3. Design Guides

A. *100 S Commander Controls*

B. *200 S Commander Controls*

C. *Custom Built Encapsulated Torpedo Pumps*

ENGINEER'S SPECIFICATION:

Furnish one QED Environmental Systems (QES). Series **100S PLC Commander** controller to operate___HP pump motor and auxiliary equipment in manual or automatic mode.

The control panel enclosure shall be NEMA type ____.

The enclosure shall be equipped with a window in the outer door, an inner door, and a drip shield. The NEMA 4X enclosure can be either stainless steel (Standard) or non-metallic.

The control system will operate from a ____ Volt, 60 Hertz, ____phase, ____ Wire power supply. Pump control components shall be sized to operate a pump motor of specified horsepower.

The control panel shall include the following as standard features:

UL: The control panel shall be constructed in accordance with Underwriter's Laboratories (UL) Standard 508 "Industrial Control Equipment" and UL standard 698A Industrial Control Panels Relating to Hazardous (Classified Locations). The panel shall be shop inspected by UL, or constructed in a UL recognized facility. The panel shall bear a serialized UL label indicating acceptance under Standards 508 and 698A.

100S Commander Pump Controller: The Total Pump Controller (TPC-100S) level controller shall be mounted on the inner door and viewable by the enclosure outer door window. The TPC-100S controller shall have a 4-digit, 13.8mm, 14-segment readout, scrolling help text and the capability to monitor and maintain liquid levels as well as output a high level indication. Level controller shall be accurate to within 0.1 inch.

PT100 Level Transducer: A submersible level transducer PT____ series shall be provided in the sump.
The transducer shall be constructed of 316 SST, and shall be a suspended type; a 4-20 mA signal shall be output to the controller for display and control of sump level.
The pressure transmitter level sensor shall have a range of ____to____ PSI with a 4-20 mA output signal proportional to the required sump level.

IP100 Flow Meter: A paddle wheel type flow meter IP100 series shall be provided in the discharge line; the paddle wheel flow sensor shall be constructed of PVC, and shall be of insertion type, a square wave signal shall be output to the TPC-100S controller for display of flow and total flow.

Main Disconnect Switch: The main disconnect switch shall be UL 98 rated and will prevent opening of the control panel inner doorwhile the power is on, and includes ____ Volt, ____ Amp dual element fuses.

Control Circuit Breaker: A UL 489 type current limiting circuit breaker shall be provided on the control circuit.

H and-Off-Auto Selector Switch: Allows manual or automatic operation of the pump motor. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door and shall be viewable by the enclosure outer door window.

Motor Starter: Provide full voltage non-reversing, circuit breaker combination type with adjustable electronic overload relay.

Wire Markers: Brady type printed wire markers shall be provided on both ends of all conductors to correlate with manufactures drawings.

Terminal Blocks: Provide terminal blocks sized for the wire used for all field terminations, clearly mark all terminal blocks with a typewritten marking system, terminal blocks shall be DIN rail mounted, screw clamp, feed through type with 600 volt minimum rating.

Control Relays: Shall be general purpose type, contacts rated 10 amps at 120 VAC, coil voltage as required, and include indicator lamp.

Control Transformer: A transformer with UL 489 type current limiting circuit breakers on the primary and secondary circuits shall be provided where required. If fuses are used provide 10 of each type used as spare parts.

Run Light: A pump running indicator lamp shall be provided. It shall be heavy duty, LED, oil tight, NEMA 4 rated. The light shall be connected to the motor starter auxiliary contacts and shall be mounted on the inner door and will be green in color and viewable by the enclosure outer door window.

Run Time Meter: A pump run time meter shall be provided and incorporated into the TPC-100S controller. The runtime meter shall be connected to the motor starter auxiliary contacts and shall be mounted on the inner door and viewable by the enclosure outer door window.

Alarm Light: A red 25 watt high intensity alarm beacon shall be provided on top of the enclosure to provide high alarm indication, the lamp shall be replaceable from the inside of the enclosure so not to disrupt water tightness of the light fixture.

Intrinsically Safe Barrier: The level sensor circuit shall be protected byan intrinsically safe barrier.

Heater with Adjustable Thermostat: A heater with adjustable thermostat shall be provided; it shall maintain the minimum temperature required for the operation of the TPC -100S level controller.

Lightning Arrestor: Eaton CHSA type or equal shall be provided.

