

To: All Plan Holders of Record

From: CT Consultants, Inc.
for the Owner

**Re: Addendum No. 3
Village of Dresden
WWTP Improvements Project**

Date: January 9, 2020

This Addendum forms a part of the contract documents and modifies the original bidding documents dated November 2019. Acknowledge receipt of this addendum in the space provided on the "proposal forms." Failure to do so may subject the bidder to disqualification.

OPINION OF COST

The Engineer Opinion of Probable Cost has been revised to \$5,000,000 as of January 9, 2020.

BIDDERS QUESTIONS AND RESPONSES

Complete list of the Bidders questions and responses received from 12/07/2019 through 01/08/2020 are attached and shall be made a part of the bid documents.

SPECIFICATIONS

SECTION 01400 – QUALITY CONTROL

- a. REPLACE Section 01400 in its entirety with the revised specification as attached.

SPECIFICATION 11135 – MECHANICAL CLEANED BAR SCREEN

- a. REPLACE Section 11135 in its entirety with the revised specification as attached.

SECTION 11280 - VALVES

- a. CHANGE Paragraph 2.02 A. 4. to read: "Henry Pratt".
- b. ADD Paragraph 2.02 A. 5. to read: "Or equal; Substitutions Refer to Section 01600: Material and Equipment.".
- c. CHANGE Paragraph 2.04 A. 2. to read: "Henry Pratt".

SECTION 11310 – INFLUENT AND RAS PUMP SYSTEM

- a. REPLACE Paragraph 2.08 D. with the following: “The Valve vault and meter pit access frames and covers shall meet the requirements for access frames and covers for the wet well as specified above, except that the access frames and covers in these locations shall be equipped with channel frames to capture surface runoff and divert it away from the interior of the vault.”

SECTION 11320 – SLUDGE TRANSFER PUMP STATION

- a. REPLACE Section 11320 in its entirety with the revised specification as attached.

SECTION 11375 – OXIDATION DITCH AND MIXING EQUIPMENT

- a. CHANGE Paragraph 2.01 B. removing “(Not Used)” and inserting: “Envirodyne Systems, Inc.”.

SECTION 11371 – AIR DIFFUSERS

- a. ADD to Paragraph 2.0:
“B. SSI Aeration, Inc.
C. EDI Diffusers
D. Engineer approved equal.”

SPECIFICATION 15201 – PROCESS PIPING

- a. CHANGE Paragraph 2.02 C. 1. e. to read: “Wall pipe with flanged end connections shall extend a minimum of 6 inches from the face of the walls unless otherwise shown. Mechanical joint end connections for wall pipe up to 12 inches shall extend a minimum of 6 inches from the face of the walls and for 12 inch and larger wall pipes the MJ shall extend a minimum of 9 inches from the wall.”
- b. CHANGE Paragraph 2.02 B. 1. b. 2) e) i. and 3) c) to read: “Cadmium or zinc plated.”

SPECIFICATION 16170 – PROCESS CONTROL PANELS AND HARDWARE

- a. REPLACE Section 16170 in its entirety with the revised specification as attached.

SECTION 16190 – SUPPORTING DEVICES

- a. ADD the text “unless otherwise indicated on Drawings” to the end of Paragraph 3.02.H.

SPECIFICATION 16900 – SUPERVISORY CONTROL & DATA ACQUISITION SYSTEM

- a. REPLACE Section 16900 in its entirety with the revised specification as attached.

PLANS

DRAWINGS SHEET 2 – GENERAL NOTES

- a. ADD to General Notes: “GENERAL NOTES, PERMITS: BUILDING PERMITS AND OEPA STORM WATER PERMIT SHALL BE OBTAINED BY THE OWNER”

DRAWINGS SHEET 11 – SITE PLAN

- a. **CLARIFICATION:** Sludge Transfer Valve Pit for Aerobic Digester Sludge Transfer Pump is not shown on these drawing, refer to the revised Sheets 37 & 38 as attached.
- b. **CHANGE** coordinates for Points # 35 and 36 in the Point Table as provided below:
“Point # 35 – N=771357.8090, E=2107573.8311”
“Point # 36 – N=771358.1065, E=2107552.2905”

DRAWING SHEET 12 – SITE GRADING PLAN

- a. **CLARIFICATION:** Sludge Transfer Valve Pit for Aerobic Digester Sludge Transfer Pump is not shown on this drawing, refer to the revised Sheets 37 & 38 as attached.

DRAWING SHEET 13 – SITE PIPING PLAN

- a. **CHANGE** Coded Note 5 to read: “Install 6”x6” DIP Wye on Scum line from Scum Pit and a clean-out”
- b. **CHANGE** Coded Note 16 to read: “Transition from 8” DIP to 6” DIP approximately 20 ft from the exterior Ox. Ditch wall.”
- c. **DELETE** Coded Note W.
- d. **ADD** Sketch 1 to show 46 ft of 10” PVC SDR35 sanitary line from Manhole 1 (MH1).
- e. Sludge Transfer Valve Pit not shown on these drawings, refer to Revised Sheets 37 & 38.
- f. **REVISED:** 6” DIP Air distribution line to Aerobic Digester Grids 1 & 2, refer to the revised Sheets 37 & 38.

DRAWING SHEET 16 – SCREEN & PRESS BUILDING PLAN

- a. Coded Note 5: **DELETE** last sentence: “SEE TRENCH DRAIN DETAIL”. **CHANGE** to read: “REFER TO SECTION – E ON SHEET 17.”
- b. **ADD** Note: “9. Air Compressor is not shown. Locate equipment in southwest corner of Dewatering System Area. Provide Equipment Housekeeping Pad.”

DRAWING SHEET 17 – SCREEN & PRESS BUILDING SECTIONS

- a. Section E: **CHANGE** roofing label “Built Up Membrane Roofing System over Precast Concrete” to “Fully Adhered Single Ply Membrane over Rigid Insulation over Precast Concrete”.
- b. **ADD** Note to Edge Bearing Detail: “Edge Bearing shall be 4” Nominal.”
- c. Section A: **DELETE** reference callout - “Edge Bearing See Detail”
- d. Section A: **ADD** Note “Edge Bearing shall be 5 ½” minimum.”
- e. Coded Note 5: **CHANGE** “copper” to “SCH 80 PVC” in this note.

DRAWING SHEET 19 – PUMP BUILDING PLAN

- a. **REVISE** Coded Note 5 to read: “Remove 1/2 of 8”x16” block both ends. Grout entire vertical courses below notch. Install 4”x16”x1/2” steel bearing plate in notch. Affix beam to veering plate, centered over pump removal grate. Grout remaining notch opening to enclose ends of beam.”

DRAWING SHEET 34 – INFLUENT SANITARY PLAN & PROFILE

- a. Screen Building to the Manhole 2 (MH2): CHANGE sanitary sewer pipe diameter to 16" DIP.
- b. Manholes 2 and 3: CHANGE sanitary sewer pipe material to read 15" PVC SDR35.

DRAWING SHEET 35 – EXISTING TRICKLING FILTER – DEMO PLAN

- a. REPLACE Note "PLUG LINE AND INSTALL 12" DIP BLIND FLANGE; TYP. 2 PLACES" with "PLUG 12" DIP WITH NON-SHRINK, NON-METALIC GROUT. LEVEL WITH FLOOR ELEVATION. TYP. 2 PLACES."

DRAWING SHEET 36 – EXISTING TRICKLING FILTER – DEMO SECTION

- a. REPLACE Note "INSTALL BLIND FLANGE ON EXISTING 12" DIP" with "PLUG 12" DIP WITH NON-SHRINK, NON-METALIC GROUT. LEVEL WITH FLOOR ELEVATION."

DRAWING SHEET 37 – AEROBIC DIGESTER & BLOWER PLAN

- a. REPLACE in its entirety as attached.

DRAWING SHEET 38 – AEROBIC DIGESTER – SECTION

- a. REPLACE in its entirety as attached.

DRAWING SHEET 41 – UV DISINFECTION

- a. Proposed Plan and Section View: CHANGE specified 2" DIP air line from the blower to the Fine Bubble Diffusers located in the Post Aeration Tank to 2" Stainless Steel Pipe.

DRAWING SHEET 43 – VALVE, GATE & WEIR SCHEDULE

- a. Butterfly Valve Schedule: : DELETE two (2) 4-inch Butterfly Valves for Trickling Filter

DRAWING SHEET 44 – PROCESS DETAILS

- a. DELETE Detail 3 from this sheet.

DRAWING SHEET 57 – GENERATOR PLAN & DETAILS

- a. ADD Fire Extinguisher (exterior grade) mounted on fence in area of generator.

DRAWING SHEET 58 – SCREEN & PRESS BUILDING ELECTRICAL PLAN

- a. ADD the following schedule to this sheet.

CONTROL CONDUIT/CONDUCTOR SCHEDULE			
LOCATION	CONDUIT SIZE (IN)	CONDUCTORS	EQUIPMENT INTERFACE
SMOKE ALARM TO RTU 4	1/2	2~#14	SMOKE ALARM
COMBUSTIBLE GAS ALARM TO RTU 4	1/2	2 SETS OF 2~#14	ALARM CONDITION / ALARM FAIL
SCREEN / WASHER COMPACTOR LCP TO RTU 4	1 1/2	11 SETS OF 2~#14	PER SPECIFICATIONS
SLUDGE PRESS LCP TO RTU 4	1	CAT-5E	PER SPECIFICATIONS
COMPOST BLOWER LCP TO RTU 4	3/4	5 SETS OF 2~#14	PER SPECIFICATIONS
ATS TO RTU 4	1	4 SETS OF 2~#14	PER SPECIFICATIONS
GENERATOR TO RTU 4	3/4	3 SETS OF 2~#14	PER SPECIFICATIONS
NOTE: CONDUCTORS REQUIRED TO PROVIDE EQUIPMENT CONTROL INTERFACE AS OUTLINED IN THE SEPCIFICATIONS ARE NOT SHOWN. EQUIPMENT CONTROL INTERFACE SHALL BE INACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ALL EXPOSED CONDUCTORS SHALL BE ROUTED IN CONDUIT.			

DRAWING SHEET 60 – PUMP BUILDING ELECTRICAL PLAN

- a. ADD the following schedule to this sheet.

CONTROL CONDUIT/CONDUCTOR SCHEDULE			
LOCATION	CONDUIT SIZE (IN)	CONDUCTORS	EQUIPMENT INTERFACE
SUMP ALARM TO RTU 1	1/2	2~#14	SUMP HIGH LEVEL ALARM
LT2 TO RTU 1	3/4	SHIELDED PR.	WET WELL LEVEL
INFLUENT PUMP PANEL TO RTU1	1 1/2	16 SETS OF 2~#14	PER SPECIFICATIONS
	3/4	SHIELDED PR.	WET WELL LEVEL
NOTE: CONDUCTORS REQUIRED TO PROVIDE EQUIPMENT CONTROL INTERFACE AS OUTLINED IN THE SEPCIFICATIONS ARE NOT SHOWN. EQUIPMENT CONTROL INTERFACE SHALL BE INACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ALL EXPOSED CONDUCTORS SHALL BE ROUTED IN CONDUIT.			

DRAWING SHEET 61 – RAS & BLOWER ELECTRICAL PLAN

- a. Electric Service Panel @ Blowers Detail: ADD Note “SCADA Interface Panel at this location is not shown. Panel shall be mounted on reverse (west) elevation of electric service panel. Panel shall be positioned to support panel access and maintenance.”
- b. Blower Area Electrical Plan: REVISE conduit designation between electrical service panel area and sludge pump disconnect from “25” to “31”.
- c. Blower Area Electrical Plan: ADD a control conduit between the electrical service panel area and sludge pump disconnect.
- d. ADD the following schedule to this sheet.

CONTROL CONDUIT/CONDUCTOR SCHEDULE			
LOCATION	CONDUIT SIZE (IN)	CONDUCTORS	EQUIPMENT INTERFACE
RAS FLOW METER LCP TO RTU 3	3/4	SHIELDED PR.	RAS FLOW
WAS FLOW METER LCP TO RTU 3	3/4	SHIELDED PR.	WAS FLOW
RAS CONTROL VALVE TO RTU 3	3/4	2~SHIELDED PR.	RAS CONTROL VALVE POSITION/FEEDBACK
WAS CONTROL VALVE TO RTU 3	3/4	2~SHIELDED PR.	WAS CONTROL VALVE POSITION/FEEDBACK
RAS PUMP STATION LCP TO RTU 3	3/4	SHIELDED PR.	PLANT EFFLUENT FLOW
	1 1/2	12 SETS OF 2~#14	PER SPECIFICATIONS
RAS WET WELL LEVEL	3/4	SHIELDED PR.	WET WELL LEVEL
DIGESTER BLOWER LCP TO RTU 3	3/4	2~SHIELDED PR.	SLUDGE TRANSFER PUMPSPEED/FEEDBACK
	2	26 SETS OF 2~#14	PER SPECIFICATIONS
NOTE: CONDUCTORS REQUIRED TO PROVIDE EQUIPMENT CONTROL INTERFACE AS OUTLINED IN THE SEPCIFICATIONS ARE NOT SHOWN. EQUIPMENT CONTROL INTERFACE SHALL BE INACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ALL EXPOSED CONDUCTORS SHALL BE ROUTED IN CONDUIT.			

DRAWING SHEET 62 – OXIDATION DITCH ELECTRICAL PLAN

- a. Electric Service Panel @ Oxidation Ditch: DELETE SCADA Interface Panel from west elevation of Electric Service Panel.
- b. ADD Note “Note: SCADA interface is not shown. Oxidation Ditch Control Panel shall interface with SCADA system via Ethernet connection (CAT 5e cable) routed to SCADA Interface Panel located at Blower Area.”

DRAWING SHEET 63 – UV DISINFECTION ELECTRICAL PLAN

- a. ADD the following schedule to this sheet.

CONTROL CONDUIT/CONDUCTOR SCHEDULE			
LOCATION	CONDUIT SIZE (IN)	CONDUCTORS	EQUIPMENT INTERFACE
EFFLUENT METER LCP TO RTU 5	3/4	SHIELDED PR.	PLANT EFFLUENT FLOW
UV SYSTEM MONITOR #1 TO RTU 5	3/4	3 SETS OF 2~#14	PER SPECIFICATIONS
UV SYSTEM MONITOR #2 TO RTU 5	3/4	3 SETS OF 2~#14	PER SPECIFICATIONS
RIVER PUMP STATION LCP TO RTU 5	1 1/2	10 SETS OF 2~#14	PER SPECIFICATIONS
POST AIR BLOWER LCP TO RTU 5	1	7 SETS OF 2~#14	PER SPECIFICATIONS
NOTE: CONDUCTORS REQUIRED TO PROVIDE EQUIPMENT CONTROL INTERFACE AS OUTLINED IN THE SEPCIFICATIONS ARE NOT SHOWN. EQUIPMENT CONTROL INTERFACE SHALL BE INACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. ALL EXPOSED CONDUCTORS SHALL BE ROUTED IN CONDUIT.			

DRAWING SHEET 65 – ELECTRICAL ONE-LINE DIAGRAM

- a. DELETE circuit breaker, conduit and conductors interfacing Conveyor #1 with PB-A. Power supply for equipment is provided via Press Control Panel. Local Disconnect to remain.
- b. DELETE circuit breaker, conduit and conductors interfacing Conveyor #2 with PB-A. Power supply for equipment is provided via Press Control Panel. Local Disconnect to remain.

