ENVIRONMENTAL PARTNERS INC
1180 NW Maple Street, Suite 310 Issaquah, Washington 98027 ph 425.395.0010

February 9, 2015

Mr. Robert Koster
Washington State Department of Ecology - Air Quality Program
Eastern Regional Office
4601 North Monroe Street
Spokane, Washington 99205

Re: Notification of RTO Minor Design Modification
Pasco Sanitary Landfill
1901 Dietrich Road
Pasco, Washington 99301

EPI Project Number: 03913.5

Dear Mr. Koster,

As requested in your recent communications with Landau and Associates, Mr. Mark Brunner, this letter is being presented in support of the Preliminary Determination (PD) for the Pasco Sanitary Landfill, and formalizes our update to Ecology of a recent minor modification to the proposed Regenerative Thermal Oxidizer (RTO) selected for the Site.

As discussed, the overall proposed dilution airflow into the RTO will be increased from 1,000 SCFM to 1,300 SCFM. This change represents a factor of safety in response to the maximum potential condensate feed rate of 12 gallons/hour compared to the previously assumed 7 gallons/hour. This increase in dilution airflow increases the overall treatment capacity of the RTO from 2,000 SCFM to 2,300 SCFM. This change does not increase the maximum flow of soil vapor routed to the RTO, which is determined by the SVE system, and therefore the estimated TAP emissions do not change. Due to the increase in total flow rate and resultant exit velocity of the stack gas, this modification would result in slightly greater dispersion of TAP emissions and slightly lower modeled TAP concentrations, therefore the worst-case modeling evaluation provided previously remains valid and is still conservative. Subsequently, no changes are needed to the worst-case air quality impacts evaluation presented in the NOC application and Tier 2 HIA.

In order to maintain consistency throughout the permit, we would like to request the following changes to the PD:

Page 1, first paragraph: Revise equipment capacity to 2,300 SCFM

Page 2, Approval Condition 1.c: Revise to indicate the maximum volume of dilution air delivered to the RTO shall not exceed 1,300 SCFM.

Please let me know if you have any questions about the design modification outlined herein. Attached you will find an updated Technical Proposal from the RTO vendor, Gulf Coast Environmental (GCE), which reflects the change to 2,300 SCFM.

Also, please let us know if this letter provides sufficient documentation of the design modification for your records or if you would also like to receive this information in a hard copy letter to Ecology.

Sincerely,

Thomas C. Morin, L.G.
President / Principal Geologist

ENCLOSURE:

Attachment A GCE Technical Proposal; 800-12 Rev.4 Technical

Gulf Coast Environmental Systems LLC
1689 Hawthorne Drive
Conroe, TX 77301
Phone: 832.476.9024
Fax: 855.301.9672

Date:	January 7, 2015
Proposal No:	800-12 Rev. 5a Technical
Proposal For:	**Environmental Partners, Inc.** 1180 NW Maple Street, Ste. 310 Issaquah, WA 98027 U.S.A. Attn: Mr. Adam Morine of Environmental Partners, Inc.
Phone:	+1 (425) 395-0028; +1 (425) 677-5727 (cell)
Fax:	
Email:	adamm@epi-wa.com
Proposed Equipment:	2,300 SCFM 2-Canister Regenerative Thermal Oxidizer (RTO) with Condensate Treatment – For the Pasco Sanitary Landfill Site in Pasco, WA

Gulf Coast Environmental Systems (GCES) is comprised of executives, engineers, and service technicians worldwide with many years of experience to service the air pollution control and industrial oven market. Through our extensive knowledge of the various technologies and design of air processing equipment, we are able to offer full service oven and abatement solutions for your plant.

