical service provided by utility company
  - Install electrical cable run between backup generator system and new landfill gas blower/flare station
  - Connection to new landfill gas blower/flare station control system
- Installation of the new landfill gas flare station, including:
  - Installation of concrete pad foundations
  - Installation of skid-mounted equipment atop concrete pads
  - Installation of knockout pot and condensate drain line with U-trap
  - Installation of blowers and flare stack
  - Testing and demonstration of flare operation
  - Preparation and submittal of associated documentation
  - Installation of fence and gates
- Repair/replacement of existing features impacted during construction
- Temporary and permanent seeding and establishment of grass on all disturbed vegetated areas within the limits of construction

1.3 OWNER SUPPLIED PRODUCTS

The following items Furnished by Owner for Installation by Contractor:

- N/A

1.4 CONTRACTOR'S USE OF SITE AND PREMISES

1.4.1 Schedule

Owner agrees to make the Site accessible to Contractor during normal working hours (Monday through Friday 7:00 a.m. to 4:00 p.m. excluding holidays observed by the City or Bristol Virginia). Equipment maintenance, preparation, fueling, site maintenance, planning, and administration may occur outside of these hours as long as no material placement or construction occur. Contractor may work on Saturdays, Sundays, and extended days if provided written authorization from Owner. Contact Owner to coordinate Site access.

1.4.2 Areas

Construction operations limited to areas noted on Drawings.

1.4.3 Cooperation

Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

1.4.4

Contractor must provide and maintain such sanitary accommodations for the use of its employees and those of its Subcontractors as may be necessary to comply with the requirements and regulations of the local and state departments of health. These accommodations must be at Contractor's expense.

1.5 OWNER OCCUPANCY

1.5.1 Term

The Owner will occupy the property during the entire period of construction.

1.5.2 Conflict

Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

1.5.3 Schedule

Schedule the Work to accommodate Owner occupancy.

1.6 PROGRESS MEETINGS

Progress meetings will be held at least every other week, unless Owner directs otherwise, to discuss the activities and accomplishments for the preceding weeks, review the work location and activities for the upcoming week, identify the Contractor's personnel and equipment assignments for the upcoming week(s), and discuss potential construction problems. The date, time, and location of progress meetings will be established at the pre-construction conference.

END OF SECTION 01 11 00

Appendix C

Revised 31 05 16 Aggregates

SECTION 31 05 16

AGGREGATES

1.0 GENERAL

1.1 SUMMARY

The requirements for riprap, pipe bedding aggregates, road base course, and other miscellaneous as shown in the PLANS, and are specified herein and General Conditions.

Related Work Specified Elsewhere:

- Section 01 45 00 Construction Quality Control
- Section 31 00 00 Earthwork
- Section 31 05 19.13 Geotextile Fabrics
- Section 31 15 40 Crushed Stone Surfacing

1.2 REFERENCE SPECIFICATIONS

The publications listed below form a part of this specification to the extent referenced in the text. The publications are referenced to in the text by basic designation only.

1.2.1 State Of Virginia

- Virginia Department of Transportation (VDOT) Road and Bridge Specifications (VDOTRBS), Latest Edition
- Virginia Stormwater Management Handbook, latest edition

1.2.2 American Society for Testing and Materials (ASTM) Standard Test Methods/Practice

- ASTM C 88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- ASTM C 131 Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- ASTM D 75 Sampling Aggregates
- ASTM C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

- ASTM D 698 Laboratory Compaction Characteristics Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
- ASTM D 1556 Density and Unit Weight of Soil in Place by the Sand Cone Method
- ASTM D 2487 Classification of Soils for Engineering Purposes
- ASTM D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Mustow Depth)
- ASTM D 4373 Calcium Carbonate Content of Soils
- ASTM D 5856 Standard Test Method for Measurement of Hydraulic Conductivity of Porous Material Using a Rigid-Wall, Compaction-Mold Permeameter
- ASTM E 11 Wire Cloth Sieves for Testing Purposes
- ASTM E 329 Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.3 SUBMITTALS

1.3.1 Prequalification

Submit the material source, descriptions, and material specifications certified by the supplier to the ENGINEER for approval.

1.3.2 Approval of Material Sources

The sources of the material to be used for producing aggregates must be selected not less than thirty (30) working days prior to the time the material will be required in the work. Any changes in the source of materials must be reported to the ENGINEER immediately. The new source must be approved by the ENGINEER. Allow a minimum of 10 working days for review and approval. The CONTRACTOR must be fully responsible for any delays in construction due to changes in material sources.

1.3.3 Certificate of Compliance

The CONTRACTOR must submit to the ENGINEER for approval at least 15 working days before procurement Certificate of Compliance from the manufacturer that the supplied materials meet the specifications herein.

2.0 PRODUCTS

2.1 GENERAL

2.1.1 Quality

Aggregates must consist of clean, sound, durable particles of crushed stone, or gravel, and screenings. Slag must not be used.

2.1.1.1 Grade and Smoothness

CONTRACTOR must obtain materials that meet the specifications and can be used to meet the grade and smoothness requirements specified herein, after all compaction and proof rolling operations have been completed.

2.1.1.2 Objectionable Materials

Aggregates must be free of silt and clay (as defined by ASTM D2487), vegetable matter, and other objectionable materials or coatings.