DRAWING SHEET 66 – ELECTRICAL PANEL SCHEDULE

- a. DELETE circuit breaker, conduit and conductors interfacing Conveyor #1 with PB-A. Power supply for equipment is provided via Press Control Panel. Local Disconnect to remain.

- b. DELETE circuit breaker, conduit and conductors interfacing Conveyor #2 with PB-A. Power supply for equipment is provided via Press Control Panel. Local Disconnect to remain.
- c. ADD Circuit 25 to LP-B to power the air compressor required by the rotary fan press. Utilize available 20A/1P breaker. Conductors to be 2~#12, 1~#12 GRD in 3/4" C.
- d. ADD Circuit 26 to LP-B to power the polymer feed skid. Utilize available 20A/1P breaker. Conductors to be 2~#12, 1~#12 GRD in 3/4" C.

DRAWING SHEET 67 – CONDUIT SCHEDULE & DETAILS

- a. ADD Note to the Conduit/Conductor Schedule “* Designates Control Wiring. Conduit and conductors designated as control shall be routed independent of any power wiring. Where handholes are required to facilitate transitions, handholes specific to control wiring shall be utilized.”
- b. ADD the following Note to the Conduit/Conductor Schedule:
 “The following designations apply to the various SCADA Interface Panels:
 CTU – SCADA Control Panel (Operations Bldg.)
 RTU 1 – Pump Building SCADA Interface Panel
 RTU 2 – Blower Area SCADA Interface Panel
 RTU 3 – RAS Pump Station SCADA Interface Panel
 RTU 4 – Screen/Press Building SCADA Interface Panel
 RTU 5 – UV Area SCADA Interface Panel”
- c. ADD the following items to the Conduit/Conductor Schedule:

REF. NO.	LOCATION	CONDUIT SIZE (IN)	CONDUCTORS	EQUIPMENT	CONTROL	NOTES
15	PULL BOX 3 TO BLOWER SERVICE PANEL	1	CAT-5E	OX DITCH LCP SCADA INTERFACE	*	
17	PULL BOX 3 TO PULL BOX 4	1	CAT-5E	OX DITCH LCP SCADA INTERFACE	*	
18	PULL BOX 4 TO OX DITCH SERVICE PANEL	1	CAT-5E	OX DITCH LCP SCADA INTERFACE	*	
31	DIGESTER BLOWER LCP TO SLUDGE TRANSFER PUMP	3/4	3~#12, 1~#12 GRD	SLUDGE TRANSFER PUMP		
		1	2 SETS OF 2~#14	SLUDGE FLOATS	*	
			2 SETS OF 2~#14	SLUDGE PUMP LEAKAGE/OVER TEMP	*	


BA



Enclosures

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BIDDERS QUESTIONS
AS OF 1/9/2020

BID OPENING 11:00 AM, WEDNESDAY, JANUARY14, 2020
END OF QUESTION PERIOD 5:00 PM, MONDAY, JANUARY 6, 2020
LAST ADDENDA 11:00 AM, THURSDAY, JANUARY 9, 2020

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
12/07/19	Timothy B. Shaw, PE The Henry P. Thompson Company tshaw@hpthompson.com Office: (513) 248-3229 Cell: (513) 807-7256	11360	BA/MS	a. Fournier does have a comment regarding the specification for the Rotary Press. The loading rate per channel needs to be changed to 75 dry-lbs/hr. b. We have reviewed the rotary press specification for Dresden. We request that you remove Prime Solutions from the Rotary Press specification section 11360.	a. Section 1.01 C. 5 a. “Sludge Feed Rate” is changed to read 75 lbs. dry solids/hr per each channel. b. Remove Prime Solutions	ADD 2
12/10/19	Timothy B. Shaw, PE The Henry P. Thompson Company tshaw@hpthompson.com Office: (513) 248-3229 Cell: (513) 807-7256	11310	BA/MS	Would you consider Fairbanks for the influent and RAS Pumps	Specification 11310, Paragraph 2.02 A will be corrected to list: 1. Flygt; 2. ABS by Sulzer; 3. Or Equal.	ADD 2
12/10/19	Timothy B. Shaw, PE The Henry P. Thompson Company tshaw@hpthompson.com Office: (513) 248-3229 Cell: (513) 807-7256	11375	BA/MS	We provided design information for a screen from Parkson a few years ago. Please see the attached from Parkson for your consideration. Let me know if you have any questions or need any additional information.	Not to include.	-
12/11/19	Timothy B. Shaw, PE The Henry P. Thompson Company tshaw@hpthompson.com Office: (513) 248-3229 Cell: (513) 807-7256	11950	BA/MS	The attached specification is written to be cast iron gates. Please confirm if you will allow the gates to be fabricated (aluminum or stainless). The stop and slide gates are specified to be aluminum fabricated gates.AD	New Specification 11950 will be provide for Stainless Steel Slide and Sluice Gates.	ADD 2
12/13/19	Timothy B. Shaw, PE The Henry P. Thompson Company tshaw@hpthompson.com Office: (513) 248-3229 Cell: (513) 807-7256	11375	BA/MS	We have reviewed the oxidation ditch specification for Dresden. We request that you remove Envirodyne from the Oxidation Ditch and Mixing Equipment specification section 11375.	Remove Envirodyne. Based upon additional information provided, Envirodyne has been reinserted into the specification.	ADD 2 ADD 3
12/16/19	Wendell D. Smitley, PE Sullivan Environmental Technologies, Inc. wendell@sullivanenvtec.com (614) 395-7379	11135	BA/MS	We also noticed Duperon Corporation is the only listed manufacturer under Specification Section 11135 - Mechanically Cleaned Bar Screen. As such, we wanted to see if there might be any consideration given to Vulcan, who makes a very similar flexible rake style screen, which they refer to as their Vulcan Knuckle Rake, or Model VKR for short (i.e. see attached brochure).	Include Vulcan into the Spec.	ADD 2
12/20/19	Thanks, Steve A. Ehret Project Executive  Lead With Safety! sae@kokosing.biz CELL: 740.398.0709	01400 07210 & Sheet 17 10525	BA	1. Section 01400 Quality Control states under paragraph 1.01 that this section includes “Testing services”, but we do not find any specific requirements for 3 rd party QC testing in this section. Please confirm whether or not the contractor is to hire a 3 rd party testing company for this project. If required, please provide a list of the specific testing that is required. This section does a nice job of defining the Preconstruction color video/audio recording requirement of the project site, but not the testing services required. 2. Bid Drawing Sheet 17, Section A states “FILL BLOCK WITH MASONRY FOAM INSULATION, CORE-FILL 500 OR EQUAL”. However, Section 07210 – Building Insulation, paragraph 2.04 requires “BLOCK INSULATION INSERTS FOR CONCRETE MASONRY(Concrete Block Insulating Systems, Korfill or equal)”. Please advise which type of insulation is required for the perimeter masonry walls at the Screen & Press Building. 3. We do not find any call-outs for fire extinguishers on the bid drawings. Please advise how many Section 10525 fire extinguishers are required for this project.	1. Specification Section 01400 will be modified to clarify 3rd party inspection services. Services to be provided by 3rd party inspection group shall include; concrete Spec. 03300, compaction Para. 3.11, Spec. 02200, Para. 3.07 and any other defined testing outlined within the various specification sections. 2. Note on Dwg. 17 will be revised to reflect specification requirement for insulation. 3. Fire extinguishers are shown on Dwg. 53. Fire extinguisher will be added to Generator area via Addendum 3 as it is currently not shown on Dwg. 57.	ADD 3

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
12/30/19	Terri Krupar <i>Project Manager</i> <i>Stanley Miller Construction Co.</i> terri.krupar@smillerconst.com 2250 Howenstine Dr. SE East Sparta, OH 44626 (330) 484-2229 (330) 495-7542 (Cell)		BA	Please provide a roof framing plan for the screen & press bldg. showing precast plank span.	A framing plan has not been provided. Additional dimensions have been provided within the details to support development of a framing plan by the precast supplier based upon their design.	ADD 3
12/30/19	Thanks, Steve A. Ehret Project Executive  Lead With Safety! sae@kokosing.biz CELL: 740.398.0709		MS/BA	<ol style="list-style-type: none"> Reference Sheet 41 of 70. This drawings shows a 2" DIP Air line from the blower to the Fine Bubble Diffusers. 3" DIP is as small as they make. What type of pipe would you like us to use for this air line? Reference Section 07500. Paragraph 2.01 B calls for the color of the TPO membrane to be Black. It is our understanding from our roofing subcontractors that this color is not available. The color choices for TPO are white, tan or gray. Please advise which color is to be provided for this project. Refer to drawing 17 of 70. This drawing shows a built-up membrane roofing system over precast concrete. Can you please provide us with the thickness of the precast hollow core roof slab? 	<ol style="list-style-type: none"> Provide 2" SS Pipe. Refer to Addendum 3 Tan Contingent upon design required by Spec. Section 03415. 	ADD 3
01/02/20	Thanks, Steve A. Ehret Project Executive  Lead With Safety! sae@kokosing.biz CELL: 740.398.0709			<ol style="list-style-type: none"> Reference Sheet 14 of 70. The influent sanitary sewer profile shows 15" DIP for the gravity sewer from the screen channel to MH2 and from this manhole to MH3. There is no such size for DIP. Please advise if this DIP should be 14" or 16". Can you please provide us a detailed bid item description for Alternate Bid Item - Compost Blower Appurtenances so we know what labor and materials that we are to include in this bid item? Specification 11135 Mechanically Cleaned Bar Screen, paragraph 2.02.J.5 states "Washer Compactor: Yes (as Alternate)" – please clarify the meaning of the "as alternate" statement. Is there to be a separate bid item for the washer compactor? Specification 11226 Clarifier Equipment, paragraph 1.04.A states "Include the cost of this item in the Alternate section of the bid." The only alternate currently on the bid form says compost blower appurtenances, which doesn't seem to have any relation to the clarifier or screen. Please clarify if this is an alternate bid item or is to be included in the Lump Sum Bid Price bid item? 	<ol style="list-style-type: none"> The sanitary sewer line from the Screen Building to MH2 shall be changed to 16" DIP as shown on Sheet 13. The sanitary sewer line between MH2 and MH 3 shall be changed to 15" PVC SDR-35, as shown on Sheet 13. Changes for the sanitary sewer line on Sheet 14 will be addressed via Addenda 2. The information is in Section 01025, Paragraph 3.02. Delete "As Alternate". Addressed in <u>Addenda 2</u>. Paragraph 1.04. A is deleted. Refer to <u>Addenda 2</u>. 	ADD 2
01/03/20	Kevin Hill Abbott Electric (330) 455-4391	Section 16020	BA	1. Clarify locations where FRP conduit is to be utilized	1. Where indicated on the Drawings. Refer to <u>Addendum 2</u> .	ADD 2
01/03/20	Jay Fromholtz Micro-Comm Inc (913)-390-4500	Section 16900	BA	1. Is a front panel touch screen display unit desired at the Central Terminal Unit? If so, where is specification located?	1. Replace Section 16900 in its entirety with the revised specification. Refer to <u>Addendum 2</u>	ADD 2
01/03/20	David Scott Kalcreeuth Roofing & Sheet Metal (740)657-6400	Sheet 17 of 70, Section E	BA	1. Clarify discrepancy between specification and drawing regarding the type of roof preferred, built-up membrane roofing system (drawing) vs single-ply membrane (spec)	1. Drawing 17 of 70, Section E: CHANGE roofing label from "Built Up Membrane Roofing System over Precast Concrete" to "Fully Adhered Single Ply Membrane over Rigid Insulation over Precast Concrete".	ADD 3

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
01/03/20	John Fitch, Jr. The Bergren Associates, Inc. Ph: 440-865-6257 johnfitch@bergren.com	Sections 11320 Section 11365 Section 16425	MS/BA	<u>Section 11320 – Sludge Transfer Pump Station:</u> 1. Prime Solution: Please confirm that the Contractor is responsible for supplying the pump package listed in this section. 2. Prime Solution: Please clarify if the Control Panel on the Rotary Fan Press in Section 11360 will be responsible for controlling these pumps. <u>Section 11365 – Polymer Blending and Feeding Equipment:</u> 3. Prime Solution: Please confirm that the Contractor is responsible for supplying the Polymer System listed in this section. 4. Prime Solution: Please clarify if the Control Panel on the Rotary Fan Press in Section 11360 will be responsible for controlling this polymer system. <u>Section 16425 – Variable Frequency Drives (VFD), Part 2 PRODUCTS, 2.01 General:</u> 5. The drives shall be ABB Model ACS550, or equal. 6. Prime Solution: Allen Bradley 523 is our standard. Is this acceptable?	1. Yes, Contractor is responsible to provide sludge transfer pump package. 2. The Sludge Press Equipment manufacturer will be responsible for the Control Panel Interface with the Sludge Transfer Pump Controls. 3. Yes. 4. The Sludge Press Equipment manufacturer will be responsible for the Control Panel Interface with the Polymer. 5. Yes. 6. No problem.	ADD 3

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
01/03/20	Doug Barnes Estimator Central Treatment Plant Group Core and Main LP 1680 Expo Lane Indianapolis, IN46214 (317) 271-1463 (P) (317) 271-2026 (F) doug.barnes@coreandmain.com	Sections 11280, 15201, 15123 Sheets 37, 38, 43	MS	<ol style="list-style-type: none"> On plan sheet 16 Note 5 refers to a Trench Drain Detail. I cannot seem to find this detail. Would you please tell me what I am overlooking? Spec Section 15123 page 2 states “Wall pipe with flanged end connections shall extend a minimum of 6” from the face of the walls unless otherwise shown. Mechanical joint end connections for wall pipe up to 12” shall extend a minimum of 6” from the face of the wall ...” Spec section 15201 page 8 paragraph C.1.e states Pipes ends shall be flush with the wall face. Please clarify what is required. Spec section 15201 page 5 paragraph B.1.b.2.3 calls for the flanged bolts to be carbon steel for exposed pipe. In spec section 11280 the specs appear to call for cadmium plated flange bolts for the plug and butterfly valves. Please clarify what is required. If Cadmium is required will this apply to all valve flange bolts? Plan sheet calls for 3 6” check valves on the air lines. I cannot seem to find these on the valve schedule. Will you please tell me what I am overlooking? Is the plain swing check valve called out in spec 11280 page 5 what is required? The Globe valves in the specs 15100 page 6 appear to overlap. Would you please clarify which one of these 2 apply to the 6” globe valves on plan sheet 37. On plan sheet 38 near the bottom on the page on the left hand side there is a call out for an 8” MJ to FLNG spool. All of this pipe appears to be drawn as flanged pipe and the Valve Schedule calls for the valves to be flanged. Would you please clarify what is required? I cannot seem to find a spec for the 3” rubber flapper check valve called out on the valve schedule. Would you please tell me what I am overlooking? On plan sheet 43 there is a call out for 2 4” flg butterfly valves. I cannot seem to find them. Would you please tell me what I am overlooking? On plan sheet 44 there is a reference to Basin 1 and Basin 2. I cannot seem to find these on the plans. Would you please clarify what this is referring to? On plan sheet 48 there are details for wall and floor PRV’s. I cannot seem to find any call outs on where these are required. Would you please tell me what I have overlooked? I cannot seem to find a spec for the quick connect on plan sheet 48 at the truck loading station. We are bidding aluminum for the material. Is this acceptable? Would you please clarify note 16 on plan sheet 13. This appears to apply to note B which is called out to be an 8” line. Note 5 on Plan Sheet 13 calls for the installation of a 6 x 6 DIP wye. I cannot seem to find where this is to take place. Will you please tell me what I am overlooking? Plan sheet 13 calls for 3” DR11 sludge line. On the Blow up of the Pump and Piping on Plan Sheet 38 After the 3” plug valve there is a 3 x 2 reducer called for and it calls for DR17. The specs appear to call for DR 11 Water and DR17 for force main. Would you please clarify what if required? I cannot seem to find the 8” C900 force main called out in Note W on plan sheet 13. Would you please tell me what I am overlooking? For clarification there is a call out to replace on sheet 41 to replace the exist 12 effluent to the exist T. On plan sheet 13 it appears that this T is approximately 10’ east of the UV tank. Is this correct? 	<ol style="list-style-type: none"> Trench Drain Detail is provided in Section E on Sheet 17. Section 15201, C.1.e. shall be <u>CHANGED</u> to the requirements of Spec Section 15123. <u>CHANGE</u> Paragraph 2.02 B. 1. b. 2) e) i. and 3) c) to read: “Cadmium or zinc plated.” Check valves called out on the air lines are part of the Blowers package. Refer to Section 11374, C. 1. <u>CHANGE</u> Glob valves to Butterfly Valves. Refer to Addendum 3 Sketch 1. <u>CHANGE</u> “8” MGxFLNG SPOOL 6” L” to “8”FLNGxFLNG SPOOL 6” L”. Refer Addendum 2, Sketch 1. Refer to the Revised Sheets 37 and 38 that show 3” Flapper CV on the drain line from the Sludge Transfer Valve Pit to the Sludge Pump wet well. <u>DELETE</u> 4” BF on Sheet 37. <u>DELETE</u> Detail 3 on Sheet 44. It is a standard detail. There is no PRV’s are required on this job. Aluminum is acceptable <u>CHANGE</u> Coded Note 16 to read: “Transition from 8” DIP to 6” DIP approximately 20 ft from the exterior Ox. Ditch Wall.” There is new 6” Wye shall be installed on “O”, the Scum line from Scum Pit for a clean-out. Refer to Sheet 38, Aerobic Digester Partial Plan. <u>Addendum 3</u>. <u>CHANGE</u> on Change Sheet 38 note to read 3”Ø DR 11 to Screen/Press Bldg.” Refer to Addendum 3. <u>DELETE</u> Coded Note W. Yes, it is correct. 	ADD 3