This proposal details the supply of one (1) 2,300 SCFM Regenerative Thermal Oxidizer (RTO) System designed to treat the Volatile Organic Compounds (VOCs) emissions from the Landfill Site. The unit shall process up to 1,000 SCFM (future volume; 600 SCFM current) of vent gas and up to 12 gallons/hour of condensate as described in this proposal and the RFI provided by Anchor Qea. The additional 1,300 SCFM of capacity is to allow operation of the equipment well below 50% of the Lower Flammability Limit (LFL) and provide flexibility in controlling the potential maximum heat release from processing up to 1,500 lbs per 24-hour day of VOCs.

With this technology and application, auxiliary fuel use for maintaining heat in the unit shall be minimal at a wide range of operating parameters.

It is understood, that average VOC loading shall be much lower than the designed maximum conditions. The proposed system shall provide seamless turndown capability to handle fluctuations in the heat release loading.

In consideration of the site producing vapor for many years and containing the stated concentrations of chlorinated hydrocarbons, GCES has quote the base equipment out of higher grade materials of construction at process contact points that may be exposed to highly corrosive by-products.

GCES prides itself on providing heavy-duty long-life, reliable, and efficient equipment. By having control of schedule and quality in our own manufacturing facility, GCES is considered one of the industry leaders in providing the best value equipment. This is validated with an industry-leading 2 year limited warranty in material and workmanship for all equipment manufactured by GCES. Expected life of the equipment with proper care and maintenance is 25 years or more (less corrosion).

The product quoted conforms to GCES specification standards. Adaptation to customer specifications shall be evaluated if provided.

Please do not hesitate to contact us with any questions and we look forward to this opportunity to work with you.

Sincerely,

Chad Clark
Gulf Coast Environmental Systems
cclark@gcesystems.com

Gulf Coast Environmental offers durable equipment for a wide range of applications.
Thank You for Considering Gulf Coast Environmental.

A Word about BACT (Best Available Control Technology) and NOx.

Gulf Coast Environmental Systems (GCES) provides low NO_x rated burners and controls for each application. NO_x emissions will vary based on the burner load required to maintain combustion temperature and the amount of heat release available from the process air. NO_x emissions from an idle unit or a unit in startup mode may vary from a unit processing plant air based on the makeup of the process stream and the compounds being abated. Please advise GCES if there are any specific NO_x limits that are necessary to achieve.

Uptime and Reliability.

Gulf Coast Environmental Systems units have been operating in some of the most challenging environments. The vast majority of units installed by GCES operate 24 hours a day, 7 days a week in production facilities across the world. Our systems consistently perform at greater than 99% uptime in rendering facilities, chemical mixing plants, petrochemical facilities and other harsh process environments. GCES stands by its equipment and backs it up with a strong guaranty and a knowledgeable service department that is available 24 hours a day.

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SECTION 2: EXECUTIVE SUMMARY

2.1 THEORY OF OPERATION

Regenerative Thermal Oxidizer (RTO)

The method of reduction of Volatile Organic Compounds in a Regenerative Thermal Oxidizer revolves around thermal oxidation. The chemical process of thermal oxidation is quite simple; the exhaust stream temperature is raised to a point that the chemical bonds that hold the volatile organic molecules together are broken. The VOCs in the process exhaust stream are converted to carbon dioxide, H_2O, and thermal energy by the high temperature of the combustion chamber.

The process of regenerative thermal oxidation operates around two energy recovery canisters in use on the system, which are the housings for the ceramic heat recovery media. The ceramic heat recovery media acts as a heat exchanger for the system. The two canisters operate under a “swing bed” absorption principle: which is the principle of transfer through two beds by the use of flow reversal. In the use of this principle with ceramic stoneware, the process is called regeneration.

As the dirty exhaust stream travels through the first bed of ceramic media, the exhaust stream adsorbs the heat energy stored in the ceramic media mass, which pre-heats the exhaust stream. The exhaust stream then enters the burner reactor chamber, where heat energy is added from the burner to reach the system operating temperature. After the temperature has been elevated and retained, the clean exhaust stream then passes through the second energy recovery canister. As the exhaust stream passes through the canister, the cold ceramic media mass absorbs the heat energy of the exhaust stream, and stores the heat energy for the reverse flow of the system. Once the heat energy of the first canister has been depleted through the absorption of the incoming air stream, the flow through the system is rotated, so the incoming dirty air stream is then directed through the previous absorption canister, with the clean waste gas now going through the previous canister. In a unit with three canisters, the same principle applies, but there are now three different cycles available. The canister not part of a cycle is used for purging the RTO. This allows for a greater achievable destruction efficiency of the VOCs.