2.1.1.3 Noncalcareous

Aggregate installed below grade within the landfill limits must contain less than 15% by weight of calcium carbonate as measured by ASTM D4373. Test results must be submitted to the ENGINEER demonstrating compliance with this requirement.

2.1.2 Fine Aggregate

Fine aggregate refers to the portion passing the No. 4 sieve. Fine aggregate may contain angular particles produced by crushing stone, or gravel that meets the requirements for wear and soundness specified by VDOTRBS Section 202. Material designations for the various fine aggregates used on the project must be as specified on the PLANS.

2.1.3 Coarse Aggregate

2.1.3.1 Standards

Coarse aggregate refers to the portion retained on the No. 4 sieve, and must be angular or rounded particles of uniform density. Coarse aggregate may contain angular particles produced by crushing stone, or gravel that meets the requirements for wear and soundness specified by the VDOTRBS Section 203.

2.1.3.2 Soundness

The coarse aggregate must have a loss of density not greater than 10 percent of the weighted average at five cycles when tested for soundness. The coarse aggregate must have a percentage of wear not exceeding 40 percent after 500 revolutions as determined by the requirements of VDOTRBS Section 203.

2.1.3.3 Material Designations

Material designations for the various coarse aggregates used for the project must be as specified on the PLANS.

2.1.3.4 Flat and Elongated

The percentage of flat and/or elongated particles must not exceed 20 in the fraction retained on the 1/2 inch sieve and in the fraction passing the 1/2 inch sieve. A flat particle is one having a ratio of

width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. When the coarse aggregate is supplied from more than one source, aggregate from each source must meet the requirements set forth herein.

3.0 EXECUTION

3.1 EQUIPMENT

3.1.1 Weather Limitation

Aggregates must be placed in accordance with VDOTRBS Section 309. Areas of completed work that are damaged by freezing, rainfall, or other weather conditions must be corrected to meet specified requirements.

3.2 STOCKPILING MATERIAL

Prior to stockpiling of material, storage sites must be cleared and leveled by the Contractor. All materials, including approved material available from excavation and grading, must be stockpiled in a manner and at locations approved by the ENGINEER. Aggregates must be stockpiled on the cleared and leveled areas designated by the OWNER so as to prevent segregation. Materials obtained from different sources must be stockpiled separately. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.2.1 Stockpile Erosion and Sediment Control

Stockpiles must have appropriate Erosion and Sediment Controls managed in accordance with applicable regulations and Section 31 25 00 of the Project Specifications, Erosion and Sediment Control.

3.2.2 Stockpile Cleanup

Remove stockpile and temporary erosion and sediment controls, leave area in clean and neat condition. Grade site surface to prevent free standing surface water. Seed and stabilize stockpile areas following clean-up.

3.3 PREPARATION OF UNDERLYING COURSE

Prior to placing aggregate, the underlying course must be cleaned of all foreign substances. At the time of construction of the course, the underlying course must contain no frozen material. The underlying course must conform to Section 31 00 00 - EARTHWORK.

3.4 GRADE CONTROL

During construction, the lines and grades must be maintained by the CONTRACTOR.

3.5 PLACING

3.5.1 Roadway

Roadway crushed stone base material must be placed in accordance with VDOTRBS Section 308 subbase course.

3.5.2 Coarse Aggregate

Coarse aggregate bedding and backfill material must be placed in accordance with VDOTRBS Section 303 Earthwork.

END OF SECTION 31 05 16

Appendix D

Revised 44 11 20 Skid-Mounted Landfill Gas Blower/Flare System

SECTION 44 11 20

SKID-MOUNTED LANDFILL GAS BLOWER/FLARE SYSTEM

1.0 GENERAL

1.1 DESCRIPTION

1.1.1 Scope of Work

1.1.1.1 Description

The work described in this section consists of furnishing all labor, materials, equipment, and incidentals necessary to furnish, install, and field test a SKID-MOUNTED LANDFILL GAS BLOWER/FLARE SYSTEM, also referred to as the landfill gas blower/flare station, as shown on the PLANS and as specified herein, including all appurtenances to provide a complete system ready for operation.

1.1.1.2 Sub-systems

The Skid-Mounted Landfill Gas Blower/Flare System shall include the following four sub-systems:

- Gas Handling System.
- Interconnecting Piping System.
- Candlestick Flare System.
- Control System.

1.1.1.3 Electrical

The CONTRACTOR shall be responsible for all electrical wiring connections for operation and control of all equipment related to the Skid-Mounted Landfill Gas Blower/Flare System.

1.1.1.4 Related Work

- Section 31 20 00: Earthwork
- Section 03 30 00: Concrete
- Section 33 51 10: LFG Pipe and Pipe Fittings

1.2 SUBMITTALS

1.2.1 Shop Drawings

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:

- Certified Shop Drawings showing all important details of construction and dimensions.
- Descriptive literature, bulletins, and/or catalogs of the equipment.
- A complete bill of materials for all equipment.
- The total weight of the equipment, including the weight of the single largest item.
- 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.
- Complete control panel diagrams and elevations showing all components, wires, connections, and numbered terminals.
- Complete electrical interconnect diagram showing all wires and terminals between the control panel and external devices.
- Exceptions to the applicable requirements, PLANS, Specifications, and applicable codes and standards.
- Certification that the equipment furnished for this project does not exceed the sound pressure specified herein.

1.2.2 Operation and Maintenance Manual

An operation and maintenance manual shall be furnished. 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 information, for equipment parts that may need servicing or replacement.