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
01/03/20	John Fitch, Jr. The Bergren Associates, Inc. Ph: 440-865-6257 johnfitch@bergren.com	11135	BA/MS	<p>1. Specification section 11135 sub section 2.04.B.7</p> <p>a. Spec states: The control panel shall be equipped with an Ethernet communication modem to interface with the SCADA system. The modem shall communication using Ethernet IP protocol. Refer to Section 16900 for detail of data points required for interface.</p> <p>b. Duperon clarification: Ethernet is not provided in this panel and the washer compactor spec calls out dry contact interface, that will be provided, this modem will not.</p> <p>2. Specification section 16170 sub section 2.04.F.3</p> <p>a. Spec states: Power the motor space heater inside of each motor that the control panel powers. The control power transformer shall provide this 120 volt power. The motor space heater power shall be switched by a relay circuit that energizes the heater only during periods of motor inactivity.</p> <p>b. Duperon clarification: The machine will be running constantly, there is no need for a motor space heater and will not be provided.</p> <p>3. Specification section 16901 sub section 2.01.C</p> <p>a. Spec states: The ultrasonic sensor shall be a Eastech Flow Controls Model FB-5 or equal. The sensor shall be constructed of glass filled polyester and shall have a maximum range of 25 ft. and a 10 degree beam angle. The transducer shall be specifically selected for the application designated for each location. Selection of the transducer model shall also factor the configuration of the channel, tank, etc. where the unit is to be installed.</p> <p>b. Duperon clarification: The bar screen section 11135 calls out a HydroRanger 200HMI and a single transducer. That is what will be provided.</p> <p>4. Specification section 11135 sub section 3.04.B Testing: Spec States:</p> <p>a. After completion of installation, Contractor shall provide for testing. Testing of the Washer Compactor shall demonstrate that the equipment is operational, and that the equipment will wash, compact and deposit materials not to exceed 4 inches.</p> <p>b. Testing of the bar screen shall include collecting screenings off of the discharge chute and collecting in a non-draining device for a period of at least 72 hours and the screenings shall be tested for moisture content and pass the State of Ohio Paint test.</p> <p>c. Bar screen equipment shall be tested by confirmed measurement of operation by level measurement in the channel. Bar screen shall initiate and terminate operation from a level measured with the level detection device supplied by the manufacturer within 0.5 inch of the set point of the device. This cycle shall be repeated at least three times for this test.</p> <p>d. Duperon clarification: This testing is affiliated with the washer compactor and will be performed on this piece of equipment not the mechanical bar screen.</p> <p>5. Specification section 1135 sub section 2.02.I.7</p> <p>a. Spec states: Discharge height 5’0”</p> <p>b. Duperon clarification: The washer compactor sits behind the rake and the top of the receiving hopper is at 3ft 5 1/4in. This can be customized to 5ft if desired. Please clarify the height of the bottom of the enclosure/top of the washer compactor hopper.</p>	<p>1. a. <u>REPLACE</u> Paragraph 2.04 B. 7. on page 10. Refer to Addendum 3.</p> <p>b. <u>ADD</u> Paragraph 2.04 B. 8. on page 10. Refer to Addendum 3.</p> <p>2. Clarification: Screen panel is specified within Section 11135, not 16170.</p> <p>3. Clarification: Equipment requirements for Interface of the Screen shall be as specified in 11135</p> <p>4. As specified in Section 11135, Paragraph 3.04 B. Testing</p> <p>5. <u>CHANGE</u> Paragraph 2.02 I. 7. to read: “7. Discharge height of Washer Compactor” . Refer to Addendum 3.</p>	ADD 3
01/03/20	John Fitch, Jr. The Bergren Associates, Inc. Ph: 440-865-6257 johnfitch@bergren.com	11950	MS	<p>1. Section 11950, Sluice Gates refers to AWWA C501 cast iron sluice gates. AWWA C501 is no longer a valid AWWA standard. Would AWWA C561, fabricated stainless steel slide gates be acceptable for this installation?</p>	1. Addressed in <u>Addendum 2</u> .	ADD 2

Date Received	Originator Name & Company	Specification/ Drawing Reference	Routed To	Question	Answer	Add #
01/07/20	Bob Turpening Bobt@transtarcorp.com	16020	BA	1. Schedule 40 PVC conduit can be used underground? 2. All underground conduits must be concrete encased unless within the building frame? 3. Exterior conduits above ground are to be GRC UNO? 4. PVC conduit may not be used above ground UNO? 5. Confirm strut supports spec 16020 3.02 H seems to indicate SS or Alum in wet and damp – print details show galv	1. Indoor only, ref. 16020, para. 2.03.C. 2. No. Ref. 16020, para. 3.08.A. 3. No. Ref. 16020, para. 2.03.B. 4. No. Ref. 16020, para. 2.03.B. 5. Ref. Addendum 3.	ADD 3
01/07/20	James Keating Engineered Product Sales, N. Ohio Hydro Controls, Inc. 473 Cincinnati-Batavia Pike, Suite 2 Cincinnati, OH 45244 jkeating@hydrocontrols.net 813-784-2045 cell 513-474-7400 office	Section 11280 Sheet 34	MS	I see 2 valves that need Electric Motor Operators on Dresden. 4” Plug Valve and 3” Pinch Valve - both on drawing #34. I do not see a manufacturer named in the specifications for the Actuator. I assume Limitorque QX/MX are acceptable?	1. Reference Spec. Section 16427.	
01/08/20	Kevin Dills Kirk Bros. Co., Inc. 1700 Fostoria Avenue, Suite 800 PO Box 390 Findlay, OH 45839 P: 419-595-4044 C: 567-429-9419 F: 419-595-4019	Page 17	BA	On page 17 of 70 Coded Note 15- 2" HDPE water piping (subgrade) transition to copper AFF. Need clarification if it is copper or sch. 80 pvc.	1. Clarified use of SCH 80 PVC. See Addendum 3.	ADD 3

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Tolerances.
- D. Audio Video Recording of Site.
- E. Manufacturers' field services and reports.
- F. Manufacturer's certificates.
- G. Testing services.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Contractor shall comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Contractor shall comply with specified standards as a minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.03 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents.
- B. Obtain copies of standards when required by Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TOLERANCES

- A. Contractor shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.
- B. Contractor shall comply with manufacturer's tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Contractor shall adjust products to appropriate dimensions; position before securing products in place.

1.05 AUDIO / VIDEO RECORDING OF SITE

- A. Scope of Work
 - 1. Furnish all labor, materials and equipment to furnish color video / audio recording of the project site in accordance with the drawings and as specified herein.
 - 2. Furnish copies of a continuous color video / audio recording of the entire area within fifty (50) feet of the construction area to concerned parties as described below. The recording shall be taken prior to any construction activity.
 - 3. The Engineer reserves the right to reject the audio / video recording because of poor quality, unintelligible audio or uncontrolled pan or zoom. Any recording rejected by the Engineer shall be rerecorded at no cost to the client. Under no circumstances shall construction begin until the Engineer has received and accepted the audio / video recording.
 - 4. Prior to recording, all areas to be recorded shall be investigated visually with notation made of features not readily visible by recording methods. This would include but not limited to culverts (size, type and condition) and manholes that may be partially buried. Record all measurements made during inspection.

- B. Media

5. CD's or DVD's
 - a. CD or DVD media shall be previously unrecorded standard quality CD-R's or DVD-R's with "Slimline" cases, labeled as described below
6. Labeling
 - b. All recording media and cases shall bear labels with the following information:
 - 1) Media Number
 - 2) Owner's Name
 - 3) Date of Recording
 - 4) Project Name and Number
 - a) In a manner acceptable to the Engineer upon completion of the work and delivery of the media.
7. Ownership
 - c. All discs and written records shall become the property of the Owner. Four copies of the finished audio / video recording shall be distributed to the following:
 - 1) One (1) copy to the owner
 - 2) Two (2) copies to the Engineer
 - 3) One (1) copy to be retained by the contractor.

C. Execution

8. Color Video / Audio Survey
 - a. Furnish a continuous color video / audio recording of the entire area within fifty (50) feet of construction in accordance with the drawings and as specified herein.
 - b. Complete coverage shall include all surface features within 50 feet of the work area to be utilized by the Contractor and shall be supported by appropriate audio description made simultaneously with video coverage.
 - 1) General: Such coverage shall include, but not limited to, all existing driveways, sidewalks, curbs, ditches (drainage patterns are of particular concern), roadways (including condition of surface for full width, landscaping, trees, culverts, headwalls, catch basins, retaining walls, equipment, structures, pavements, manholes, vaults, handrails, fences, visible utilities, etc. and all buildings (interior and exterior) located within the aforementioned work zone. Video coverage shall extend to the maximum height of all structures within this zone. Of particular concern are existing faults, fractures, defects, or other imperfections.
 - 2) Streets: Unless otherwise noted, streets and street areas shall be recorded by audio / video tape for full width of the zone of influence of construction, including both sides of the street. The term street shall be understood to mean street, highway, avenue, boulevard, road, alley, lane, driveway, parking lot, etc.,

and all adjacent areas within the possible zones of the influence of construction.

- 3) Access roads and streets shall be recorded, including both sides of the street. Access roads shall include North Ripple Lane.
9. All recording shall be done during times of good visibility. No recording shall be done during periods of visible precipitation, or when more than ten percent of the ground area is covered with standing water, unless otherwise authorized by the Owner.
10. Each recording shall begin with the Owner's name, Contract name and number, the Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.
11. Information appearing in the recording must be continuous and can simultaneously be computer generated, transparent digital information. No editing or overlaying of information at a later date will be acceptable.
12. Digital information to appear in the recording shall be as follows:
 - a. Name of Contractor
 - b. Month, Day, Year, Hour, Minutes and Seconds, electronically displayed accurately and continuously throughout the recording.
 - c. Name of project and Specification Number.
13. Time must be accurate and continuously generated.
14. Written documentation must coincide with the information on the disc so as to provide for easy retrieval of locations sought for at a later date.
15. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints.
16. Audio: All audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Audio for each recording shall begin with the current date, project name and municipality, and be followed by the general locations (i.e. name of the street or property owner), location of cross county line, viewing side, and direction of progress. The engineering stationing (where required) shall be noted on the audio track. Houses and buildings shall be identified audibly by owner name and address where available. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.
17. Prior to commencement of audio / video recording, the Contractor shall notify the Engineer in writing when and where the audio / video recording will begin. The Engineer may provide a designated representative to accompany and oversee coverage of all recording operations. Audio / video recording completed without an engineering representative present will be unacceptable unless specifically authorized by the Engineer.

1.06 MANUFACTURERS' FIELD SERVICES AND REPORTS

ADD 3

- A. When specified in individual specification sections or when requested by Engineer, Contractor shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions of surfaces and installation, and quality of workmanship.
- B. Contractor shall submit qualifications of observer to Engineer 30 days in advance of required observations.
- C. Contractor shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer' written instructions.
- D. Contractor shall submit report in duplicate within 30 days of observation to Engineer for information.

1.07 MANUFACTURERS' CERTIFICATES

- A. When required by specified sections, submit three copies of manufacturer's certificates that certify the products meet or exceed specified requirements.

1.08 TESTING SERVICES

- A. When required by specified sections, Contractor shall appoint, employ and pay for specified services of an independent firm to perform testing.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Engineer.
- C. Testing and source quality control may occur on or off the project site. Perform offsite testing as required by the Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Engineer and Contractor indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing does not relieve Contractor to perform Work to contract requirements.

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions of the Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 11135

ADD-3

MECHANICALLY CLEANED BAR SCREEN

PART 1 GENERAL

1.01 SCOPE

A. Work Included:

1. This section includes furnishing and installing one (1) mechanical cleaned fine bar screen to be installed indoors with controls in compliance with the following specification and as shown on the Drawings.
2. All equipment supplied under this section shall be furnished by or through a single Screening System Supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the screening components. The Screen Supplier shall have the sole responsibility for the coordination and performance of all components of the screenings system with the performance and design criteria specified herein.

B. Related Work:

1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions, and sections in Division 1 of these Specifications.
 - a. Section 05530 - Grating and Floor Plates
 - b. Section 09900 - Painting and Finishes
 - c. Section 11280 -Valves
 - d. Section 16170 - Process Control Panels and Hardware

1.02 QUALITY ASSURANCE

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and have at least 25 installations of the specified model of bar screen that have been in successful operation at similar installations and with a minimum of a five (5) year history of satisfactory production acceptable to the Owner. References shall be made available upon request.
- B. The Mechanically Cleaned Bar Screens shall be fully assembled and shop tested at the manufacturing facility prior to shipment. Shop testing shall include a minimum of four (4) hours of run time. The Contractor, Engineer, Owner, or the Owner's representative reserve the right to witness the shop test. A minimum two (2) week notice shall be provided prior to the test to allow for travel coordination.

- C. Qualification of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper installation of the work in this Section.
- D. Data from three (3) separate tests proving compliance of the screen with the "Paint Filter Test" as described in EPA Publication SW 486 Method 9095.

1.03 FABRICATION

- A. Structural steel used in the fabricated parts shall conform to the requirements of "Standard Specifications for Steel for Bridges and Buildings," A.S.T.M. Designation A-36. All shop welding shall conform to the latest standards of the American Welding Society.
- B. Fabricated assemblies shall be shipped in convenient sections permitted by carrier regulations and properly match-marked for ease of field installation.