By using the reversal of exhaust flow through the ceramic beds, a minimal amount of heat energy needs to be added to the incoming exhaust stream to maintain the systems minimum operating temperature. The sizing of the ceramic media beds is such that a maximum of 95% heat recovery efficiency is possible through the regenerating, reversal flow process.

2.2 PROPOSAL OVERVIEW

The proposal details the supply of one (1) 2,300 SCFM Two-Canister RTO. The entire system shall be capable of processing up to 1,000 SCFM of process vapor, 12 gallons/hour of condensate, and 1,300 SCFM of dilution air. The dilution air source shall be fresh ambient air and be provided by others through the fresh air fan supplied by GCES. The following is a summary of the scope of supply for our offering:

- One (1) Two-Canister RTO with 98% or less than 20 ppm_v Destruction Removal Efficiency (DRE) of the VOCs (to H_2O & CO_2)
- One (1) System Dilution Air Fan and Motor
- Two (2) Heat Exchanger Canisters designed for 92% heat recovery with structured and saddle ceramic heat recovery media – carbon steel with internal zinc coating
- One (1) Combustion Chamber section – carbon steel with internal zinc coating
- One (1) Natural Gas Fired Burner for the RTO combustion chamber
- One (1) Combustion Air Fan and Motor with Air Filter
- One (1) Fuel Train designed per NFPA regulations
- One (1) Flow Directional Damper – Alloy C276
- One (1) Inlet Duct Manifold – 316 SS
- One (1) Outlet Duct Manifold – Alloy C276
- One (1) Process Isolation Damper / Fresh Air Damper Assembly
- One (1) Cold-Side Bypass System – 316 SS
- One (1) Exhaust Stack – 20’ discharge height above grade – Alloy C276
- One (1) Control Panel – Outdoor Rated: Mounted at the RTO Unit
- One (1) Aqueous Injection System for condensate (pump by others)
- One (1) Compressed Air Reservoir Tank
- One (1) Lot Factory Mounting, Pre-Piping, and Pre-Wiring to the greatest extent possible for shipping
- One (1) Lot Installation, Installation Supervision, & Commissioning Services
- Approximate Equipment Footprint: 11’L x 13’W
- Approximate Equipment Dry Weight: 25,000 lbs

SECTION 3: DESIGN CONSIDERATIONS

3.1 Process Data – Supplied by Customer

- APPLICATION STREAM: SVE Off-Gas and Condensate
- PROCESS VAPOR STREAM VOLUME: Up to 1,000 SCFM @ up to 225°F
- CONDENSATE VOLUME: Up to 12 gallons per hour or up to 0.2 gallons per minute maximum
- MAXIMUM DILUTION VOLUME: Up to 1,300 SCFM @ 70°F
- MAXIMUM VOC LOADING & TYPE: 1,710,000 btu/hr release value or 28,500 btu/min

Max. Process Composition Includes Condensate	Vol %	SCFM or LB/HR
Nitrogen	64.30	666
Oxygen	17.16	178
Water	17.15	177
Non-Corrosive VOCs Acetone, 2-Butanone, Ethanol, Ethylbenzene, Methyl Isobutyl Ketone, Toluene, Xylene	1.38	130.7 lbs/hr
Corrosive Chlorinated VOCs Methylene Chloride, Trichloroethene	0.01	2.5 lbs/hr
**Corrosive CFC VOCs* Trichlorofluoromethane (CFC-11), Dichlorodifluoromethane (CFC-12)	Neg.	0.15 lbs/hr

The process stream composition is limited to the constituents in the above table. The VOCs are assumed to not include any additional halogenated, corrosive, or silicate forming compounds.***

*A higher combustion temperature is required for good conversion of CFCs. Therefore, a CFC destruction efficiency of 98% is not guaranteed under this equipment offering. In addition, the formation of HF from the CFCs results in the attack of silica (insulation, ceramic media). Due to the potential for very low concentrations, this may not be a concern, but with the unknown presence over time of the entering CFCs, expedited degradation of the silica components of the proposed system could occur.