1.2.3 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.

1.2.4 Spare Parts

Provide manufacturer specifications and cut sheets for the spare parts listed in subsection 2.8.

1.3 QUALIFICATION

1.3.1 Experience

The Skid Mounted 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.

1.3.2 Manufacturer

The Skid Mounted Landfill Gas Blower/Flare System shall be manufactured by Callidus Technologies Inc., John Zink Company, LFG Specialties, Inc., Parnel Biogas Inc., or Perennial Energy, Inc.

1.4 DESIGN CRITERIA

1.4.1 Landfill Gas Blowers

1.4.1.1 Gas Classification

Equipment specified herein is intended to be standard equipment for use in a landfill gas handling system.

1.4.1.2 Operating Standards

The blowers shall be designed for continuous operation in an outdoor environment and shall conform to the values in Table 44 11 20 - 1, measured at standard 14.7 psia and 68 degrees F condition:

Table 44 11 20 - 1 – Blower Operating Standards

Standard	Value
Number required	2
Rated capacity, scfm (per blower)	2,000
Minimum capacity, scfm (per blower)	400
Site elevation, ft AMSL	1900
Gas composition	
Methane, %	13 - 55
Carbon Dioxide, %	15 - 60
Oxygen, %	0 – 13
Nitrogen, %	0 – 55
Traces gases (e.g., VOCs, H2S), %	0 – 2
Blower inlet vacuum, inches of water	20 - 60
Blower outlet pressure, inches of water	15
Landfill gas inlet temperature	
Maximum, degrees F	140
Minimum, degrees F	60
Motor	
Totally enclosed, fan cooled	
Minimum motor horsepower	30
Noise limit, dbA at 3 ft	85
LFG moisture content, % saturated	100
Shaft Type	Gas with mechanical seal

1.4.1.3 Surging

When rated volumetric capacity is reduced to 20 percent of design, blowers under the specified inlet conditions shall not surge or overload the motor.

1.4.1.4 Rating

Each blower equipment rating shall be based upon data previously established by tests in accordance with the ASME Power Test Code for Centrifugal Blowers.

1.4.2 Candlestick Flare System

1.4.2.1 Operating Standards

The landfill gas flare system shall be designed to operate continuously at the service conditions listed in Table 44 11 20 – 2.

Table 44 11 20 - 2 – Candlestick Flare Operating Standards

Standard	Value
Landfill gas flow rate, scfm	400 to 2500
Btu loading, MM Btu/hour	3.0 to 83
Inlet temperature, degrees F	80 to 140
LFG moisture content, % saturated	100
Landfill gas composition range:	
Methane, %	13 - 55
Carbon Dioxide, %	15 - 60
Oxygen, %	0 – 13
Nitrogen, %	0 – 55
Traces gases (e.g., VOCs, H2S), %	0 – 2
Site elevation, ft AMSL	1900

1.4.2.2 Controls

Controls and accessories to include the following:

- Propane supply with a spark plug igniter for flame ignition
- Thermocouple for flame temperature confirmation
- Ultraviolet flame scanner or thermocouple for flame confirmation
- Flare control panel
- Auto re-start
- Automatic notification system
- Pneumatically-operated emergency shut-off valve
- Totalizing Flow meter
- Digital Data Recorder
- Flame arrester
- Flare stack liquids drain
- Continuous landfill gas methane analyzer

1.4.3 Pressure

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.

1.4.4 Destruction Efficiency

The landfill gas flare 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.

1.4.5 Thermal Radiation

The thermal radiation at 6 feet above ground level shall be less than 500 BTU/h ft2 when the flare is operating at its maximum design flow rate and methane composition.

1.5 APPLICABLE CODES AND STANDARDS

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):

- Local laws and ordinances
- State and Federal laws
- National Electrical Code
- National Electrical Manufacturers Association (NEMA)
- Underwriters Laboratories (UL)
- Uniform Building Code (UBC)
- American National Standards Institute (ANSI)
- American Society of Mechanical Engineers (ASME)
- American Gas Association (AGA)
- American Petroleum Institute (API)
- Institute of Electrical and Electronic Engineers (IEEE)
- Instrument Society of America (ISA)
- Industrial Risk Insurance (IRI)
- Factory Mutual (FM)
- National Fire Protection Agency (NFPA)
- Environmental Protection Agency (EPA)

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

1.6.1 Protection

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.

1.6.2 Delivery

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 permission is received in writing from the ENGINEER.

1.6.3 Exposed Surfaces

Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

1.6.4 Labeling

Each box or package shall be properly marked to show its net weight in addition to its contents.

1.7 WARRANTY AND GUARANTEES

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).

2.0 PRODUCTS

2.1 GENERAL

2.1.1 New Equipment

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. If equipment is damaged or found to be defective it must be replaced. Re-built equipment will not be accepted.

2.1.2 Equipment Standards

Equipment must be designed and proportioned to have liberal strength, stability, and stiffness and shall be especially adapted for the intended service. Ample room and facilities must be provided for inspection, repairs, and adjustments.

2.1.3 Parts Standards

Parts of equipment must 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.

2.1.4 Additional Considerations

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 Skid Mounted Landfill Gas Blower/Flare System not mentioned in these Specifications or shown on the PLANS shall be furnished and installed.

2.1.5 Pressure

At all levels of performance of each 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.