1.04 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with pertinent provisions of Section 01300.
- B. The following product data shall be submitted in accordance with the approved Construction Schedule required in Section 01310 of these Specifications:
 - 1. Shop Drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades;
 - 2. Manufacturer's recommended installation procedures which, when approved by the Engineer, will become the basis for accepting or rejecting actual installation procedures used on the Work.
 - 3. Full scale field test data demonstrating the performance required in this Section of the Specifications. If such data is not available, the Contractor shall be responsible for running performance tests at start-up. The specified performance must be met before the equipment is accepted. All testing costs shall be borne by the Contractor.
- C. Upon completion of this portion of the Work, as a condition of its acceptance, deliver to the Engineer three copies of an operation and maintenance manual compiled in accordance with the provisions of Section 01730 of these Specifications.
- D. To be selected as an approved equal a submittal showing compliance with these specifications shall be submitted ten (10) days before bid opening. Selected equipment manufacturers will be added by addendum.

1.05 PRODUCT HANDLING

- A. Comply with pertinent provisions of Section 01600.

1.06 WARRANTY

- A. Manufacturer shall provide a written one year standard warranty from the date of substantial completion to guarantee that there shall be no defects in material or workmanship in any item supplied.
- B. Manufacturer shall warrant for the period of five (5) years all rotating parts of the Mechanically Cleaned Bar Screen including the gear motor, bearing, drive head, and the link system including the links, castings, pins and retaining rings. Manufacturer warrants that these components shall be replaced if damaged or defective in the normal use of the equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements of these Specifications and Drawings, manufacturers offering Screens which may be supplied for the work include the following:
 - 1. Duperon Corporation, Saginaw MI Model FlexRake Stainless Steel Link driven, Front Cleaning, Front Return with Duperon Corporation WC3.A1.5 (3/4 HP Motor) Washer Compactor
 - 2. Vulcan Industries, Inc Model VKR-32 Knuckle Rake Bar Screen with Vulcan Industries Model EWP 250/600 Washing Press
 - 3. Parkson Corporation, Aqua Caiman™ Flex Rake
 - 4. Or equal.
- B. To be selected as an approved equal a submittal showing compliance with these specifications shall be submitted ten (10) days before bid opening. Selected equipment manufacturers will be added by addendum
 - 1. The design and layout shown on the drawings are based on the Manufacturer listed above. If equipment other than that of the Manufacturer shown is submitted to the Engineer for consideration as an equal, it shall be the responsibility of the CONTRACTOR wishing to make the substitution to submit with the request a revised drawing of the mechanical equipment and basin layouts acceptable to the ENGINEER.
 - 2. Changes in architectural, structural, electrical, mechanical and plumbing requirements for the substitution shall be the responsibility of the CONTRACTOR wishing to make the substitution. This shall include the cost of redesign by ENGINEER or ENGINEER'S SUBCONSULTANTS. Any additional cost incurred by affected subcontractors shall be the responsibility of the CONTRACTOR and not the OWNER. Any such changes to the plans shall be stamped by a professional engineer registered the State of Ohio.

2.02 BAR SCREEN BASIS OF DESIGN

- A. The Screen shall be a front-cleaning type with multiple rakes to clean the debris from the bar rack on the upstream side. Back-cleaned screens and single-rake screens are not acceptable. Wall seals shall be supplied and attached to the side frames to seal the area between the screen and channel walls.
- B. The Screen shall have at least 0.5 scrapers below water level at any one time and shall have a rated volume of debris removal capacity at high and low speeds. Those capacities shall be at least 9 cubic feet per hour at low speed and 39 cubic feet per hour at high speed.
- C. The bars shall be shaped to reduce the pass through of solids and shall limit the headloss through the screen in both clean water and wastewater.
- D. The Screen shall be designed to run continuously (24/7).
- E. The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. The drive output shaft rotation shall be constant and in one direction in order to reduce maintenance and increase product life. Units which have single raking arms or that require cycle times shall not be allowed.
- F. Designs employing the use of endless moving media or cables and hydraulic cylinders to remove debris from the channel shall not be allowed.
- G. The design shall be such to ensure that all maintenance can be accomplished at the operating floor level or above. No part of the drive system including sprockets shall be located below the water surface at maximum design flow unless such a design also employs a pivot system that would allow the screen to be rotated out of the channel for maintenance. Such a system would require structural evidence that there would be no adverse stress to the equipment while lifting out of the channel.
- H. The fine screen shall be designed and built to withstand maximum possible static and hydraulic forces exerted by the liquid to the screen. All structural and functional parts shall be sized for the loads encountered during the screening, conveying and pressing operations. All submerged components and all components of the fine screen in contact with the screened solids shall be of 304 stainless steel construction.
- I. Design Conditions:
 - 1. Normal daily flow 0.40 mgd
 - 2. Maximum daily design flow 1.0 mgd
 - 3. Peak hourly flow design 1.4 mgd
 - 4. Channel width 3'-0"
 - 5. Effective bar screen width 2'-0"
 - 6. Channel depth 16'-6"

- | | |
|---|---|
| 7. Discharge height of Washer Compactor | 5'-0" |
| 8. Maximum water level | 1'-3" |
| 9. Bar spacing (clear opening) | 10.25" |
| 10. Maximum clean water headloss | 4" |
| 11. Maximum wastewater headloss | 8" |
| 12. Liquid level sensing system | 1 upstream ultrasonic meter,
water resistant |

J. Data for Indoor Installation:

- | | |
|--------------------------------------|-------------------------------------|
| 1. Ceiling clearance height: | 14 feet |
| 2. Roof Opening available: | No |
| 3. Door Opening Size: | Rolling 12 ft. x 12 ft. |
| 4. Installation Area Classification: | CL. 1, Div. 1, Gr. D after start up |
| 5. Washer Compactor: | Yes |

2.03 DETAILED COMPONENT SPECIFICATIONS

A. Bar Screen Assemblies. Unless noted otherwise materials of construction shall be 304-type stainless steel. A stainless steel channel bottom plate shall be an integral part of the bar screen assembly to fully engage scrapers in the bar screen at the base of the unit and assure that the raking mechanism reaches the bottom of the screen to prevent debris accumulation. The bar screen assembly shall be shipped in one piece.

1. Screen Bars: Bars shall be 316L stainless steel and be teardrop or trapezoidal shaped with a Hydraulic coefficient shape factor of 0.76 (teardrop bar) or 0.92 (trapezoidal bar) and the minimum dimensions of 0.25 inch x 0.75 inch x 0.13 inch. Bars shall be individually replaceable or replaceable in sections without welding.
2. Side Fabrication: The screen framework shall be bent plate with a minimum 3/16 inch cross section. Horizontal members shall be stainless steel bent plate or stainless steel pipe. Support members and frame shall adequately support the bar screen based on site specific requirements.
3. Dead Plate: Dead plate shall be 0.25 inch thick stainless steel. The dead plate shall be flat and true; span the entire width of the unit; and transition from bar screen to discharge point.
4. Discharge Chute: The discharge chute shall be 11 gauge, 304 stainless steel minimum. The discharge chute shall be bolted to the dead plate and shall be designed to allow debris to be transferred from discharge point into the debris containment.
5. Link Slides: The link slide assembly shall be provided per manufacturer standard design and shall be constructed of UV stable UHMW PE rollers and 304 stainless steel supports and components.

- B. Return Guide/Closeouts: Return guide/Closeouts shall be 304 stainless steel and shall assure proper alignment of scrapers as they enter the bar screen and assure that there is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.
- C. Debris Blade: A 304 stainless steel and UV Stable UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed to assist in removing debris from the scraper on the bar screen unit as recommended by the manufacturer. Hydraulic, shock or spring controlled debris blade mechanisms are not acceptable.
- D. Screen Enclosure: A 14 gauge #4 brushed satin finish 304 stainless steel enclosure shall be installed to cover the screen above the operating deck level. Front enclosure shall have removable panels for access to equipment. Removable panels shall be 16-gauge stainless steel and shall be provided with knurled knobs for "no tool required" access. Alignment notches shall be included to support repositioning of removable panels. The top of the front enclosure shall include a knock out for a customer site option to install a 6-inch pipe stub. (The option of connecting to the site's exhaust system, to provide a positive air exchange from interior of enclosure, by Others.) Rear enclosure shall have hinged removable doors and shall be secured with a lift-slide-latch handle or ¼-turn cam latches. Rear removable door shall include an integral viewing door that shall be secured with a lift-slide-latch handle or ¼-turn cam latches to provide access for a quick look inside.
- E. Link System: the link system shall be passivated stainless steel castings and have a minimum ultimate strength of 60,000 lbs. with a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs. each. Parts must meet ASTM A380 specification for surface finish.
 - 1. 304 or CF8M stainless steel system includes 302 stainless steel retaining rings and 304 or 316 stainless steel pins.
- F. Scrapers: Scrapers shall be spaced 21 inches apart or spaced so that there are at least 0.5 scrapers under water at any one time. To provide long product life the scraper shall move at no greater speed than 30 inches per minute at standard operating speed of ½ rpm allowing for approximately one debris discharge per minute. Staging Scrapers and Thru Bar Scrapers shall be a maximum ratio of 3:1 per manufacturer recommendations. At least one scraper every 84 inches shall fully penetrate the bar screen, cleaning all three sides of the bars as well as through to the cross members in openings of 0.25, 0.375, and 0.50 inches.
 - 1. Staging Scrapers: Staging scrapers shall be one inch thick x 4 inches x screen width UV Stable UHMW-PE with a serrated edge.
 - 2. Thru Bar Scrapers: Thru bars scrapers shall be minimum 0.375 inch thick x 5 inches x screen width 304 stainless steel.
- G. Drive Head: The Drive head shall be located at the top of the bar screen.

1. Drive Unit: Each bar screen unit shall operate independently and shall have its own drive unit and driven components.
 - a. Drive Sprockets shall be coated ASTM A48, CL40 cast iron with ASTM A536 80-55-06 ductile cast iron end castings or 304 stainless steel.
 - b. Drive Shaft shall be AISI 1018 steel or 303 stainless steel.
 - c. Gearbox shall be shaft-mounted, right angle type and include spiral bevel gearing. The output shaft speed shall be controlled by a vector type inverter or per rake manufacturer's recommendation. It shall have at least a 1.52 or greater service factor based on machine torque requirements. The gearbox may or may not be vented to the outside atmosphere. The gearbox shall be grease filled or oil filled. Oil filled gearboxes are not allowed.
 - d. The motor shall be AC induction type, high efficiency, inverter duty, 3 phase 480 volt and mounted to the gear reducer. The motor shall be $\frac{1}{2}$ HP, designed for 1800 RPM base speed and rated Class I, Groups C & D, Class II Groups F & G environments. The motor shall have an EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be 1.0 or greater, Class F insulation and be optimized for IGBT type inverters. The motor must be UL listed and designed for continuous operation.
 - e. Motor shall have built in, normally closed, thermostat to protect from overheating that is to be field wired to corresponding terminal in control panel for redundant (ambient) overload protection.
 - f. All drive head components shall be of components available in the United States.
 2. Bearing: bearing shall be greased ball bearing type, non-self-aligning, sealed and lubricated and shall have a 24 day, 7 day a week, 360 day a year L10 life of 20 years when in compliance with stated O&M recommendations. Non-sealed bearings are not acceptable.
 3. Speed Reducer: Reducer shall be a double-reduction, cycloidal or helical worm style and shall comply with all applicable AGMA standards. The speed reducer shall be capable of a 4/1 speed range with variable output speeds between 0.50 to 2.2 output torque of 11,000 in.lb. And have a gear ratio of 809:1 or 837:1.
- H. Standard Coating: All non-stainless bar screen components shall be coated in strict accordance with the paint manufacturer's specification. Surface Preparation shall be done in accordance with SSPC-SP-10 f Tnemec as follow: Prime Coat Series 90-97 Tnemec Zinc at 2.5-3.5 mils DFT, Intermediate Coat series 27 F.C. Typoxy at 3.0-5.0 mils DFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils DFT. Standard color is 11SF Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements. Types and thickness of paint coat will be more conservative of this and the specification found in Section 09900.

Alternative: Any alternate products must provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those

products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.

- I. The bar screen shall be provided with a 304 stainless steel custom return guide/closeouts for by-pass, which shall be securely fastened to the frame of the bar screen and secured to the base plate as shown on the drawings.

2.04 ELECTRICAL, CONTROLS, INSTRUMENTATION

- A. General: Controls for each rake and washer compactor shall be in enclosures provided by the bar screen manufacturer. The bar screen manufacturer shall be responsible for proper sizing and function of the controls at 480 VAC, unless specified otherwise. The power to the control panel will be 480 V, 30, 60 Hz.

1. Main control panels will be installed in a controlled environment out of direct sunlight and in a temperature range of 35 to 104 degrees F.
2. Controls shall be designed to accept incoming power supply per the Drawings and shall include a step down transformer as needed to achieve 120 volts.
3. Control panel shall be constructed to meet the appropriate NEMA classification requirements and will include a main, lockable disconnect. The panel will be constructed by a UL certified panel build facility and will be supported by the appropriate UL labeling.
4. Controls shall be tested prior to shipment to Owner. The rake manufacturer shall verify all overload settings in the rake controller to insure proper overload and speed settings required for the application are properly programmed.
5. Panel and panel mounted devices shall be labeled with engraved I.D. markers that reference back to the system schematics. Tags shall be white with black core, engraved as required. Refer to Section 16195.
6. Contractor shall be responsible for all field wiring and power cables between the bar screen Main Control panel and the Local Push Button Station.

- B. Components:

1. Main Control Panel (Screen and Washer Compactor)
 - a. Enclosure shall be NEMA 4x 304 SSTL.
 - b. Enclosure shall not be located in an explosive environment.
 - c. Main Control panel shall be designed with a SCCR rating of 18KA at 480 VAC minimum and labeled as such, unless otherwise specified.
 - d. All terminals utilized in the main panel shall be 600V rated terminals and 20% spare terminal space shall be provided for any potential future revisions.
2. The screen manufacturer shall provide one (1) Primary Control Panel mounted remotely and contain the following controls at a minimum:
 - a. Main circuit breaker

- b. VFDs
 - c. Control transformer
 - d. Control power "OFF-ON" selector switch
 - e. Time clock to initiate operation
 - f. Elapsed run-time meter
 - g. Screen failure alarm light
 - h. Screen running light
 - i. Power on light
 - j. Float switch - mercury encapsulated float back up level control
3. The screen manufacturer shall provide one (1) secondary control station to be mounted at the screen rated NEMA 7 and to contain one "Hand-Off Auto" selector switch with lockout provisions in the "OFF" position. Local station shall be located within ten feet or as close to the equipment as safely possible and be field wired by the Electrical Contractor to the corresponding terminal inputs in the main control panel.
 4. The bar screen mode of operation shall be controlled by the "H-O-A" selector switch and the remote pushbutton station shall include HOA, Forward/Off/Jog Reverse and E Stop buttons. In the "Hand" mode, the screen shall run continuously. In the "Auto" mode, the screen shall run by a repeat cycle timer or the level controller.
 5. Relay based controls shall include the following:
 - a. Variable Frequency Drive (VFD)
 - b. Electronic torque control
 - c. Hard contact SCADA interlock (s)
 - d. Adjustable on/off cycle timers
 6. Instrumentation: A separate level system shall be installed and field wired per the manufacturer's instructions. The level sensor system shall be installed in the control panel.
 - a. The level sensor system shall be a Siemens HydroRanger 200 HMI with one Ultrasonic Level Transducer for Class 1 Div. 1 hazardous environments, or equal. Transducer shall be installed upstream of the rake as shown on the Drawings and shall not have obstructions between the transducer face and the water surface. The level sensor will be configured with two level setpoints.
 7. The control panel shall be equipped to interface with the SCADA system. The interface shall incorporate the following control points:

Description	Type
Panel Power Fail	DO
Screen HOA Position	DO x 3
Screen Failure Alarm	DO
VFD Fault	DO

8. Operation and control of the Screen shall be controlled by the control panel provided by the equipment manufacturer. SCADA Interface Panel.