The assumed HCl formation is 200 ppm_v (worst case).

- PROCESS STREAM PRESSURE: 25”-100” w.c. (at iso. damper)
  [Will stabilize to system pressure drop]
- VOLUMETRIC TURNDOWN RATIO: ~4:1
- SITE LOCATION ELEVATION: <400’ above sea level (ASL)
- RTO EXPECTED OPERATING TEMP: 1,600°F or 871°C
- RTO POTENTIAL MAXIMUM TEMP: 1,800°F or 980°C
- MEDIA HEAT EXCHANGER EFFICIENCY: 92%
- DESTRUCTION REMOVAL EFFICIENCY: 98% or less than 20 ppm_v
  (not including CFCs)
- OXIDIZER LOCATION/CLASSIFICATION: Outdoors / Controls Outdoors
  Standard Classification
  (General Purpose)
- NATURAL GAS REQUIREMENT (Start-up): 750 SCFH @ 10 psig
  LHV = ~1,000 btu/cu. ft.
- NATURAL GAS USAGE (Operation): <75 SCFH @ 10 psig
  At full volume and VOC release
- ELECTRICAL SUPPLY VOLTAGE: 480V / 60Hz / 3 Phase
- COMPRESSED AIR USAGE: 5 CFM peak – 2 CFM average
  Instrument Air Requirements: 80 psig @ -40°F dewpoint (clean)

SECTION 4: EQUIPMENT SPECIFICATIONS

This proposal is based on preliminary engineering intended to achieve the performance goals. GCES reserves the right to alter component selections during engineering.

4.1 System Dilution Fan

The system dilution fan is sized and supplied for pushing fresh ambient air through the Oxidizer System. The fan allows for a *neutral (0)* pressure of 0" w.c. at the inlet during normal operation. The fan shall be placed on the customer supplied pad.

The dilution fan is complete with an expected 10 horsepower energy efficient motor. The fan housing is fabricated of continuously welded heavy gauge carbon steel. The fan shall be supplied with heavy-duty roller bearings with grease fittings, OSHA approved belt / bearing and shaft guards, shaft seals, and an access door for fan maintenance, where applicable.

Volume control of the dilution air shall be controlled by the temperature inside the RTO combustion chamber. The fresh air damper (section 4.8) shall modulate to control the volume.

Fan Manufacturer	**New York Blower or equal**
Expected Motor Size	**10 HP**
Motor Type	**TEFC Premium Efficiency – Inverter Duty**
Fan Materials of Construction	**Carbon Steel Housing** **Base & Pedestal shall be Carbon Steel**
Differential Safety Pressure Switch	**Dwyer 1950 Series or equal**
Some Additional Fan Options Included	**Access Door and Drain** **Punched Inlet & Outlet Flanges**

4.2 Energy Recovery Canisters

The purpose of the energy recovery canisters in the RTO system are to house the heat recovery media used during the regeneration cycles of the system. The canisters are insulated with ceramic fiber block materials to insure the outer skin temperature is below 70°F (21°C) above ambient based upon an outdoor installation with a 5 mph (8 km/hr) wind and no sun or external heat load.

Each of the canisters shall be sized to handle the maximum anticipated airflow of the process and designed based upon the required thermal efficiency, pressure drop, and physical size requirements. The support structure for the ceramic media shall be made from alloy C276 in order to insure structural stability during high temperature operation and maintain corrosion resistance.