2.1.6 Nameplate

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, and any other information necessary for complete identification.

2.1.7 Modifications

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.

2.2 GAS HANDLING SYSTEM

2.2.1 Blower and Motor

2.2.1.1 Blower

The blower unit shall be a gas inlet driven, direct drive, multistage centrifugal type. 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. Blower shall comply with the Design Criteria of Section 1.4 above.

2.2.1.2 Blower Housings

The housings shall consist of cast iron sections held securely between cast iron inlet and outlet heads with steel tie rods.

2.2.1.2.1 Shaft Contact

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 insure no leakage of gas to the atmosphere or air into the landfill gas.

2.2.1.2.2 Connections

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.

2.2.1.3 Impellers

2.2.1.3.1 Manufacture

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.

2.2.1.3.2 Balance

Impellers shall be precisely machine balanced. Vibration shall not exceed 2 mils in the vertical plane measured at the blower bearing housings.

2.2.1.4 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.

2.2.1.5 Shaft

Each shaft shall be made of high grade carbon steel of sufficient diameter to operate below first critical speed.

2.2.1.6 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.

2.2.1.7 Casing Drains

Each blower stage shall be provided with 3/8-inch diameter casing drains manifolded to a single manual shut-off valve.

2.2.1.8 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.

2.2.1.9 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.

2.2.1.10 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.

2.2.1.11 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.

2.2.1.12 Blower Motor Assemblies

The blower motor assemblies shall be located, installed, and plumbed on a skid, and delivered to the site as a complete unit.

2.2.1.13 Auxiliary Equipment

The following auxiliary items shall be provided by the blower manufacturer:

- The manufacturer of the blowers shall provide flanged expansion joints and concentric tapered reducers; e.g. Lamson BA-1024 series.

2.2.1.14 Blower Controls

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.

2.2.1.15 Variable Frequency Drive

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, a 4-20 mADC signal provided by the flow rate or vacuum monitoring system, or Modbus TCP/IP or Ethernet/IP communications from 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 and/or vacuum.

2.2.1.16 Experience

2.2.1.16.1 Manufacturer Experience

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.

2.2.1.16.2 Acceptable Manufacturers

- Hoffman Air & Filtration Systems
  - Syracuse, New York 13057
  - (315) 423-8617
- Gardner Denver, Inc (Lamson Corporation)
  - Peachtree City, Georgia
  - (800) 982-3009
- Other manufacturers as approved by the Engineer

2.2.2 Moisture Separator Assembly (knock-out pot):

2.2.2.1 Materials

The moisture separator shall be completely fabricated from epoxy coated steel or 6061 T6, 6063 T6 and/or 3003 alloy aluminum. It shall be of a vertical, cylindrical design with element removal from the top. An 8 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. HDPE fabrication may be acceptable if approved by the ENGINEER.

2.2.3 Demister

The demister shall be made from non-corrosive mesh and shall be supported on and held down by high open area, stainless steel grid, or equivalent. 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.

2.2.4 Capacity

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 3.0 pounds per square inch gauge vacuum.

2.2.5 Condensate Removal

There shall be a 4-inch IPS pipe coupling in the bottom of the assembly for condensate removal.

2.2.6 Pressure Drop Monitoring

There shall be two 1/2-inch pipe couplings 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).

2.2.7 Manufacturer Experience

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.

2.2.8 Location

The moisture separator assembly shall be located, installed, and pre-plumbed on the gas handling system skid.

2.3 INTERCONNECTING PIPING SYSTEM

2.3.1 Valves

2.3.1.1 Butterfly Valves

2.3.1.1.1 Shafts

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.

2.3.1.1.2 Materials

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** (teflon is insufficient) 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.

2.3.1.1.3 Operation

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.

2.3.1.1.4 Interior

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.

2.3.1.1.5 Manufacturer

All butterfly valves shall be manufactured by American-Darling Valves, Clow Valve Company, DeZurik, Kennedy Valve Manufacturing Company, or approved equal. Replacement parts and valves shall be commonly available.

2.3.1.1.6 Exterior

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.

2.3.1.2 Stainless Steel Cock Valves

Stainless Steel Cock Valves. Gas and pressure sampling valves shall be quick connects or 1/4-inch stainless steel cock valves. Valve seats and seals shall be EPDM. Valves shall have a 1/4-inch MPT on one end and hose connection on the other and. Valves shall be as manufactured by McMaster-Carr or approved equal. Replacement parts and valves shall be commonly available.

2.3.2 Piping

2.3.2.1 Material

Piping on the gas handling system skid shall be Stainless Steel Type 304L, or approved equal. The same specification applies to tees, elbows, wyes, flanges, and other pipe fittings. Flanges shall conform to ANSI 125-pound specifications.

2.3.2.2 Gaskets

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.

2.3.2.3 Drainage

Where shown on the PLANS 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.

2.3.2.4 Supports

Piping and fittings shall be supported so as to prevent any strain being transmitted between sections and connected equipment and appurtenances. Release of any joint shall result in no transverse piping movement and shall allow easy removal and replacement of any piping component. Supports in addition to those shown on the PLANS may be required.

2.3.2.5 Heat Tracing

Where shown on the PLANS or as required, piping and fittings shall be heat traced between sections and connected equipment and appurtenances. Heat tracing may be done by the MANUFACTURER or the CONTRACTOR. Heat tracing in addition to that shown on the PLANS may be required.