2.05 WASHER COMPACTOR

A. Design Features:

1. Compacting Action: Dual augers provide positive displacement action, are orientated on top of each other and rotate in opposing directions. The augers are intermeshed and are of 1 left hand and 1 right hand lead and shall have ability to rotate, 2.2 RPM in opposing directions. Compactor augers shall be designed with a limited float on top of a perforated plate, allowing them to accommodate irregular debris. Alternately, a single auger shall be furnished for compacting action using patterns of forward and reversing action to accomplish the cleaning of the screenings.
2. Washing Action: Wash port manifold is integrated prior to the compaction housing and delivers 3 to 19 GPM assuming supply pressure is 40 to 60 PSI at a ½ inch NPT connection for attaching water source utilizing filtered effluent or municipal water. Washing action is flood wash type from a minimum of one and maximum of four ½ inch NPT solenoid valves for wash water supply. Drain connection shall be 3" NPT male.
3. Operation: Washer Compactor is designed to be continuous run not requiring operator. If the design requires, the Washer Compactor shall be equipped with a self-regulating, active pressure zone designed to accept non-standard wastewater debris in its original form, such as rocks, broken concrete, and metal (bolts, short pipe, etc.) up to 4 inches long. Washer Compactor shall have the ability to process multiple pieces of clothing, variable volumes of debris, and unprocessed septage or grease. Compactor moves at minimum operating speed of 2.2 RPM and can run intermittently to sync with upstream equipment.

B. Components:

1. Compactor Housing: The compactor housing shall be constructed of stainless steel and be a minimum of 11 gauge and connect to 3/8 inch thick flanges.
2. Augers: Shall be of stainless steel (see table for material options available) with flights 3/8 inch and have a 4 inch flight pitch. Augers shall float mounted in a UHMW thrust and plane bearing arrangement that allows movement for accommodation of irregular debris. Alternately, a hollow shaft, single auger design shall be provided in alloy steel having a Brinell hardness of 200 with a nominal diameter of 8 ½ inches with ¾ inch thick flights and a 9½ inch flight pitch. An independent, 304 stainless steel thrust bearing shall be flange mounted between the compactor housing and drive assembly. The thrust bearing shall to fully support the auger in a cantilevered position inside the compactor housing and handle all loads created during compaction and reversal of the screw.
3. Drive Assembly:
 - a. Each Washer Compactor unit shall operate independently and will have its own drive unit and driven components. The gearbox may or may not be vented to the outside atmosphere.

- b. The gearbox shall be grease or oil lubricated and designed for 5 years (or 20,000 hours of operation) between recommended clean and re-grease services. The gearbox shall be right angle type and shall incorporate cycloidal and spiral bevel or helical worm gearing with a minimum ratio of 105:1. The gear reducer output shaft speed shall be 0.5 RPM minimum - 2.2 RPM maximum and controlled by an AC Tech, vector type inverter or greater service factor based on unit torque requirements. It shall be shaft mounted utilizing the keyless Taper- Grip® bushing or keyed to the shaft.
 - c. The motor shall be mounted to the gear reducer by utilizing a quill, C-Face mounting style. The gear motor shall be AC induction type, minimum 3/4 HP, 3 phase, 60 Hz, /230/460 volt, explosion proof, inverter duty high efficiency model.
 - d. The drive assembly shall incorporate the coating system as specified herein and in Section 09900.
- 4. Speed Reducer: Shall have a maximum output of 2.2 RPM, a minimum 105:1 reduction ratio with 18,500 in-lb of output torque.
- 5. Thrust Bearings (if the design requires): Shall be Delrin or equivalent, self-lubricating and be capable of withstanding minimum 2000 Lb of thrust load (each auger) at 2.2 RPM for life of machine.
- 6. Screw supports (if the design requires): Shall be UHMW plane type, self-lubricating and fastened into place using stainless steel fasteners.
- 7. Spur Gears (if the design requires): Shall be 17-4 PH stainless steel.
- 8. Spare Parts and Special Tools:
 - a. Shall include the following:
 - 1) Plane bearing kit includes:
 - a) 2 side screw supports (if the design requires)
 - b) 2 upper/lower screw supports (if the design requires)
 - c) Fasteners (if the design requires)
- C. Fabrications: All welded fabrications are to be made from stainless steel (see table for material selections). All welded connections and welding procedures shall comply with AWS "Structural Welding Code - Sheet Steel" D1.3/D1.6.
- D. Select Parts: Select power transmission parts to be made from cast iron; however, shall conform to coating as follows.
- E. Discharge Bagging Device: The end of the discharge section will be equipped with a type 304 stainless steel transition piece and continuous bagging device to capture the dewatered screenings. The bagging device shall be supplied with a replaceable magazine of continuous plastic hose.
- F. Standard Coating:
 - 1. Motor Gearbox shall be coated in strict accordance with the paint manufacturer's specification. Surface Preparation shall be done in accordance with SSPC-SP-10 Near White. The three-part coating system shall be manufactured by Tnemec as follows: Prime Coat Series

90-97 Tnemec Zinc at 2.5-3.5 mils OFT, Intermediate Coat Series 27 F.C. Typoxy at 3.0-5.0 mils OFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils OFT. Standard color is 11SF

Safety Blue. Material shall meet all state and federal VOE and other regulatory requirements.

Alternatives: Any alternate products must provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.

2. Non-metal: Parts not covered above shall be made from UHMW polyethylene.

2.06 ELECTRICAL DEVICES AND CONTROLS

A. Controls

1. Controls shall be provided by Washer Compactor manufacturer.
2. Controls shall be designed to accept 3PH 240/480 volt incoming power supply per Drawings and Specifications. Control panel power shall be 1PH/120VAC and shall include a step-down transformer to achieve 120V.
3. Controls shall be built by a UL-approved panel builder and bear the UL-approved logo. Controls shall be tested by panel builder and by the Washer Compactor manufacturer prior to shipment to owner. The Washer Compactor manufacturer shall verify all overload settings in the Washer Compactor controller to ensure proper overload and speed settings required for the application are properly programmed.

B. Main Panel:

1. Controls for the Washer Compactor shall be integrated into the Mechanical Bar Screen main panel.
2. Main control panels require shading from the sun and shall be operated within a temperature range between 35 and 104 F. Sunshields, visors, or other structures necessary to provide shade are by others.
3. The controls shall be rated NEMA 4X, yet be located in a climate-controlled environment and be mounted per Drawings.
4. Control panel shall have an inner door pocket that includes a copy of As-Built drawings from the manufacturer, as well as any other pertinent documentation necessary to properly operate the controls.
5. The control package shall include the following and utilize the panel builder's standard component manufacturers, unless otherwise approved by the Washer Compactor manufacturer:
 - a. N4X 304 SSTL enclosure with continuous hinge, exterior, lockable

- door.
 - b. High voltage transformer.
 - c. HOA Selector where Hand mode shall enable the local station and Auto receives a Run signal from a remote/discrete source. When input signal is cut, the Washer Compactor shall then utilize an off-delay timer to allow debris to finish depositing.
 - d. Magnetic starter or Speed controller (based on vector drive technology), pre-programmed for speed/overload control by the panel builder and verified by the Washer Compactor manufacturer.
 - e. Dry contact input for motor thermostat to shut down equipment if motor overtemp condition occurs.
 - f. Dry contact output signals for "Run", "Start Solenoid", "Common Fault", and "In Auto" conditions.
 - g. 120 VAC output power to wash water solenoid.
 - h. Dry contact input terminals for "Remote Run", "Motor Thermostat", and remote station.
 - i. Main control power breaker with lockable, thru-door operator.
 - j. Elapsed run-time meter.
 - k. "Push-to-Test" type indicator lights for "Power On", "Forward", "VFD Fault", and "Motor Overtemp".
 - l. Phenolic label on outer door indicating equipment identification number in accordance with Section 16195.
 - m. Push/Pull E-Stop on outside of enclosure.
6. Interface of the Water Compactor Controls with the SCADA Interface Panel shall incorporate the following data points:

Description	Type
Washer Compactor - Run	DO
Washer Compactor - In Auto	DO
Washer Compactor - Common Fault	DO
Washer Compactor - Motor Overtemp	DO
Washer Compactor - VFD Fault	DO

7. Operation and control of the Washer Compactor shall be controlled via the control panels provided by the equipment manufacturer. The SCADA Interface Panel shall serve a monitoring function only.

C. Remote Panel:

1. A NEMA 7/9 remote push button station is required to maintain equipment requirements and local safety codes.
2. The remote station shall be rated NEMA 7/9 and include H-O-A, Forward/Off/Jog Reverse, and E-Stop buttons. The remote station shall be mounted as close to the equipment as safely possible and be field-wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.

D. Sequence of Operations:

1. The controls shall enable the remote push button station installed near the Washer Compactor when in Hand mode and utilize an input signal from a remote source when in Auto mode. Upon receiving a stop signal in Auto mode, the Washer Compactor shall utilize an off-delay timer to allow debris to finish depositing.
2. With the use of a speed controller, fault shall be cleared by turning off the Washer Compactor, then waiting approximately three minutes (or time designated per current UL standards) and then turning the HOA back to the desired setting. A motor overtemp fault shall clear automatically when the motor cools to be within normal operating range. With the use of a motor starter, fault shall be cleared by pushing the common reset push button.

E. Miscellaneous

1. The following shall be provided by the electrical contractor and are not part of the Washer Compactor manufacturer's scope of supply:
 - a. Mounting stands
 - b. Mounting hardware
 - c. Field wiring and conduit
 - 1) VFD rated motor cable (Belden #29502 or equal) is recommended for all motors with use of a VFD.
 - 2) Motor cables shall be less than 80 ft long unless specified otherwise
 - d. Junction boxes
 - e. Installation
2. The field wiring shall include (but not be limited to) the following connections as applicable:
 - a. Incoming power supply to the main control panel
 - b. All required grounding of the motor and controls
 - c. Motor to the main control panel
 - 1) VFD rated motor cable (Belden #29502 or equal) is recommended for all motors with use of a VFD.
 - 2) Motor cables shall be less than 80 ft long unless specified otherwise.
 - d. Motor thermostat to the terminal inputs in the control panel
 - e. Input and output signal wiring for remote start/stop as required by plans/specs
 - f. Remote station contacts to the corresponding terminal inputs in the main control panel

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion

of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the Work of those trades for interface with the work of this Section.

3.03 INSTALLATION

- A. Install the work of this Section in strict accordance with the manufacturer's recommendations and shop drawings as approved by the Engineer. All conduit and interconnecting wiring between the primary control, secondary control station, and electrical components on the screen shall be supplied and installed by the Contractor.
- B. Anchor Bolts: Anchor bolts and nuts shall be 304 stainless steel and furnished for each item of equipment by the Contractor.
 - 1. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.
 - 2. Anchor bolt sizes, quantity and requirements will be indicated on the submittal drawings. Quantity is site specific but typically each bar screen assembly requires eight to twelve ½" diameter x 4 ½" long embed HILTI HAS RODS with RE-500V3 Adhesive system anchor bolts for screen anchorage and typically eight to twelve ¾" diameter x 3-3/8" long embed HILTI HAS RODS with RE-500V3 adhesive system anchor bolts for the Return Guide/Closeouts anchorage.
- C. Upon completion of the installation, carefully inspect each component and verify that all items have been installed in their proper location, adequately anchored, and adjusted to achieve optimum operation.

3.04 SERVICE

- A. Demonstrate to the Owner's operation and maintenance personnel the proper methods for Operating and maintaining the equipment. Review the contents of the operation and maintenance manual requiring submittal under Article 1.03 in this Section.
- B. The Contractor shall furnish to the Owner, through the Engineer, a written report prepared by the equipment manufacturer's field service technician certifying that:
 - 1. The equipment has been properly installed, in accordance with manufacturer's recommendations.
 - 2. The equipment check out and initial start-up activities have been completed in accordance with manufacturer's recommendations and under the technician's supervision.
 - 3. The equipment is in accurate alignment.

4. The equipment is free from any undue stress imposed by connecting piping or anchor bolts.
5. The equipment has been operated under full load and that it operates satisfactorily and in compliance with the requirements of this section.

C. Testing:

1. After completion of installation, Contractor shall provide for testing. Testing of the Washer Compactor shall demonstrate that the equipment is operational, and that the equipment will wash, compact and deposit materials not to exceed 4 inches.
2. Testing of the bar screen shall include collecting screenings off of the discharge chute and collecting in a non-draining device for a period of at least 72 hours and the screenings shall be tested for moisture content and pass an EPS or State of Ohio Paint Filter test
3. Bar screen equipment shall be tested by confirmed measurement of operation by level measurement in the channel. Bar screen shall initiate and terminate operation from a level measured with the level detection device supplied by the manufacturer within 0.5 inch of the set point of the device. This cycle shall be repeated at least three times for this test.

- D. The Contractor shall include with his bid the on-site service of the manufacturer's field service technician for a period of one (1) eight (8) hour day to be designated by the Engineer. This service shall be for the purpose of instruction of plant personnel.

Washer Compactor Data Sheet	
EQUIPMENT:	
Washer Compactor:	1
Bagging System	1
DESIGN SUMMARY:	
Peak Capacity:	30 cu. ft/hour (for approx. 15 minutes)
Average Capacity:	6.5 cu. ft/hour (continuous)
Water: Typical	Utilizes filtered effluent or municipal water
	Consumes 3 to 19 gallons per minute min.
	Requires 40 to 60 PSI
	1/2-inch NPT supply - female threads
	3 inch NPT drain - male threads
Materials of Construction:	304 SSSL
	17-4 spur gears (if applicable)
	Self-lubricating main auger bearings
Hopper Height (Deck to Hopper):	38"
Hopper Length (WC3A1.5 Unit):	27"

PERFORMANCE DATA:	
Performance Parameters	30%-60% dry solids
	60%-70% mass/weight reduction
	70%-80% volume reduction
	Significantly reduces odor and fecal content
MOTOR/DRIVE:	
Motor Size:	3/4 HP (minimum)
Motor Paint:	Tnemec Coating
Motor Service Factor:	1.0
Output Speed:	2.2 RPM (maximum)
Speed Reducer Ratio/Output:	105: 1 or 809:1
Speed Reducer Paint:	Tnemec Coating
SITE POWER:	
Phase/Voltage:	3 Phase (240/480 volt)
CONTROLS:	
Control Panel	NEMA 4X SSTL enclosure
	Main Control Breaker
	Emergency Stop
	HOA (Auto is discreet "Run" input)
	Fwd/Joq Reverse/E-Stop push button station
	"Run" and "In Auto" discrete outputs
	Explosion Proof Local Stations Standard
CONTROLS MOUNTING:	
Mounting Arrangement	Wall
	Pedestal (By Others)
PROJECT MANAGEMENT:	
Submittal Quantity:	2-4
O&Ms Quantity:	2-4
Warranty Period:	1 Year
SHIPPING:	Partially Assembled: Shipped in Pre-Assembled Sections

END OF SECTION

SLUDGE TRANSFER PUMP STATION

PART 1 GENERAL

1.01 SCOPE

- A. Provide two (2) non-clog submersible pumps with one to be installed in a simplex Sludge Transfer Pump Station and one to be turned to the Owner for storage as a shelf item.
- B. Furnish all labor and material to install one (1) Sludge Transfer Pump for pumping aerobically digested waste activated sludge at 1-3 % solids concentration from Aerobic Digester to the Rotary Press located in the Sludge Press Building.
- C. Sludge Transfer pump shall be installed in the existing wet well and consist of pump, discharge piping, valves and fittings, guide rails and supports, lifting chain with hooks, access hatch, motor, VFD drive and power supply, flow control floats, control panel for a complete operating system as shown on the Drawings and as specified herein.
- D. Contractor shall furnish and install a Valve Pit with access hatch as shown on the Drawings.
- E. All piping shall be mounted in the valve chamber and supported in place, ready to bolt to connect to PE piping outside the chamber
- F. A spare pump shall be ready for complete and easy installation in the wet well.
- G. The unit shall include all manufacturers motors, starters/electrical work necessary connecting conduit, wiring controls, control panels within requirements of Division 16.
- H. All applicable requirements of other portions of the Contract Documents apply to the Work of this Section.