Total Capacity each Canister	**2,300 SCFM**
Maximum Inlet Temperature	**225°F**
Number Of Energy Recovery Canisters	**2**
Approx. Internal Canister Size	**2' x 3'**
Canister Shell Material	**Carbon Steel with Internal Zinc Coating**
Insulation Material	**Ceramic Fiber Modules**
Media Support	**Alloy C276 Material**

4.3 Ceramic Heat Exchange Media

The heat exchange media shall consist of a chemically resistant structured and saddle ceramic media. The quantity of media and bed configuration shall be as such to reach 92% thermal recovery efficiency at the maximum design flow conditions.

Type	**Structured and Saddle Media**
Efficiency of Media	**92%**
Approx. Bed Depth per Canister	**5.0'**
Approx. Media Volume	**each canister 30 ft^3** **total 60 ft^3**

4.4 Combustion Chamber

The combustion chamber serves two purposes within the system. Purpose #1 is to input the required heat energy to bring the pre-heated air exiting the energy recovery bed up to the required operating temperature with the burner firing into the chamber. Purpose #2 is to retain the process stream at the operating temperature for the required elevated temperature in order to achieve the desired destruction efficiency – this is typically called the residence time.

Design Operating Temperature Expected Operating Potential Maximum	 **1,600°F or 871°C** **1,800°F or 980°C**
Minimum Destruction Removal Efficiency	**98% or less than 20 ppm_v Excluding CFCs**
Shell Material	**Carbon Steel with Internal Zinc Coating**
Insulation Material	**Ceramic Fiber Modules**
Temperature Elements	**Duplex Type "K" Thermocouples**
Access Door(s)	**Internally Insulated Davit-Assisted**

4.5 Burner & Combustion Air

The purpose of the burner on the RTO is to input the heat energy required to raise the heat exchange media outlet temperature to the required combustion chamber operating temperature.

One combustion blower shall be used on the application for the combustion chamber burner. The combustion air blower shall feed the required air volume to the burner and shall be provided with an inlet filter and a damper to control volume.

Burner Manufacturer	**Eclipse or equal**
Number Of Burners	**1**
Approx. Rated Capacity of each burner	**0.75 mm Btu/hr**
Combustion Air Blower	**New York Blower or equal**
Number of Combustion Air Blowers	**1**
Approx. Combustion Air Volume of Each Blower	**160 SCFM**

4.6 Fuel Train

The fuel train consists of a main gas line that safely delivers natural gas to the combustion chamber burner. One main line shall be used to feed the burner.

The fuel train shall be designed as per NFPA standards.

Manual Shut-off Cocks	**Apollo or equal**
Y-Strainer	**Mueller or equal**
Pressure Regulator	**Sensus or equal**
Low and High Gas Pressure Switches	**Karl Dungs or equal**
Fuel Gas Shut-off Valves with limit switches	**Siemens or equal**
Pressure Gauges	**Mil Jocco or equal**

4.7 Damper System

The purpose of the flow control damper is to direct the process stream movement into and out of the energy recovery canisters for the process of regeneration.

The damper shall be designed to handle maximum designed exhaust temperatures experienced during high temperature operation. The seal on the system shall be primary metal to metal seat with a secondary tadpole gasket for minimal leakage across the valves.

The inlet and outlet manifolds shall be a flanged connection.

Damper Type	**Rotary**
Damper Number	**One (1)**
Damper Material of Construction	
Approx. Size	**18” diameter**
Housing	**Alloy C276**
Blade	**Alloy C276**
Shaft	**Alloy C276**
Actuator Type	**Pneumatic**
Actuator Manufacturer	**SMC or equal**
Directional Valve Manufacturer	**SMC or equal**
Inlet and Outlet Manifolds	
Approx. Size	**10” x 20”**
Material	**Inlet: 316 SS; Outlet: Alloy C276**

4.8 Process Isolation Damper / Fresh Air Damper

The purpose of the process isolation damper is to isolate the RTO system from the process stream. It shall be on / off actuation.