2.4 CANDLESTICK FLARE SYSTEM

2.4.1 Manufacture

The landfill gas 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.

2.4.2 Piping and Wiring

The landfill gas flare system shall be pre-piped and pre-wired to the extent possible, requiring minimal field assembly.

2.4.3 Components

The landfill gas flare system shall include, but not be limited to, the following components:

2.4.3.1 Automatic Shut-Off Valve

The valve shall open when prompted by the flare. The landfill gas flare system shall include, but not be limited to, the following components: 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.

2.4.3.2 Flame Arrester

2.4.3.2.1 Connections

Flame arrester shall have 125 pound ANSI flanged connections.

2.4.3.2.2 Materials

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.

2.4.3.2.3 Capacity

Maximum head loss through the flame arrester shall not exceed 3 inches of water column at 1,000 scfm. All grids of the bank shall be arranged for individual removal. The flame arrester shall be UL approved and manufactured by Whessoe Varec, Model 5010E or approved equal.

2.4.3.3 Flare Stack

The flare stack shall be constructed from ASTM A53 steel, and it shall be of sufficient length to provide an overall flare system height of more than 20 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.

2.4.3.4 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 specification.

2.4.3.5 Windshield

The flare windshield shall be constructed of 310 stainless steel. The windshield shall extend at least 2 feet above landfill gas exit.

2.4.3.6 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 two (2) 100 pound L.P. bottles equipped with fuel gauges and regulators arranged such that one bottle can be removed from the system for re-filling without affecting system operation.

2.4.3.7 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.

2.4.3.8 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 foundation to prevent overturning and provide resistance against seismic or wind forces. Structural design shall comply with UBC 100 MPH criteria.

2.4.3.9 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). Finishing must be completed prior to shipment to site.

2.4.3.10 Control Louvers

Flare stack will include control louvers (dampers) to adjust flow.

2.5 CONTROL SYSTEM

2.5.1 Control Panel

The control panel for the Skid Mounted Landfill Gas Blower/Flare System shall be NEMA 4-rated. The main control panel shall be sized to accommodate the required controls, and shall be provided with a swing out panel, and with a window in the door through which status annunciators, recorder, controller, etc. may be viewed. The control panel shall be mounted, installed and prewired by the manufacturer. The panel shall include, but not be limited to, the following components:

2.5.1.1 Load Center

A load center for the motors, outlets, fixtures, controls, devices, lights, etc.

2.5.1.2 Control Center

A control center to receive all the signals from the various safeties, controls and monitoring equipment, and to automatically control all the components of the system.

2.5.1.3 Operator Control Panel

The control panel for the landfill gas blower/flare system shall be NEMA 4-rated. The main control panel shall be sized to accommodate the required controls and shall be provided with a swing out panel, and with a 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:

2.5.1.3.1 Flare Controls

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 a Programmable Logic Controller (PLC) via monitoring of the thermocouples and UV scanners.

2.5.1.3.2 Blower Controls

Blower controls shall include ITE Type ETI, or equal motor circuit protectors, variable frequency drives, voltage monitors, dual set point ammeter switch gauges (undercurrent and over-current points shall be clearly indicated on the ammeters), running time meters, hand-off-automatic switches, and green push-to-test run lights. A time delay will prevent blower restart until sufficient time has elapsed for the shaft to stop spinning minimum 5 minutes)

2.5.1.3.3 Blower Operations

The blower controls shall provide for 1 or 2 blower operation through a selector switch (Blower 1, Blower 2, or Blower 1 and 2). During automatic startup of Blower 1 and 2, a time delay will prevent both blowers from starting simultaneously.

2.5.1.3.4 SCADA Interface

The control panel shall be sized to accommodate a future DIN-rail industrial SCADA PC and cellular modem, including fused 24 VDC power from the battery backup.

2.5.1.3.5 Climate Control

The control panel shall be heated/air conditioned to maintain the internal panel temperature between 55°F and 85°F.

2.5.1.3.6 Touchscreen

Local touch screen, no less than 7-inches in size. Must be Ethernet and USB ready. Program it to record flare compliance data on a minute-by-minute basis on to an external storage medium (e.g., CF card, SD card, USB storage, etc.):

- Flare controlling temperature (F)
- Flare status (on/off)
- All LFG flow rates (SCFM)
- All LFG totalized flows (SCF, MMSCF, etc.)

Approved HMI manufacturers are:

- Allen Bradley – Panelview Plus 7
- Automation Direct – C-more HMI CM5
- Maple Systems - Advanced HMI

2.5.1.3.7 Programmable Logic Controller

Control of the flare shall be achieved using a Programmable Logic Controller (PLC).

- Approved PLC manufacturers are:
  - Allen-Bradley - CompactLogix PLC or Micro800 Series PLC
  - Automation Direct – Productivity 1000 or 3000 series
  - ENGINEER approved equal
- PLC HARDWARE
  - All control circuits will use 24VDC unless otherwise specified.
  - Ethernet communications are required.
- Minimum 8 channel analog input and output cards are required. Mixed input/output cards will not be accepted.
- All analog channels are required to be wired through analog isolators.

- Intrinsically safe barriers will be used for any sensors located in a classified environment
- Minimum 16 point input and output cards are required.
- All IO will be terminated to terminal blocks.
    - Minimum of 20% spare slot space will be required.
    - CPU rack will contain at least 2 empty slots for rack-based PLCs.
    - Filler cards will be used to fill spare slots for rack-based PLCs.