Pass Along Circuit: A pass along circuit shall be provided to enable a shut down of the pump in the event of a high level alarm at a storage facility.

Breakout Junction Box: An BOB junction box with terminals shall be provided for connections of field devices to the control panel, 1 BOB shall be provided for the pump power connection, and 1 shall be provided for the level transducer and flow meter. A poured seal off shall be installed between the BOB and the control panel to prevent migration of landfill gasses into the control panel.

ENGINEER'S SPECIFICATION:

Furnish one, Series 200S Commander controller to operate a ___HP pump motor and auxiliary equipment in manual or automatic mode.

The control panel enclosure shall be NEMA type _____.

The enclosure shall be equipped with a window in the outer door, an inner door, and a drip shield. The NEMA 4 (standard) enclosure is finished with ANSI 61 gray polyester powder paint. The NEMA 4X (optional) enclosure shall be stainless steel.

The control system will operate from a _____ Volt, 60 Hertz, _____phase , _____ Wire power system. Pump control components shall be sized to operate a pump motor of specified horsepower.

The control panel shall include the following as standard features:

UL: The control panel shall be constructed in accordance with Underwriter's Laboratories (UL) Standard 508 "Industrial Control Equipment" and UL standard 698A Industrial Control Panels Relating to Hazardous (Classified Locations). The panel shall be shop inspected by UL, or constructed in a UL recognized facility. The panel shall bear a serialized UL label indicating acceptance under Standards 508 and 698A.

200S Commander Pump Controller: The Total Pump Control (TPC-200S) level controller shall be a micro processor touch screen based controller mounted on the inner door and viewable by the enclosure outer door window. The TPC - 200S controller shall have a multi line touch screen display for viewing the system control and status, controller shall be field upgradable utilizing a Micro SD removable data memory card, controller shall have a built in configurable memory of 256K and support up to 5000 I/O points. The controller shall support a minimum of 4 high speed counter inputs and 4 analog inputs. Data and control set points shall be entered by a popup numeric keypad, and shall be capable of data logging. The controller shall be field upgradable to a SCADA system utilizing a wireless radio modem, Ethernet, Telephone modem, and cell modem.

PT100 Level Transducer: A submersible level transducer PT _____ series shall be provided in the sump. The transducer shall be constructed of 316 SST, and shall be a suspended type; a 4 20 mA signal shall be output to the controller for display and control of sump level.
The pressure transmitter level sensor shall have a range of_____to ____ PSI with a 4-20 mA output signal proportional to the required sump level

I P100 Flow Meter: A paddle wheel type flow meter IP100 seriess hall be provided in the discharge line; the paddle wheel flow sensor shall be constructed of PVC , and shall be of the insertion type, a square wave signal shall be output to the TPC -200S controller for display of flow and total flow.

Main Disconnect Switch: The main disconnect switch shall be UL 98 rated and will prevent opening of the control panel inner door while the power is on, and includes _____ Volt, _____ Amp dual element fuses.

Control Circuit Breaker: A UL 489 type current limiting circuit breaker shall be provided on the control circuit.

Hand-Off-Auto Selector Switch: Allows manual or automatic operation of the pump motor. The selector switch shall be a heavy duty, oil tight, NEMA 4 rated switch mounted on the inner door and shall be viewable by the enclosure outer door window

Moto Starter: Provide full voltage NEMA rated, circuit breaker combination type with adjustable quick trip overload

Wire Markers: Brady type printed wire markers shall be provided on both ends of all conductors to correlate with manufactures drawings

Terminal Blocks: Provide terminal blocks sized for the wire used for all field terminations, clearly mark all terminal blocks with a typewritten marking system, terminal blocks shall be DIN rail mounted, screw clamp, feed through type with 600 voltminimum rating.

Control Relays: Shall be general purpose type, contacts rated 10 amps at 120 VAC, coil voltage as required, and include indicator lamp.

Control Transformer: A transformer with UL 489 type current limiting circuit breakers on the primary and secondary circuits shall be provided where required. If fuses are used provide 10 of each type used as spare parts.

Run Light: A pump running indicator lamp shall be provided. It shall be heavy duty, LED, oil tight, NEMA 4 rated The light shall be connected to the motor starter auxiliary contacts and shall be mounted on the inner door and will be green in color and viewable by the enclosure outer door window.

Alarm Light: A red 25 watt high intensity alarm beacon shall be provided on top of the enclosure to provide high alarm indication, the lamp shall be replaceable from the inside of the enclosure so not to disrupt water tightness of the light fixture.