1.02 REFERENCES

- A. ASTM – American Society for Testing and Materials
- B. IEEE – Institute of Electrical and Electronic Engineers
- C. NEMA - National Electrical Manufacturers Association

- D. SSPC - Steel Structures Painting Council

1.03 SUBMITTAL

- A. Section 01300 - Submittals: Procedures for submittals.
- B. Product Data: Provide data on joint devices, attachment accessories and admixtures.
- C. Shop Drawings:
 - 1. Pump Performance Curves.
 - 2. Pump Outline Drawing.
 - 3. Station Drawing for Accessories.
 - 4. Electrical Motor Data.
 - 5. Typical Installation Guides.
 - 6. Technical Manuals and Parts List.
 - 7. Printed Warranty.
 - 8. Management system certificate ISO 9001.
 - 9. Manufacturer's Equipment Storage Recommendations.
 - 10. Manufacturer's Standard Recommended Start-Up Report Form.
- D. Maintenance and Operating Instructions
 - 1. Three (3) copies of each Manufacturer's maintenance and operating instructions manual shall be provided with the equipment at the time of delivery.
 - 2. Spare Parts List

1.04 QUALITY ASSURANCE

- A. The manufacturer shall provide data on alternate equipment manufacturer's experience. Only Manufacturers with 20 or more years of experience who have furnished at least 5 similar lift stations shall be considered.
- B. Factory Testing
 - 1. Each completed and assembled pump/motor unit shall undergo the following factory tests at the manufacturer's plant prior to shipment:
 - a. Hydraulic performance test
 - b. No-Leak seal integrity test
 - c. Electrical integrity test

2. Qualifications and Manufacturers Factory test each pump using water with a factory certified motor, the same size as that specified.
3. The pump manufacturer shall provide factory performance tests in accordance with the Hydraulic Institute Standards, latest edition. Certified performance curves shall be submitted for capacity, power requirements and pump efficiency at specified minimum operating head, shut off head and at least three other points.
4. Major components, such as pumps, pump motors, etc., and accessory components failing to perform as specified, or proven defective in service during the guarantee period, shall be replaced, repaired or satisfactorily modified by the Contractor without cost to the Owner.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling of Equipment

1. Inspect all equipment and materials against reviewed Shop Drawings at time of delivery.
2. Equipment and materials damaged or not meeting the requirements of the reviewed Shop Drawings shall be immediately returned for replacement or repair.

B. Storage

1. Carefully prepare for storage and label all equipment and materials after they have been inspected.
2. Store all equipment and materials in a dry, covered, ventilated location and protect from harm according to the manufacturer's instruction.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Pump Manufacturers:

1. Flygt Pump by Xylem
1. ABS Pump by Sulzer
2. Or Equal.

2.02 COMPONENTS

A. Operating Conditions:

1. Each pump shall have an initial capacities and total heads as provided in a Pump Schedule at the end of this specification.

2.03 MATERIALS

- A. Pump housing: ASTM A-48, Class 35B
- B. Impeller and Insert ring: A 532 ALLOY III A (25% Chrome)
- C. Stator housing: ASTM A-48, Class 35B
- D. Shaft: ASTM A479 S43100-T.
- E. Shaft seal: Pump side: Corrosion resistant Tungsten carbide WCCR
- F. Shaft seal Motor side: Carbon (Csb) -Aluminum oxide (AL2O3)
- G. Pump Discharge Connection: Cast Iron ASTM A-48, Class 30

2.04 CONSTRUCTION

- A. Pump shall be supplied with a quick discharge connection/slide rail system to automatically connect the pump to the discharge piping without any adjustments, fasteners, or clamps. Pump shall be furnished with a discharge elbow and 125 lb. flat face ANSI flange.
- B. The pump(s) shall be automatically and firmly connected to the discharge connection guided by no less than two 316 stainless steel guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. A slide rail assembly consisting of 316 stainless steel upper and lower rail brackets, pump guide brackets shall be provided to allow the pumps to be installed or removed without requiring personnel to enter the wet well. Guide rails shall be sized by the pump manufacturer. Guide rails shall be attached securely at the top of the wet well by a non-corrosive, durable bracket.
- C. Pump shall be provided with a replaceable cast iron A 48, Class 30 slide rail guide shoe attached to the pump discharge flange. The guide shoe shall direct the pump down two vertical guide rails and onto the discharge connection in a simple lineal movement. The buildup of sludge and grease on guide rails shall not present problems during the lifting operation. The guide shoe shall be designed with integral hooks at the top to transmit full weight of the pump to the base plate flange, making metal

to metal contact with the pump discharge forming a seal without the use of bolts, gaskets or other elastomeric seals.

- D. All major parts of the pumping unit including casing, impeller, suction cover, wear rings, motor frame and discharge elbow shall be manufactured from gray cast iron, ASTM A-48 Class 30. Casings shall have smooth surfaces devoid of blow holes or other casting irregularities. Casing design shall be centerline discharge with a large radius on the cut water to prevent clogging.
- E. The outlet flange of the discharge connection shall be 3" drilled according ANSI B16.1.
- F. All nuts, bolts, and miscellaneous hardware in contact with the pumped material shall be 316 stainless steel.
- G. Pump shall be provided with a tandem mechanical seal system consisting of two totally independent seal assemblies. The seals shall require neither maintenance nor adjustment and shall be capable of operating in either clockwise or counter clockwise direction of rotation without damage or loss of seal function.
- H. Pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. The seal lubricant shall be non-hazardous.
- I. The pump end shall consist of a dynamically balanced, single vane or two vane, impeller operating in a non-concentric pump case.
 - 1. Pump wearing surfaces shall be easily replaceable with simple hand tools and shall require no remaking of any parts.
 - 2. Scroll type pump cases which tend to unbalance impeller side loading with resultant shaft stress shall not be considered equal
- J. The impeller shall be single or radial multi-vane, open design. It shall be dynamically balanced and shall be designed for solids handling with a long thru-let without acute turns. The inlet edge of the impeller vanes shall be angled toward the impeller periphery so as to facilitate the release of objects that might otherwise clog the pump. The design shall also include back pump out vanes to reduce the pressure and entry of foreign materials into the mechanical seal area. In addition, a lip seal shall be located behind the impeller hub to further reduce the entry of foreign materials into the seal area. Impellers shall be direct connected to the motor shaft with a slip fit, key driven, and secured with an impeller bolt.

The design shall include a replaceable cast iron suction cover. The suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies.

K. Pump Motor

3. The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. It shall be permanently submersible according standard IEC 60034 and protection class IP 68.
4. The motor shall be capable of no less than 15 evenly spaced starts per hour and be able to operate throughout the entire pump performance curve from shut-off through run-out even when the motor is not submerged. The stator windings shall be insulated with moisture resistant Class H insulation rated for 356°F.
5. The motor shall be secured in place by standard threaded fasteners and shall require only simple hand tools for removal or replacement.
 - d. No bolts shall protrude through the motor housing for fastening the stator onto the housing.
 - e. Motor shall be wound for 460 volts, 3 phase. Motor shall have 1.15 service factor. Motor shall be variable frequency rated. Motor shaft shall be one piece 403SS AISI 403 material, rotating on two permanently lubricated ball bearings designed for a nominal L-10 life of 50,000 hrs.
 - f. Thermal sensors shall be used to monitor stator temperatures. The stator shall be equipped with three (3) thermal switches, embedded in the end coils of the stator winding. These shall be used in conjunction with and supplemental to the external motor over protection and wired to the control panel.
 - g. The pump shall be Explosion approved according FM CLASS 1. DIV 1, group C and D locations.
 - h. The cable entry shall consist of dual cylindrical elastomer sleeves, flanked by washers, all having a close tolerance fit against the cable and the cable entry. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.
 - i. The junction chamber containing the terminal board shall be hermetically sealed from the motor by an elastomeric compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.
 - j. The motor shall be equipped with 50 feet of cable suitable for submersible pump applications. The power cable shall

be sized according to NEC and ICEA standards. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet. Stainless steel strain relief cord grips shall be provided for each pump cable.

2.05 JUNCTION BOX

- A. The junction box shall be constructed of structural plastic for corrosion resistance and of adequate thickness to provide stability and mechanical strength. The junction box shall have a fully gasketed cover that is held in place by four (4) captive stainless steel screws with heads of adequate size so that they may easily be installed and removed without the use of special tools. The heads of the screws shall be totally encapsulated so that no metal parts are exposed. The cover shall be fastened to the main body of the junction box by means of a totally corrosion-resistant tether to prevent dropping the cover during service.
- B. An adequate number of sealing-type cord grips shall be supplied for incoming pump and level control cords. The cord grips shall be made of non-corrosive material, such as PVC or nylon, and shall make an effective seal around the wire jacket. The cord grips shall seal to the junction box with an O-ring or gasket.
- C. The junction box shall have a PVC solvent weld type conduit hub of adequate size to accommodate the number of wires required for pump and level control operation. The incoming wires shall be sealed by an external EY type seal-off (supplied by others) so that condensation from the conduit or groundwater will not enter the enclosure. The interior of the enclosure shall be of adequate size to accommodate the wires and connections for pump and level control operation.
- D. The wires running between the control panel and the junction box shall be color-coded and fastened to the pump and level controls by means of adequately sized and insulated twist lock or crimp connectors.
- E. The junction box shall be designed to NEMA 6P (IP67) standards for occasional submergence.

2.06 LIFTING EQUIPMENT

- A. A stainless steel lifting cable of a size recommended by the pump manufacturer. Provide sufficient cable to attach to the hoist cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

- B. Contractor shall supply and install a cable holder made with 4 hooks of Stainless Steel AISI 316.
- C. The float/cable hanger shall be easily accessed from the hatch opening.

2.07 ACCESS FRAMES AND COVERS

- A. The access hatch shall be equipped with a fall protection safety grate. Grating panel(s) shall be aluminum with a powder coat paint finish that is safety yellow (or safety orange) in color. Panel shall be designed to meet the requirements of OSHA standard 29 CFR 1910.23 and be equipped with a hold open device to lock the grating panel(s) in the open position. Hold open device and all hardware shall be Type 316 stainless steel. Panel shall be rated to withstand a live load equal to, or greater than, the design rating of the related access cover. Manufacturer shall provide a twenty-five year warranty against defects in material and workmanship. Sizing to be done by field measurement.

2.08 SURFACE PREPARATION AND PAINTING

- A. All surfaces shall be thoroughly cleaned of dirt, grease, oil, rust, scale, or other injurious substances. All metal surfaces shall be cleaned in accordance with coating manufacturer's instructions.
- B. All castings must be blasted before coating. All wet surfaces are to be coated with two-pack Oxysane Ester Duasolid 50. The total layer thickness should be at least 120 microns. Zinc dust primer shall not be used.
- C. All metal surfaces which shall be partially or wholly submerged shall receive a shop coat of polyester resin primer.
- D. Manufacturer's standard factory finish is acceptable.

2.09 SPARE PARTS

- A. One (1) float
- B. Two (2) hatch operating keys
- C. One (1) seal kit with spare parts
- D. One(1) additional set of bearing for each pump
- E. Spare parts utilized during start-up and prior to acceptance of the equipment shall be replaced by the Contractor at no additional cost to the Owner.

- F. Spare parts shall be shipped with the pumping equipment and stored by the Contractor until turned over to the Owner during project closeout and shall be accompanied by documentation signed and dated by the Contractor's and Owner's representative.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install as indicated and in accordance with manufacturer's written instructions.
- B. Paint touch up is required on all ferrous metal surfaces where necessary.

3.02 INITIAL LUBRICATION

- A. Initial lubrication required for startup and field test operation shall be furnished and applied in accordance with the manufacturer's recommendations.

3.03 INSPECTION, STARTUP, AND TESTING

- A. Prior to the final test, the Contractor shall flush all influent lines to the station and then shall remove all debris and sediment that has accumulated in the station bottom.
- B. The Final Acceptance Test shall demonstrate that all items of these specifications have been met by the equipment as installed and shall include, but be limited to, the following items:
 - 1. That the quick release lift out feature functions properly and allows the pumps to be easily raised and lowered.
 - 2. That all units have been properly installed and are in correct alignment.
 - 3. That the units operate without overheating or overloading any parts without objectionable vibration.
 - 4. That there are no mechanical defects in any of the parts.
 - 5. That the pump sensors and controls perform satisfactorily as to control sequence; i.e. correct start and stop elevations, and proper alarm level functions.
- C. The manufacturer of the pumps shall provide a representative to check the installation, make final adjustments, supervise initial startup of each pump, and prepare a written test report thereof for the Owner.

- D. Field testing shall be provided by the Contractor with the representative of the pump manufacturer present, and witnessed by the Engineer and the Owner:
1. A three point pump performance test shall be performed, measuring the amperage draw, voltage, discharge pressure and the rate of flow.
 2. The rate of flow and head shall be within 10 percent and 5 percent, respectively, above the approved curve for acceptance.
 3. The test results shall be provided to the Engineer prior to the final inspection of the system.
 4. Upon completion of each station, the PUMP MANUFACTURER shall inspect the installation and submit a certificate stating that the installation of the equipment is satisfactory, and that the equipment is ready for operation.
- E. Motor Test
1. Tests shall be performed in accordance with the American Standard Test Code.
 2. Standard commercial test: A certified report of the standard commercial test of the model of motor proposed to be furnished shall be submitted to the Engineer for acceptance.

3.04 OPERATION AND MAINTENANCE MANUALS

- A. Operation and maintenance (O&M) manuals shall be provided prior to or with the delivery of the equipment. The O & M manuals shall include instructions on storage, installation, start-up, and operation and maintenance, together with a complete parts list and a recommended spare parts list. The O & M manuals shall be in compliance with the General Requirements.

3.05 TRAINING

- A. The representative shall instruct the Owner's personnel in the operation and maintenance of the equipment.
- B. Training shall be a minimum of four (4) hours and cover the complete Pumping System and related controls.