Contractor shall furnish an unlocked copy of the complete source code to the OWNER.

2.5.1.4 Communication Protocol

The PLCs will communicate via the Ethernet port using Modbus TCP/IP or EtherNet/IP. Vendor shall furnish a full tag list of every PLC tag with its corresponding Modbus TCP/IP or EtherNet/IP tag. All Ethernet equipment shall be IPd by the vendor.

Furnish an Ethernet switch with a minimum of 8 ports. A minimum of two spare ports is required.

Include an external outdoor-rated ethernet programming port on the front of the panel.

2.5.1.5 Power

Provide surge protection for all control power.

All control power shall be 24 VDC. Where applicable, a 24 VDC relay shall be used to interface with other control voltages.

Provide a 24 VDC battery backup system (UPS) to power the PLC, HMI, data recorder, Ethernet switches, future cellular modem, and future SCADA Edge PC. The UPS shall provide a minimum of 3 minutes of backup power.

Approved manufacturers are:

- Phoenix Contact – e.g., UNO-UPS, QUINT-UPS

2.5.1.6 Control Mode

The operator control panel to allow either manual or automatic selection for the control of the operating components of the system.

2.5.1.6.1 Flare Controls

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 a Programmable Logic Controller (PLC) via monitoring of the thermocouples and UV scanners.

2.5.1.6.2 Blower Controls

Blower controls for two (2) blowers. Blower controls shall include ITE Type ETI, or as approved by the ENGINEER as equal motor circuit protectors, variable frequency drives, 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.

The blower controls shall provide for one or both blowers operation through a selector switch (Blower 1, Blower 2). During automatic startup of more than one blower, a time delay will prevent multiple blowers from starting simultaneously.

2.5.1.7 Weather Shield

A weather/heat shield shall be provided to protect the control panel against radiated heat (solar and/or flare) and rain. The control system shall be designed and manufactured as an outdoor system.

2.5.1.8 Safeties

The system shall be equipped with the following safeties as a minimum:

- Blower motor overcurrent shall cause system shutdown.
- Blower motor undercurrent (surge) shall cause system shutdown.
- Flame failure shall cause system shutdown.
- High temperature shutdown.
- Low temperature shutdown.
- High temperature flashback shutdown.
- High blower bearing temperature shutdown.
- High liquid level in knock-out pot shutdown.
- Inlet valve failure.
- Low methane content shutdown.

2.5.1.9 Control Panel Face-Mounted Devices

The system shall be equipped with the following control panel face-mounted devices as a minimum:

- Alarm and shutdown indicating lights.
- Blower motor current meter.
- LFG and supplemental fuel flowmeters.
- Hand/off/auto switches for the blowers.
- Hand/off/auto switches for the flare.
- Run indicators for the blower.
- Total elapsed run time for each blower.
- Flame failure indicator for the flare.
- Automatic shut-off valve failure indication.
- Inlet Valve Failure Indication.
- Safety Shutoff Switch.
- Blower Bearing Temperature Gauges.
- Supplemental Gas Flow Indication.
- Digital data recorder.

2.5.2 Auxiliary Equipment

2.5.2.1 Local Alarm Light.

Local alarm light shall be provided.

2.5.2.2 Auxiliary Lighting

Auxiliary lighting shall be provided via photocell-activated light mounted to the flare/blower control panel rack and a second light in the vicinity of the blowers.

2.5.2.3 Receptacles

Two outdoor receptacles (120V) with ground fault protection shall be provided at the flare/blower control panel rack.

2.5.3 Pushbutton/Selector Switches, Control Units, And Panel Lights

2.5.3.1 Manufacturers:

- Allen Bradley
- Cutler-Hammer
- Square D
- Or equal

2.5.3.2 Construction:

- Heavy duty
- Oiltight
- Base mounted or
- Flush panel mounted

2.5.3.3 Pushbuttons:

- Flush head unless otherwise specified elsewhere.
- Control blocks:
    - Double break silver contacts
    - AC ratings: 7200 make, 720 break
    - Single-pole-double-throw or double-pole-double-throw
    - Up to six (6) tandem blocks
- Maintained contact unless otherwise specified elsewhere.
- Non-illuminated.
- Legend plates as required for type of operation or as specified elsewhere.

2.5.3.4 Selector Switches

- Maintained position unless otherwise specified elsewhere.
- Contact blocks:
  - Double break silver contacts
  - AC ratings: 7200 make, 720 break
  - Single-pole-double-throw or double-pole, single-throw
  - Up to six (6) tandem blocks
- Operators:
  - Number of positions as required or specified elsewhere
  - Standard knob type of operation unless otherwise specified elsewhere

2.5.3.5 Panel Lights

- Transformer type
- LED
- Colored lenses as specified elsewhere
- Interchangeable lenses
- Legend plates as required or as specified elsewhere
- Press-to-test feature.