The fresh air damper shall allow ambient air to purge the oxidizer system during a system start-up and allow fresh air introduction during vapor processing. The fresh air damper shall modulate based on the fresh air demand and be located on the discharge of the dilution air fan.

Damper Type	**Butterfly**
Damper Process Material of Construction	**Isolation: 316 Stainless Steel** **Fresh Air: Carbon Steel**
Actuator Type	**Pneumatic**
Actuator Manufacturer	**Max-Air or equal**
Directional Valve Manufacturer	**Max-Air or equal**
Positioner Manufacturer	**Max-Air or equal**

4.9 Cold-Side Bypass

Due to the potentially high hydrocarbon loading, a “cold-side” bypass system shall be included with the RTO to control the VOC oxidation temperature. A cold-side bypass damper shall be provided for automatic temperature control. The bypass damper shall modulate to divert the required portion of the incoming process gas around the heat exchange media to control the excess energy released by the VOC oxidation. The bypass shall allow the system to operate during periods of high VOC loading without high temperature shut-downs.

The bypass shall consist of a duct, modulating damper, and pneumatic actuator with positioner for control. The damper shall modulate via a PID controller to allow only the required amount of air to bypass the exchanger as required to control the pre-heat temperature.

As the temperature in the combustion chamber rises due to an increase in the VOC load, the damper shall open proportionally to bypass the pre-heat side of the heat exchange media by sending the process directly to the combustion chamber.

Damper Type	**Butterfly**
Damper Material of Construction Material	**316 Stainless Steel**
Actuator Type	**Pneumatic**
Actuator Manufacturer	**Max-Air or equal**
Modulating Positioner Manufacturer	**Max-Air or equal**

4.10 Exhaust Stack

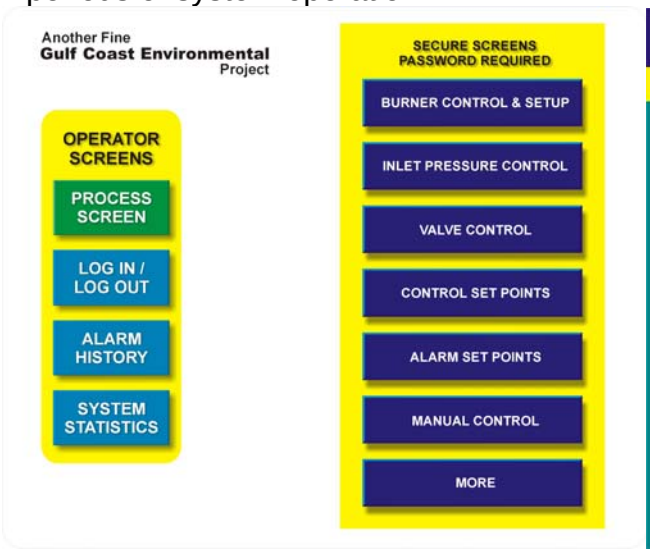
An exhaust stack shall be provided with the equipment to direct the clean air volume to atmosphere. The stack shall be shipped loose from the equipment and will require mounting and support at the installation site. The stack is currently designed and quoted to discharge at a height of 20' above grade and be constructed out of alloy C276. Two (2) 3” diameter test ports shall also be provided.

An exhaust stack ladder and platform has NOT been included.

4.11 System Controls / Safety Equipment

GCES designs, assembles, and manufactures a fully automatic control system for the abatement system. The control system shall consist of a GCES designed "SCS" (Safety Control System). The SCS system is manufactured and custom tailored per the National Electric Code and UL508A standards.

The SCS shall be a fully automated push button operation for the sequence of operation. The single button start/stop design has been utilized for ease of use and to eliminate the possibility of costly operator error. The SCS has been designed to provide a self-checking safety control and monitoring system that is user-friendly during all periods of system operation.