Intrinsically Safe Barrier: The level sensor circuit shall be protected by an intrinsically safe barrier.

Heater with Adjustable Thermostat: A heater with adjustable thermostat shall be provided; it shall maintain the minimum temperature required for the operation of the 100 level controller.

Lightning Arrestor: Eaton CHSA type or equalshall be provided

Pass Along Circuit: A pass along circuit shall be provided to enable a shut down of the pump in the event of a high level alarm at a storage facility.

Breakout Junction Box: An BOB junction box with terminals shall be provided for connections of field devices to the control panel, 1 BOB shall be provided for the pump power connection, and 1 shall be provided for the level transducer and flow meter. A pored seal off shall be installed between the BOB and the control panel to prevent migrationof landfill gasses into the control panel.

SYSTEM LOGIC AND FUNCTION

The controller is designed to start and stop a pump using the TPC -200S level controller with a submersible pressure transmitter. The pump starts at the pump start level set point and continues to run until the liquid level decreases to the pump stop level set point as programmed in the TPC -200S level controller. If the liquid level rises to the high level alarm set point, a high level alarm will be annunciated by the illumination of the external alarm light. A pump status screen shall be provided to display pump lifetime running time in hours, and lifetime pump start count. The pressure transmitter level sensor shall have a range of 0 to 11.5 feet with a 4-20 mA output signal.

Pumps

PART 1 – GENERAL

1.01 SCOPE OF WORK

a. The leachate extraction pumping system(s) outlined in this section shall perform to the design operating requirements within the conditions and dimensions as described and shall be complete and minimally consist of a pump and motor assembly with power cable; control panel and level sensor and cable with gages and meters as required; deployment and retrieval assembly to include pump carriage; discharge pipe assembly; appropriate exit fitting for gas-tight transition through the sump or riser wall and all appropriate fasteners, fittings and accessories necessary for "Turn-Key" operation.

b. System shall be designed for primary, secondary and or leakage detection service. Multiple systems shall ideally be identical and interchangeable and if not identical, will share as many identical, similar and interchangeable components and characteristics as possible.

2.01 QUALITY ASSURANCE

a. Hydraulic Institute Compliance: Design, manufacture, and install pumps in accordance with "Hydraulic Institute Standards."

b. National Electrical Code Compliance: Components shall comply with NFPA 70 "National Electrical Code."

c. UL Compliance: pumps shall be listed and labeled by UL and comply UL Standard 778 "Motor Operated Water Pumps."

d. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with the Sump and Sewage Pump Manufacturers Association (SSPMA) Standards.

e. SingleSource Responsibility: Obtain pumps of the same type from a single manufacturer

f. Pumping manufacturer shall have a MINIMUM of five (5) years experience with their proposed type of pumping system in a landfill leachate application.

g. Design Criteria: The Drawings indicate sizes, profiles, connections, and dimensional requirements of pumps and are based on the specific manufacturer types and models indicated. Pumps having equal performance characteristics by other manufacturers may be considered, provided that deviations in dimensions and profiles do not change the design concept or intended performance as judged by the Engineer. The burden of proof for equality of pumps is on the proposer.

3.01 DELIVERY, STORAGE, AND HANDLING

a. Store pumps in a dry location.

b. Retain shipping flange protective covers and protective coatings during storage.

c. Protect equipment and couplings against damage froms and, grit, and other foreign matter.

d. Comply with manufacturer's rigging instructions for handling.

4.01 MANUFACTURER'S WARRANTY

a. The pump manufacturer shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below.

   i. All equipment, apparatus, and parts furnished shall be warranted for one (1) year, excepting only those items that are normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, o-rings, etc. The pump manufacturer shall be solely responsible for warranty of all pump components.

b. Components failing to perform as specified by the Engineer, or as represented by the manufacturer, or as proven defective in service during warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer.

c. It is not intended that the manufacturer assume liability for consequential damages or contingent liabilities arising from failure of any vendor supplied product or part which fails to properly operate, however caused. Consequential damages resulting from defects in design, or delays in delivery are also beyond the manufacturer's scope of liability.

d. The warranty shall become effective upon acceptance by the purchaser or the purchaser's authorized agent, or sixty (60) days after installation, or ninety (90) days after shipment, whichever occurs first.