2.5.3.6 Nameplates:

- Engraved laminated plastic
- Letters 3/16-inch high
- White letters on black background
- Identity per equipment controlled

2.5.4 Power Supplies

- 120 VAC 60 HZ power input
- Integral PI filter
- On/off circuit breaker
- 0.2% load regulation
- Short-circuit limit protection
- Crowbar overvoltage protection

2.5.5 Control Relays

- Manufacturers:
  - Potter and Brumfield
  - IDEC
  - Or equal

- Operating Data:
  - Pickup time: 13 ms maximum
  - Dropout time: 10 ms maximum
  - Operating Temperature: -45 deg to 70 deg C
- Contacts:
  - Gold flashed fine silver, gold diffused
  - Form C
  - 110 VAC
  - Minimum 2 amp rating
- Rated at 10 million operations.
- Plug-in sockets.

2.6 IGNITION PROCEDURE

2.6.1 Controls

The pilot and main flame shall be controlled by the PLC, ultraviolet (UV) scanner (optional), thermocouples, solenoids, relays, and timers to perform the following functions:

2.6.1.1 Pilot

Spark ignition of propane gas creates pilot flame that ignites LFG main flame.

2.6.1.2 Activation

When pilot is successfully ignited, blower(s) and actuator valve on flare inlet are activated.

2.6.1.3 Propane Shut-off

When main flame is successfully ignited (as detected by a UV scanner or thermocouple), pilot propane gas is shut off.

2.6.1.4 Pilot Failure

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.

2.6.1.5 Flame Failure to Ignite

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.

2.6.1.6 Flame Failure

If the main flame fails, the blower(s) is turned off, and the inlet valve is closed and alarm sent.

2.6.1.7 Delay

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.

2.6.2 Power Failure

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.

2.6.3 Restarts

The PLC shall be programmed to attempt four (4) restarts before an alarm notification is initiated.

2.6.4 Manual Operation

The PLC shall be programmed to allow only 4 hours/day of flare manual mode operation.

2.6.5 Operator Control

The PLC program shall be written to allow the operator to:

- Select flow and/or vacuum control.
- Select the thermocouple used for temperature control.
- The operator shall have the ability to adjust the set points.
- System shall monitor all points and provide control as required by the OWNER.

2.7 AUXILIARY EQUIPMENT

2.7.1 Gas Mass Flow Meter

2.7.1.1 Meter Operation

The mass flow meter shall consist of a single insertion type probe and remote electronics. The method of operation shall utilize a varying delta T signal with a fixed power source to separate the heating element. The flow meter shall have a digital LCD readout showing instantaneous (SCFM) flow located 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 chart recorder as temperature. The unit shall be pressure and temperature corrected. The gas mass flow meter shall be manufactured by: Eldridge Products, Fluid Components, Thermal Instruments, 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.

2.7.1.2 Digital Data Recorder

The digital data recorder shall continuously record temperature, flow, and knock-out pot inlet vacuum, record of alarms, at a minimum. It will be powered by 24 VDC power from the battery backup and have math and USB flash drive capabilities and a minimum of 6 input channels. The

digital recorder shall be manufactured by Yokogawa Model DX Advanced DX 1000 or GM-10, installed in the control panel unit.

2.7.1.3 Totalizer

A flow totalizer shall be included in the touch screen control panel.

2.7.2 Gauges

The system shall be equipped with the following gauges as a minimum:

2.7.2.1 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.

2.7.2.1.1 Flame arrester pressure drop indicator

Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

2.7.2.1.2 Moisture separator pressure drop indicator.

Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

2.7.2.1.3 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.

2.7.2.1.4 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.

2.7.2.1.5 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.

2.7.2.2 Blower inlet and outlet temperature indicators.

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.

2.8 SPARE PARTS

The Vendor shall provide the following spare parts:

- 20 ounces of LAMSON No. 5 Grease, if Lamson blower is used, or equal.
- One each vacuum, pressure and temperature gauge.
- One shaft coupling.

- Two thermocouples.
- Indicator light package.
- 1 ultraviolet scanner.
- One set fuses/relays.
- Two igniter assemblies.

3.0 EXECUTION

3.1 INSTALLATION

3.1.1 Supplied Items

The manufacturer/supplier shall install the following items on the main skid:

- Blower-Motor Assemblies.
- Moisture Separator Assembly (knock-out pot).
- Piping and fittings.
- Valves.
- Control Panels.

3.1.2 Flame Arrestor

The flame arrester and inlet control valve shall be installed on the flare inlet pipe, supported by the candlestick flare skid and pipe support.

3.1.3 Manufacturer's Recommendations

All equipment shall be installed in strict accordance with the manufacturer's recommendations and codes and standards.

3.1.4 Piping

All skid-mounted equipment shall be installed plumb and perpendicular to piping.

3.1.5 Surface Defects

Marred or abraded surfaces of equipment shall be cleaned and refinished to match original finish.

3.1.6 Electrical Work

The CONTRACTOR shall coordinate the electrical work with the equipment manufacturer and panel fabricator to provide a complete, integrated, and automatic system.

3.2 START-UP AND TESTING

3.2.1 Factory Test

The controls for the landfill gas blower/flare system shall be tested at the supplier's plant before shipment. Complete test reports shall be provided to the ENGINEER which show that all system controls operated correctly prior to shipment.

3.2.2 Factory Representative

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.

3.2.3 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.

3.3 DEMONSTRATIONS

3.3.1 Separation

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.

3.3.2 Test

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:

- That the system has been properly installed and all parts are in correct alignment.
- That the system performs satisfactorily during continuous operation for at least 3 consecutive days.
- That there are no mechanical or electrical defects in any of the parts.
- That the controls perform satisfactorily, including automatic starting and stopping, manual operation, safety shutdowns, autodialer operation, and under all alarm conditions.