3.06 PUMP SCHEDULE

- A. Each pump shall be as specified or equal and have the following characteristics:

<u>Name</u>	<u>No. of Pumps</u>	<u>Type</u>	<u>Drive</u>	<u>GPM</u>	<u>TDH</u>	<u>HP</u>
Sludge Dewatering Feed	1 + 1 spare	Submersible non clog	VFD	15 30	12' 13'	2 min.
3"Ø discharge; Efficiency - minimum 40%						

END OF SECTION

SECTION 16170

ADD. 3

PROCESS CONTROL PANELS AND HARDWARE

PART 1 GENERAL

1.01 SCOPE

- A. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, start-up and place into satisfactory operation all process control panels and enclosures.

1.02 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete
- B. Section 16171 - Panel Mounted Instruments and Devices
- C. Section 16900 - Supervisory Control and Data Acquisition System
- D. Section 16901 - Instrumentation

1.03 RELATED EQUIPMENT SPECIFIED ELSEWHERE

- A. Section 11135 - Screen Control Panel
- B. Section 11360 - Rotary Fan Press Control Panel
- C. Section 11375 - Oxidation Ditch Control Panel

1.04 QUALITY ASSURANCE

- A. Standards, Codes and Regulations:
 - 1. Construction of panels and the installation and interconnection of all equipment and devices mounted within shall comply with applicable provisions of the following standards, codes and regulations:
 - a. National Fire Protection Association 79, Annex "D" Standards, (NFPA).
 - b. National Electrical Code, (NEC).
 - c. National Electrical Manufacturer's Association Standards, (NEMA).
 - d. American Society for Testing and Materials, (ASTM).
 - e. Operational Safety and Health Administration Regulations, (OSHA).
 - f. Underwriters' Laboratory, Inc., (UL).
 - g. State and Local code requirements.

- h. Where any conflict arises between codes or standards, the more stringent requirement shall apply.
- 2. All materials and equipment shall be new and all panels shall be built in an Underwriters' Laboratory, Inc. (UL) approved panel shop and bear the UL label.

B. General Design Requirements:

- 1. Comply with applicable sections of Division 16.

1.05 SUBMITTALS

A. Submit under provisions of Section 01300 and Section 16010.

B. Complete submittal shall be provided to the engineer for approval prior to equipment fabrication. The submittal data shall include the following:

- 1. Product Data - Provide product data sheets for each instrument and component supplied in the panel. The data sheets shall show the component name as used on reference drawings, manufacturer's model number or other product designator, input and output characteristics, scale or ranges selected, electrical or mechanical requirements, and materials compatibility.
- 2. Shop Drawings - Provide drawings for each panel showing the wiring diagrams for control circuits and interconnections of all components. The drawings shall include wiring diagrams for all remote devices connected to the panel.
- 3. Panel Layout Drawings - A front panel and sub-panel layout shall be included as part of each control panel drawing. Components shall be clearly labeled on the drawing.
- 4. Installation Drawings - Typical installation drawings applicable to each panel in the system shall be included.
- 5. Operator Interface - The submittal shall include a generic but detailed technical description of the Operator's Interface as proposed for each panel including:
 - a. Sample text screens and menus
 - b. Sample graphics screens

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Prior to packaging, each manufacturer or Supplier shall securely attach tag number and instructions for proper field handling and installation to each panel.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION REQUIREMENTS

- A. Provide all electrical components and devices, support hardware, fasteners, interconnecting wiring and/or piping required to make the control panels and/or enclosures complete and operational.
- B. Locate and install all devices and components so that connections can be easily made and that there is ample room for servicing each item.
- C. The overall short circuit withstand and interrupting rating of the equipment and devices shall be equal to or greater than the overall short circuit withstand and interrupting rating of the feeder device immediately upstream of the Control Panel, but not less than 65,000 amperes RMS symmetrical at 480 Volts and 22,000 amperes RMS at less than 480 Volts, including all circuit breakers and combination motor starters. Systems of motor controllers employing series connected ratings for main and feeder devices shall not be used. Motor starter units shall be tested and UL 508A labeled for the specified short circuit duty in combination with the motor branch circuit protective device.
- D. There shall be selective device coordination between the Main Breaker, Feeder Breakers and control circuit protective devices. When using a circuit breaker or fuses as a main protective device, the instantaneous trip levels of the main protective device must be higher than the available fault current to the control panel. If fuses are utilized in the control panel design, the protective devices for 3 phase loads shall contain single phase protection of such equipment. If a fault occurs in the circuit of one load of a design with a backup load, the feeder protective device should not remove both loads from the control system.
- E. Use ground fault sensing on grounded wye systems.
- F. The complete control panel assembly shall be UL certified or carry a UL listing for "Industrial Control Panels".
- G. Motor controllers, including associated devices, shall be designed for continuous operation at rated current in a 40 degree C ambient temperature.
- H. Panels and enclosures shall have full front access doors.
- I. Adequately support and restrain all devices and components mounted on or within the panel to prevent any movement.
- J. Provide sub-panels for installation of all relays and other internally mounted components.

- K. All wiring to panel connections from field instruments, devices, and other panels shall be terminated at master numbered terminal strips, unless otherwise specified.
- L. Provide copper grounding studs for all panel equipment.
- M. The bottom 12-inches of free standing panels shall be free of all devices, including terminal strips, to provide ease of installation and testing.
- N. No device shall be mounted less than 36-inches above the adjacent grade level, unless otherwise specified.

2.02 IDENTIFICATION

A. Panel Nameplates:

- 1. Engraved three-layer laminated plastic, black letters on white background unless otherwise indicated.
- 2. Locations: Each control panel or instrument enclosure.
- 3. Nameplate and Letter Size:
 - a. Identification of Panels and Enclosures: Use 1.5 inches (H) by 4 inches (W) nameplate with 1/4 inch letters.
 - b. Identification of Front-Mounted Panel Components:
 - 1) Use 1 inch (H) by 3 inches (W) nameplate with 3/16 inch letters for identifying components with a front surface area of more than 5 square inches.
 - 2) Use 1 inch (H) by 2.25 inches (W) nameplate with 1/8 inch lettering for identifying components with a front surface area of less than 5 square inches.
 - c. Provide 0.5 inch minimum spacing on each side of nameplate to allow for attachment of nameplate using stainless steel screws.

B. Wire and Terminal Markers:

- 1. Wire Markers: Self-laminating type; white labeling area with transparent polyester wrapping, such as the Brady LAT 18-361, or similar marking tape.
- 2. Text: Produced with hand-held laser printer, such as a Brady ID Pro labeler or similar device. Handwritten markings are not acceptable.
- 3. Terminal Markers: Printed labels sized to match the labeling area provided on the terminal strip. Handwritten markings are not acceptable.
- 4. Locations:
 - a. Every terminal within custom built control panels and instrumentation panels.

- b. Every wire terminated to control panel or instrumentation panel terminals.
- c. Every wire terminated to interior components of a control panel or instrumentation panel.
- d. All wiring terminated to field instrumentation.

C. Component Markers:

- 1. Description: Permanently affixed tape or engraved nameplate with 3/16 inch black lettering on white background, uniquely identifying each control device within an enclosure with a number or code corresponding to the circuit diagram.
- 2. Location: On or adjacent to each control device and visible from panel front.
- 3. Handwritten markers are not acceptable.

D. Instrument Identification Tags:

- 1. Description: Engraved three-layer laminated plastic, black letters on white background.
- 2. Locations: Each field instrument.
- 3. Nameplate and Letter Size: Use 0.75 inches (H) by 1.5 inches (W) tag with 1/8 inch lettering.

E. Nameplate Engraving and Installation:

- 1. Install nameplates above front panel-mounted components to correspond with the component that the nameplate identifies.
- 2. Engrave nameplates so that text is at the same heights on all nameplates. Variance in height should not be evident in individual nameplates mounted across the top of a row of components.
- 3. Secure nameplates to front of enclosures or panel backplanes using 20 gage, flat-head, stainless steel screws, countersunk flush with the front of the nameplate.
- 4. Where a row of front panel-mounted components deviate in size, and where the size deviation in these components requires different size nameplates, change the size and text lettering of all nameplates within the row of components to be identical.
- 5. Install nameplates and labels parallel to equipment lines.

2.03 PANELS AND ENCLOSURES

A. General:

- 1. Panels and enclosures shall meet the NEMA requirements for the type specified.

2. Sizes shown are estimates. CONTRACTOR shall furnish panels and enclosures amply sized to house all equipment, instruments, front panel mounted devices, power supplies, power distribution panels, wiring, tubing and other components installed within, as required.

B. Construction Features:

1. Control panels located inside control or electrical room areas shall be NEMA 12 rated unless otherwise designated on the Drawings.
 - a. Fabricate enclosures using minimum 14-gage steel for wall or frame mounted enclosures and minimum 12-gage for free standing enclosures. Steel shall be free of pitting and surface blemishes.
 - b. Continuously weld all exterior seams and grind smooth. Also, surface grind complete removal of corrosion, burrs, sharp edges and mill scale.
 - c. Reinforce sheet steel with steel angles where necessary to adequately support equipment and ensure rigidity and to preclude resonant vibrations.
 - d. Panel shall be flat within 1/16-inch over a 24-inch by 24-inch area, or flat within 1/8-inch for a larger surface. Flatness shall be checked by using a 72-inch long straight edge. Out-of-flatness shall be gradual, in one direction only, and shall not consist of obvious depressions or a series of wavy sections.
 - e. Use pan type construction for doors. Door widths shall not exceed 36- inches.
 - f. Mount doors with full-length heavy-duty piano hinge with stainless steel hinge pins.
 - g. Provide oil resistant gasket completely around each door or opening.
 - h. Provide handle-operated, oil-tight, key-lockable three-point stainless steel latching system with rollers on latch-rods for easy door closing.
 - i. Use stainless steel fasteners throughout.
 - j. Provide interior mounting panels and shelves constructed of minimum 12-gage steel with a white enamel finish.
 - k. Provide steel print pocket with white enamel finish.
 - l. Provide enclosure mounting supports as required for floor, frame, or wall mounting as required by the Drawings.
 - m. Provide all holes and cutouts for installation of conduit and equipment. Cable and piping to enter the enclosure through the bottom, unless otherwise noted. All conduit and piping openings and all conduits shall be sealed watertight.
 - n. Completely clean all interior and exterior surfaces so they are free of corrosive residue, oil, grease and dirt. Zinc phosphatize for corrosion protection.

- o. One coat of primer shall be applied to all interior and exterior surfaces immediately after corrosion protection has been applied. Exterior surfaces shall then be given sufficient coats of primer surfacer, applied with sanding and cleaning between coats, until a Grade 1 finish can be produced on the finish coat.
 - p. All interior surfaces shall be painted with two coats of semi-gloss white polyurethane enamel.
 - q. All exterior surfaces shall be painted with a minimum of three finish coats of polyurethane enamel to ultimately produce a Grade 1 finish (super smooth; completely free of imperfections). Color to be selected by ENGINEER from complete selection of standard color charts furnished by the manufacturer.
 - r. Primer and finish paint shall be compatible and shall be a low VOC, high solids polyurethane enamel, Hi-Solids Polyurethane B65 W300 Series as manufactured by Sherwin-Williams, Inc. or equal.
 - s. Provide one extra quart of touch-up paint for each exterior finish color.
2. Control panels located in field shall be NEMA 4X rated.
- a. Panels shall be Type 316L stainless steel construction with a minimum thickness of 12-gage for all surfaces (except those areas requiring reinforcement) having a smooth brushed finish.
 - b. Stainless steel screw clamp assemblies on three sides of each door.
 - c. Rolled lip around three sides of door and along top of enclosure opening.
 - d. Hasp and staple for padlocking.
 - e. Provide interior print pocket.
 - f. Provide enclosure mounting supports as required for floor, frame, or wall mounting as required by the Drawings.
 - g. Provide all holes and cutouts for installation of conduit and equipment. Cable and piping to enter the enclosure through the bottom, unless otherwise noted. All conduit and piping openings and all conduits shall be sealed watertight.

C. Electrical Systems:

- 1. Control of Environment:
 - a. Outdoor Panels:
 - 1) Where required for the operation of the components interior to the control panel, provide adequately sized automatically controlled 120 VAC strip heaters to maintain temperature inside each enclosure above 40°F to maximum of 80°F when the outside temperature is -20°F through 40° F.
 - 2) Provide automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the

maximum operating temperature rating of the components inside the enclosure. Air conditioner shall have a minimum capacity of 4,000 BTU. Housing shall be constructed of corrosion resistant materials.

- 3) Provide thermostats to automatically control heating and cooling requirements without need of manual operation of a heating/cooling transfer switch.
- 4) Provide documentation if any of the above is deemed unnecessary.
- b. Indoor Panels:
 - 1) Provide adequately sized, automatically controlled 120 VAC strip heaters to maintain temperature 10°F above ambient for condensation prevention inside panels.
 - 2) Provide automatically controlled closed loop ventilation fans or closed loop air conditioners with filtered air louvers if required to maintain temperature inside each enclosure below the maximum operating temperature rating of the components inside the enclosure. Air conditioner shall have a minimum capacity of 4,000 BTU.
 - 3) Provide documentation if any of the above is deemed unnecessary.
2. Power Source and Internal Power Distribution:
 - a. General: Control panel power supply source, type, voltage, number of circuits and circuit ratings shall be as shown on the Drawings or as outlined in the Specifications.
3. Wiring:
 - a. Internal wiring shall be Type MTW and THW stranded copper wire with thermoplastic insulation rated for 600 V at 90°C for single conductors, color coded and labeled with wire identification.
 - b. For DC panel signal wiring, use No. 18 minimum AWG shielded.
 - c. For DC power wiring, use No. 12 minimum AWG. For AC signal and control wiring, use No. 16 minimum AWG. For wiring carrying more than 15 A, use sizes required by NEC standards.
 - d. Separate and shield low voltage signal wiring from power and control wiring by a minimum of 6-inches.
 - e. Group or bundle parallel runs of wire using covered troughs. Maximum bundle size to be 1-inch. Troughs shall have 40 percent spare capacity.
 - f. Install wire troughs along horizontal or vertical routes to present a neat appearance. Angled runs are not acceptable.
 - g. Adequately support and restrain all wiring runs to prevent sagging or other movement.
 - h. Terminate all field wiring using forked, insulated, crimp-on connectors (soldered type not acceptable) at 600 V rated barrier type terminal strips with screwed connections and permanently affixed numeric identifiers beside each connection. Identifiers to be

self-stick plastic tape strips with permanent type, machine printed numbers. For DC field signal wiring, terminal strips shall be capable of handling No. 12 wiring (minimum). Provide Phoenix Contact, Entrelec, Allen Bradley, or equal.

- i. All wiring shall be installed such that if wires are removed from any one device, power will not be disrupted to any other device.
 - j. All alarms generated external to the panel, spare alarm, and repeat contacts shall be wired out to terminal blocks.
 - k. For internal component-to-component wiring only, compression type terminal blocks are acceptable.
 - l. Provide spare terminals equal in number to 20 percent of the terminals used for each type of wiring (e.g., DC signal and AC power).
 - m. Provide a separate terminal for grounding each shielded cable.
 - n. Use separate 5/16-inch diameter copper grounding studs for instrument signal cable shields and AC power.
 - o. Where wires pass through panel walls, provide suitable bushings to prevent cutting or abrading of insulation.
 - p. When DC power and/or low voltage AC power is required, provide and install the necessary power supplies and transformers in the panel.
 - q. Provide circuit breakers to protect each circuit, with no more than six instruments on a single circuit.
 - r. Provide complete wiring diagram showing "as-built" circuitry. Diagram shall be enclosed in transparent plastic and placed in easily accessible pocket built into panel door.
4. Surge Protection:
- a. General: Surge protection shall be provided to protect the electronic instrumentation system from surges propagating along the signal and power supply lines. The protection systems shall be such that the protection level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level, and be maintenance free and self-restoring. Instruments shall be housed in suitable metallic cases, properly grounded. Ground wires for all surge protectors shall be connected to a good earth ground and where practical each ground wire run individually and insulated from each other. These protectors shall be mounted within the instrument enclosure or a separate junction box (compatible with the area designation) coupled to the enclosure.
 - b. The units shall be as manufactured by Telecommunication Industries, Inc., Joslyn, or equal.