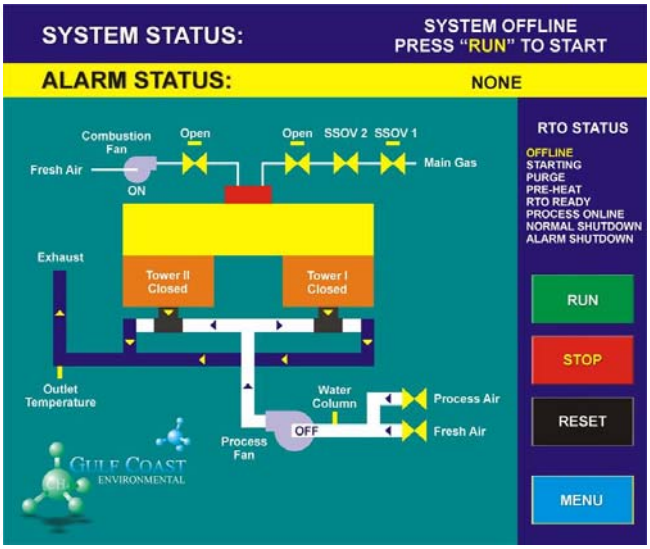


DIAGRAM IS A SAMPLE ONLY: ACTUAL MAY VARY.

The system shall incorporate displays and graphics for operational status and fault / troubleshooting messages. The fault indicator shall display messages defining the reason for any system or control shutdown. The messages minimize any time needed to correct operation of a faulty condition; minimizing time spent troubleshooting faults and maximizing the process run time.

Control Panel Type	**NEMA 4X (Stainless Steel) – Outdoor Rated With A/C**
Operator Interface	**AUD EZTouch**
Control Panel Standard	**UL508a**
Programmable Logic Controller	**Allen Bradley MicroLogix or equal**
Burner Management System	**Eclipse or equal**
Flame Safety Type	**Flame Rod**
Voltage Main Control	**480 VAC / 3 phase / 60 Hz** **120 VAC / 1 phase / 60 Hz (via trans. by GCES)**

4.12 Aqueous Injection System

An aqueous injection system shall be supplied with the system to provide the condensate for treatment. The condensation injection piping shall be made from stainless steel and include a solenoid valve for each heat recovery canister that shall alternate with each process inlet recovery canister.

The condensate pump provided by others shall have the ability to briefly (less than 10 seconds under normal operation) recirculate the water through the use of bypass solenoid valve provided by GCES with the aqueous injection system.

SECTION 5: DOCUMENTATION, SERVICES, & EXCLUSIONS

5.1 Surface Painting & Preparation

All carbon steel, which is not galvanized or aluminized, shall be treated and painted in GCES's standard color. Stainless steel, plastic, and other finishes shall not be painted. Purchased components will be coated per the OEM paint standard system and color.

5.2 Factory Acceptance Testing

GCE Systems shall assemble the system in the factory to the greatest extent reasonable. A full quality assurance testing of the control panel shall be performed before shipment of the equipment. Safeties, controls, and components shall be verified through operation as functionally correct and calibrated. The customer is always welcome and recommended to visit during the shop testing of the control panel.

5.3 Standards & Codes

Equipment manufactured by GCE Systems complies with the U.S. applicable sections of the Occupational Safety and Health Act (OSHA), National Fire Protection Association (NFPA), National Electric Code (NEC) and National Electric Mfg. Association (NEMA).

5.4 Operations & Maintenance Manuals

GCE Systems shall supply a complete **electronic** copy of the operations and maintenance manual for the equipment. The manual shall be supplied during the startup of the equipment. The manual shall have all of the necessary documentation for the operation and maintenance of the equipment. Written instructions, general arrangement drawings, equipment drawings, process flow diagrams, electrical schematics, and the components original OEM information shall be provided.

5.5 Installation, Start-Up, & Training Services

GCE Systems shall supply a factory trained field service crew for the installation, startup, and confirmation of proper equipment operation and for validation of the warranty. Training will commence immediately after the final checkout of the equipment. The allotted period for the crew is expected to be a continuous 10 business days.