Equipment is not considered ready for use by the owner until testing is complete.

3.4 CLEANING

3.4.1 Surfaces

The CONTRACTOR shall clean exposed surface of all greases, dirt, and other foreign materials.

3.4.2 Surface Defects

The CONTRACTOR shall touch up all marred or abraded surfaces as specified herein.

3.5 SAFETY

The blower, flare, and associated equipment shall be designed and constructed to comply with applicable safety standards.

END OF SECTION 44 11 20

Appendix E

Pre-Bid Meeting Minutes

PRE-BID MEETING MINUTES

Stage II LFGCCS Expansion
Bristol, VA - Integrated Solid Waste Management Facility

ITB# SW-25-002

Wednesday March 12th, 2025
1:00 p.m.

PROJECT: Stage II Landfill Gas Collection and Control System Expansion

OWNER: City of Bristol
2655 Valley Drive
Bristol, VA 24201
Laura Socia, Director – Solid Waste
276-285-2142, (office)

ENGINEER: SCS Engineers
Midlothian, VA 23113
804-378-7440 (office)
Brandon King (bking@scsengineers.com)
Thomas Williams (twilliams@scsengineers.com)

LANDFILL CONTACT: Mike Martin, Administrator Manager
276-645-7380

I. INTRODUCTION

A. **Sign-In Sheet** (emails will be used for Addendum distribution)
B. Key Personnel Introductions
C. Review of Project Scope of Work and Objectives

II. Summary of Work

A. Mobilization, H&S plan, ESC controls as needed
    a. The City emphasized the importance of maintaining safety and environmental compliance during the work.
    b. The Contractor must prepare and submit a site-specific health and safety plan and an environmental protection plan.
B. Clearing, Grubbing, Stripping
C. Construction of the new quarry access road
    a. A borrow area is available on-site, it's located south of the scalehouse.

D. Installation of new landfill gas piping, including air/FM/header; valves, connections, etc,
    a. Contractor responsible for surveying installed features
E. New force main cleanouts, air release valves, ball valves
F. Installation of two new condensate sumps
G. New Landfill Gas Blower/Flare Station
H. New Backup Generator System and electrical runs
    a. The City is coordinating with BVU Authority to extend new overhead electrical service near the proposed generator location
    b. It was clarified that the BVU Authority is considering two different routes for the new overhead electrical service

III. Bidding Requirements

A. Due Date and Location: April 17th, 2:00 PM, Procurement Department
B. Bid Form
C. Required documents include bid security, list of proposed subcontractors, list of proposed suppliers, contractor's license number, evidence of authority to do business in Virginia, bidder qualification statement with supporting data
D. Bid Guarantee Bond (5%)
E. Electronic Data. CAD Files are available upon request.
F. Bid Opening/Award
G. Questions are to be submitted by Monday, March 31st, 2025

IV. Contract Administration

I. Schedule of Work
    a. Substantial Completion: 330 days; Final Completion: 365 days
    b. Completion dates based on Issuance of Notice to Proceed
J. Bond Requirements – See Terms and Conditions
K. Retainage – 5%
L. Liquidated Damages – See Terms and Conditions
M. Weather Delays – See Terms and Conditions for schedule of expected weather delays per month. Delays beyond the expected number must be documented.
N. CQC Services – Various testing requirements

V. Issues Regarding Working at the Site

A. Coordination with Landfill Operations
B. Site Access; Normal Working Hours are M-F 7am—6pm, excluding holidays
    a. Weekend hours may be discussed with the City if there is a scheduling need
C. Available Utilities
D. Location of Contractor's Facilities and Material Storage
E. Health & Safety

F. Waste Transport (No active landfill available on-site)
    a. 12” Intermediate Cover soil required over waste by end-of-day
    b. The City may assist the Contractor by providing transport with the waste, the details should be arranged with the City
G. Restoration
H. Soil Availability
    a. An on-site borrow area is available to the south of the scalehouse.

VI. Questions and Clarifications

A. Questions Received to Date
    a. The dates of substantial and final completion will be based on the issue date of the notice to proceed
    b. The Electronic submission is optional per the new Virginia law for procurement. However, it is required that the bidder physically submits all documentation per the Invitation to Bid (00 11 16). The physical submission must be received by the bid due date to be considered responsive.

Appendix F

Pre-Bid Sign-in Sheet

PRE-BID MEETING SIGN-IN SHEET

Stage II LFGCCS Expansion
City of Bristol, VA

ITB# SW-25-002

Wednesday March 12th, 2025
1:00 p.m.

Contractor Name, Name of employees on-site, and Emails

Contractor Name: ADVANCE ONE

Employees on Site: TYLER HELTON, WILLIS ELLIS

Emails: TYLER.HELTON@LANDFILLGROUP.COM WILLIS.ELLIS@LANDFILLGROUP.COM

Contractor Name: HARNDEN GROUP

Employees on Site: BRENT GALLAGHER

Emails: bgallagher@harndengroup.com

Contractor Name: JESSE KOCH / MARCEL BOUCHER

Employees on Site: MC 3 SOLUTIONS

Emails: JKOCH@MC3SOLUTIONSVA.COM

Contractor Name: SCS FIELD SERVICES

Employees on Site: LOGAN CULHANE

Emails: LCULHANE@SCSENGINEERS.COM