PART 2 – PRODUCTS

1.01 MANUFACTURERS

a. The contractor shall furnish and install a complete leachate pumping system as manufactured by:

i. Qed Environmental Systems
2355 Bishop Circle West
Dexter, MI 48130
1-800-624-2026

ii. Any system manufacturer or supplier not specifically named as an approved manufacturer must provide a complete submittal package to the engineer prior to the bid date for pre-approved as an equal system provider. To simplify comparison, the manufacturer seeking approval will provide references and documentation of experience and a thorough technical brief addressing each specifying paragraph as either "no exception taken" (acceptance of both the fact and spirit of the designer's intent) or "exception taken" with arguments for equality to the specification.

b. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include the following:

i. Leach Riser Pumps (Collection & Detection):

1. Collection: QED Environmental Systems Model # _____ rated for _____ GPM @ _____ Total Dynamic Head

a. Motor Horsepower: Motor horsepower shall be a minimum of _____ horsepower, and shall operate on _____ volt, _____ phase, 60 hertz supply power.

2. Detection: QED Environmental Systems Model # _____ rated for _____ GPM @ _____ Total Dynamic Head

a. Motor Horsepower: Motor horsepower shall be a minimum of _____ horsepower, and shall operate on _____ volt, _____ phase, 60 hertz supply power.

2.01 LEACHATE RISER PUMPS

a. Pump Construction

i. The materials of pump construction shall be as follows:

1. Impeller: 304 Stainless Steel
2. Impeller Seal Ring: Teflon
3. Motor Adaptor: 304 Stainless Steel
4. Inlet Screen: 304 Stainless Steel
5. Pump Shaft: 431 Stainless Steel
6. Coupling: 316 Stainless Steel
7. Check Valve Housing: 304 Stainless Steel
8. Check Valve: 304 Stainless Steel
9. Check Valve Seat: 304 Stainless Steel
10. Diffuser Chamber: 304 Stainless Steel
11. Fasteners: 304 Stainless Steel
12. Bearings: Teflon®
13. Suspension Cables: 3/16" 7x19 Braided 304 Stainless Steel

b. Submersible Motors

i. Motors shall be 4-inch, corrosion-resistant motors as manufactured by Franklin Electric or Grundfos or equal having the following characteristics:

1. Temperature and Time Rating: Continuous duty with 0.25 ft/sec. flow past motor. Temperature 30˚C ambient.

2. Enclosure: Hermetically sealed windings, corrosion-resistant materials. Stainless steel, splined shaft.

3. Bearings:
   a. Thrust Bearing: (Stationary) Carbon
   b. Radial Bearing: (Complete) Ceramic
   c. Thrust Bearing: (Rotating) Ceramic

4. Lubrication: Water Based

c. Carriage System: Pump shall be mounted in a High Density Polyethylene (HDPE) carriage designed for side slope riser leachate applications. Wheels will NOT be of an acceptable construction due to wear, failure and/or immobility caused by lack of contact with the inside diameter of the riser pipe.

d. Check Valve: Check valve shall be pre-drilled with a 1/8" diameter hole, to prevent freezing in discharge line. (optional)

e. Spare Parts (Packaged and labeled for storage): Provide one complete spare pump with stainless steel cable, power and control cable of proper length.

f. Submersible Transducer: A submersible transducer shall be provided with an adequate size cable for each pump (including spare). The transducer shall be all 316 stainless steel. The unit shall provide a 4-20mA signal output to the control unit. Static accuracy rating shall be no less than ±.1% of full scale. Cable shall be the same length as the pump power cable.

3.01 EXAMINATION

a. Examine areas, equipment foundations, and conditions with Installer present, for compliance with requirements for installation and other conditions affecting performance of pumps. Do NOT proceed with installation until unsatisfactory conditions have been corrected.

b. Examine rough- in for piping systems to verify actual locations of piping connections prior to installation.

4.01 INSTALLATION

a. General: Comply with the manufacturer's written installation and alignment instructions.

b. Install pumps in indicated locations.

5.01 CONNECTIONS

a. Install discharge pipe sizes equal to the diameter of the pump discharge.

b. Discharge Pipe: Discharge pipe shall be High Density Polyethylene (HDPE) hard pipe, directly to the discharge exit connection.

c. Discharge Exit Connection: Discharge exit connection shall be minimum 304 stainless steel "Pitless" style quick disconnect fitting.

6.01 COMMISSIONING

a. After installation of pumps and related piping and controls, manufacturer's representative to perform system start-up and test to ensure proper functioning of pumping systems.