2.04 CONTROL PANELS WITH MOTOR STARTERS / VFD's

- A. Provide NEMA 12 enclosures for indoor applications and NEMA 4X 316 stainless steel enclosures for all other applications unless otherwise

noted.

- B. Control panels shall be produced by a UL 508A control panel shop. The control panels shall qualify for and be labeled with a UL 508A label. The label shall state the short circuit current rating (SCCR) of the control panel as determined in accordance with Part SB of UL 508A. The minimum SCCR rating required are:
 - 1. 42 KA for control panels with a 480 Volt power input.
 - 2. 14 KA for control panels with a power input of less than 480 Volts.
- C. Provide a main circuit breaker for each control panel: Main circuit breaker shall:
 - 1. Be of the thermal magnetic type.
 - 2. Have the required AIC rating to achieve the SCCR rating called for by the voltage rating of the control panel.
 - 3. Have a mechanism added to the circuit breaker to operate its on/off handle via a flexible cable operating mechanism attached to the enclosure flange-mounted operator handle as described for the enclosure.
 - 4. Have lightning arrestor on the line side of the main circuit breaker for surge protection. Mount lightning arrestor inside of NEMA 1 box inside of control panel enclosure to protect against destructive failure of lightning arrestor should this occur. Lightning arrestors shall be Delta Lightning Arrestor, Big Spring TX, model LA 303 or approved equal.
- D. Where control panels are indicated to incorporate motor starters, provide combination motor starters for each motor to be powered from the panel. Combination motor starters shall:
 - 1. Be fed from the control panel main circuit breaker
 - 2. Consist of a thermal magnetic circuit breaker, a NEMA rated and sized contactor and an overload unit to provide a full voltage, across-the-line starter for each pump at the pump station unless otherwise noted. NEMA Size 1 contactors shall be the minimum size provided. Overload unit shall have a calibrated adjustment dial, calibrated in amperes, for adjusting the setting of the unit. Unit shall be set to trip at 1.25 times the full load amps (FLA) of the pump motor for motors with a marked service factor of not less than 1.15 or motors with a temperature rise of 40°C or less. For all other motors, set unit to trip at 1.15 times the motor FLA. Unit shall be either ambient compensated or ambient insensitive.

- E. Where control panels are indicated to incorporate variable frequency drives (VFD's), provide VFD's for each motor to be powered from the panel. VFD's shall be as outlined in Section 16425.
- F. Control power shall be provided from within the control panel. Control power shall:
 - 1. Be 120V AC
 - 2. Be from an internal control power transformer located downstream of the main circuit breaker sized for the VA rating of the electrical items powered by it. Provide two fuses on the primary side of the control power transformer and one fuse in the ungrounded leg on the secondary side of the transformer.
 - 3. Power the motor space heater inside of each motor that the control panel powers. The control power transformer shall provide this 120 volt power. The motor space heater power shall be switched by a relay circuit that energizes the heater only during periods of motor inactivity.
- G. Relays, timers and internal control wiring shall be as specified in Section 16171, Panel Mounted Instruments and Devices.
- H. Provide the control panel switches, lights, time delays, discrete and analog input and output signal provisions and other control items as shown on the instrumentation and electrical drawings. As a minimum, the control panels shall have the following items for each motor:
 - 1. Red run light indicating that the motor is operating
 - 2. Green stopped light indicating that the motor is stopped
 - 3. Amber common alarm light indicating the presence of an alarm. Alarms shall remain latched until reset.
 - 4. Elapsed time meter (hour meter)
 - 5. Discrete run contacts that close when motor is running.
 - 6. Discrete alarm contacts that open when the motor experiences any alarm condition.
- I. Provide a print pocket on the inside of the control panel door. Place a plastic laminated copy of each manufacturer drawing for the control panel in the print pocket.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install equipment in conformance with NEC.
- B. Unless otherwise noted, wall-mount indoor panels.

- C. Unless otherwise noted, install outdoor panels on support structure with reinforced concrete housekeeping pad as shown on the Drawings:
- D. Install and interconnect all equipment, devices, electrical hardware, instrumentation and controls and process controller components into and out of and among the enclosures as indicated on the Drawings.

3.02 TESTING AND ADJUSTMENTS

- A. Perform system testing and make any adjustments necessary in accordance with this Section.
- B. Perform power supply, voltage adjustments to tolerances required by the appurtenant equipment.

3.03 PANEL SCHEDULE

A. Post Air Blower Local Control Panel

Panel:	Post Air Blower Local Control Panel				
Location:	UV Area Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	20A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	Post Air Blower	5	Motor Starter	HOA	R, G, A ₁ , A ₂ , RTM
<u>Equipment Control Interface:</u>					
	<u>Description</u>				<u>Type</u>
	Post Blower High Pressure (alarm condition - A ₁)				DI
	Post Air Blower High Temperature (alarm condition - A ₂)				DI
<u>SCADA Interface:</u>					
	<u>Description</u>				<u>Type</u>
	Panel Power Fail				DO
	Blower Run				DO
	Blower HOA Position				DO x 3
	Blower High Temperature				DO
	Blower Over Pressure				DO
<u>Panel Control Logic:</u>					
-	In "AUTO" Blower operates based upon a 24-hour timer.				
-	Timer sequence is set by Operator at LCP.				
-	Timer shall incorporate option for a minimum of three (3) operational periods in a 24-hour period.				

Clarifier Local Control Panel

Panel:	Clarifier Local Control Panel				
Location:	Clarifier Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	20A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	Clarifier #1	1/2	Motor Starter	On/Off	R,G, A ₁ , A ₂
	Clarifier #2	1/2	Motor Starter	On/Off	R,G, A ₁ , A ₂
<u>Equipment Control Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	Clarifier #1 – 100% Torque (alarm) (A ₁)	DI			
	Clarifier #1 – 100% Torque (alarm/shutdown) (A ₂)	DI			
	Clarifier #2 – 100% Torque (alarm) (A ₁)	DI			
	Clarifier #2 – 100% Torque (alarm/shutdown) (A ₂)	DI			
<u>SCADA Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	Panel Power Fail	DO			
	Clarifier #1 – Run	DO			
	Clarifier #1 – High Torque	DO			
	Clarifier #1 – Torque Overload	DO			
	Clarifier #2 – Run	DO			
	Clarifier #2 – High Torque	DO			
	Clarifier #2 – Torque Overload	DO			
<u>Panel Control Logic:</u>					
-	Clarifier equipment is manually actuated at the LCP by the operator by turning the motor control to the “ON” position.				

B. Digester Blower Local Control Panel

Panel:	Blower Control Panel				
Location:	Blower Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	100A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	Sludge Blower #1	20	VFD	HOA	R, G, A ₁ , A ₂ , RTM
	Sludge Blower #1	20	VFD	HOA	R, G, A ₁ , A ₂ , RTM
	Sludge Blower #3	20	VFD	HOA	R, G, A ₁ , A ₂ , RTM
	Sludge Transfer Pump	2	VFD	HOA	R, G, A, RTM

<u>Equipment Control Interface:</u>		
	<u>Description</u>	<u>Type</u>
	Sludge Transfer Pump Over Temperature (alarm / shutdown)	DI
	Sludge Transfer Pump Leakage Sensor (alarm / shutdown)	DI
	Blower #1 High Pressure (alarm condition - A1)	DI
	Blower #1 High Temperature (alarm condition - A2)	DI
	Blower #2 High Pressure (alarm condition - A1)	DI
	Blower #2 High Temperature (alarm condition - A2)	DI
	Blower #3 High Pressure (alarm condition - A1)	DI
	Blower #3 High Temperature (alarm condition - A2)	DI
	Sludge Transfer Float Controls (2) (Off - Low Level Alarm / On)	DI
<u>SCADA Interface:</u>		
	<u>Description</u>	<u>Type</u>
	Panel Power Fail	DO
	Blower #1 Run	DO
	Blower #1 HO Position	DO x 2
	Blower #2 Run	DO
	Blower #2 HO Position	DO x 2
	Blower #3 Run	DO
	Blower #3 HO Position	DO x 2
	Sludge Transfer Pump Run	DO
	Sludge Transfer Pump HOA Position	DO x 3
	VFD #1 Fault	DO
	VFD #2 Fault	DO
	VFD #3 Fault	DO
	Sludge Transfer VFD Fault	DO
	Sludge Transfer Pump Speed Required	AI
	Sludge Transfer Pump Speed Feedback	AO
	Sludge Low Level Alarm	DO
	Sludge Level "Operable"	DO
	Blower High Temperature	DO x 3
	Blower High Pressure	DO x 3
<u>Panel Control Logic:</u>		
-	Blower operation is manually initiated by the operator by placing a Blower in "HAND" or "AUTO".	
-	Only two (2) blowers shall be permitted to operate at the same time. An interlock shall be provided to prevent simultaneous operation of three blowers.	
-	Sludge Pump target operation speed is received from the Sludge Press via SCADA.	
-	Blower speed (#1, #2, #3) is set locally by operator via interface with respective VFD's.	
-	Sludge transfer pump is controlled via interface with Sludge press (remote). Operational speed of pump is modulated based on sludge rate requested. Sludge Transfer float controls serve as back-up controls for pump "Off" operation.	
-	Sludge Transfer Pump "ON" float is utilized to signal that adequate sludge is available for Sludge Transfer Pump to operate.	

C. Influent Pump Local Control Panel

Panel:	Influent Pump Local Control Panel				
Location:	Pump Building – Main Level				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	50A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	Influent Pump #1	7.5	VFD	HOA	R,G,A, RTM
	Influent Pump #2	7.5	VFD	HOA	R,G,A, RTM
	Influent Pump #3	15	Motor Starter	HOA	R,G,A, RTM
<u>Equipment Control Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	Influent Pump #1 Over Temperature (alarm / shutdown)	DI			
	Influent Pump #1 Leakage Sensor (alarm / shutdown)	DI			
	Influent Pump #2 Over Temperature (alarm / shutdown)	DI			
	Influent Pump #2 Leakage Sensor (alarm / shutdown)	DI			
	Influent Pump #3 Over Temperature (alarm / shutdown)	DI			
	Influent Pump #3 Leakage Sensor (alarm / shutdown)	DI			
	Backup Floats (5 Float System)	DI			
	Wet Well Level	AI			
	Visual Alarm Light (high level)	DO			
	Audible Alarm Siren (with silencer) (high level)	DO			
<u>SCADA Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	Panel Power Fail	DO			
	VFD #1 Fault	DO			
	VFD #2 Fault	DO			
	Influent Pump #1 Run	DO			
	Influent Pump #1 HOA Position	DO x 3			
	Influent Pump #2 Run	DO			
	Influent Pump #2 HOA Position	DO x 3			
	Influent Pump #3 Run	DO			
	Influent Pump #3 HOA Position	DO x 3			
	High Water Alarm	DO			
<u>Panel Control Logic:</u>					
-	Pump operation based upon the level within the wet well.				
-	Pump speed is paced to match level in wet well reported via level transducer. Lead Pump (of 7.5 HP pumps) initiates operation at 40 Hz at set level and ramps to 60 Hz. Continuing level rise engages Lag Pump (7.5 HP). Continuing level rise engages Pump #3 and drops operation of Lead Pump. Level drop to "Lag" level drops operation of Pump #3. Low level drops Lag Pump (or Lead Pump if Lag Pump was not engaged as a part of sequence).				
-	Alternation sequence Between Pump #1 / Pump #2 shall be Operator selectable and/or shall be based upon least run time.				
-	Float system serves as back-up to level transducer.				

D. River Pump Station Local Control Panel

Panel:	River Pump Local Control Panel				
Location:	UV Area Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	30A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	River Pump #1	5	Motor Starter	HOA	R,G,A,RTM
	River Pump #2	5	Motor Starter	HOA	R,G,A,RTM
<u>Equipment Control Interface:</u>					
	<u>Description</u>				<u>Type</u>
	River Pump #1 Over Temperature (alarm / shutdown)				DI
	River Pump #1 Leakage Sensor (alarm / shutdown)				DI
	River Pump #2 Over Temperature (alarm / shutdown)				DI
	River Pump #2 Leakage Sensor (alarm / shutdown)				DI
	Float Controls (4) (Off / Lead On / Lag On / High Level Alarm)				DI
	Visual Alarm Light (high level)				DO
	Audible Alarm Siren (with silencer)(high level)				DO
<u>SCADA Interface:</u>					
	<u>Description</u>				<u>Type</u>
	Panel Power Fail				DO
	Pump #1 Run				DO
	Pump #1 HOA Position				DO x 3
	Pump #2 Run				DO
	Pump #2 HOA Position				DO x 3
	High Level Alarm				DO
<u>Panel Control Logic:</u>					
-	Station is "Normally Off". Operator engages electrical service to LCP manually based on river level.				
-	Alternation sequence shall be Operator selectable				
-	Pumps operate in a Lead/Lag configuration.				

E. RAS Pump Station Local Control Panel

Panel:	RAS Pump Station Local Control Panel				
Location:	RAS Pump Station Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	60A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	RAS Pump #1	5	VFD	HOA	R,G,A,RTM
	RAS Pump #2	5	VFD	HOA	R,G,A,RTM
	RAS Control Valve	Fractional	Feeder	On/Off	
	WAS Control Valve	Fractional	Feeder	On/Off	
<u>Equipment Control Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	RAS Pump #1 Over Temperature (alarm / shutdown)	DI			
	RAS Pump #1 Leakage Sensor (alarm / shutdown)	DI			
	RAS Pump #2 Over Temperature (alarm/shutdown)	DI			
	RAS Pump #2 Leakage Sensor (alarm/shutdown)	DI			
	Float Controls (4) (Off/Lead On/Lag On/High Level Alarm	DI			
	Visual Alarm Light (high level)	DO			
	Audible Alarm Siren (with silencer) (high level)	DO			
<u>SCADA Interface:</u>					
	<u>Description</u>	<u>Type</u>			
	Panel Power Fail	DO			
	Effluent Flow Rate	AI			
	VFD #1 Fault	DO			
	VFD #2 Fault	DO			
	RAS Pump #1 Run	DO			
	RAS Pump #1 HOA Position	DO			
	RAS Pump #2 Run	DO			
	RAS Pump #2 HOA Position	DO			
	High Water Alarm	DO			
<u>Panel Control Logic:</u>					
-	Pump speed is set via the VFD by operator.				
-	Alternation sequence shall be Operator selectable and/or shall be based upon least run time.				
-	Pumps operate in a Lead/Lag configuration.				

F. Compost Blower Local Control Panel

Panel:	Compost Blower Local Control Panel				
Location:	Compost Blower Electric Service Panel				
Voltage:	480V / 3Ø / 3W				
Main Circuit Breaker:	15A / 3P				
<u>Motor Control:</u>					
	<u>Description</u>	<u>HP</u>	<u>Type</u>	<u>Controls</u>	<u>Accessories</u>
	Compost Blower	2	Motor Starter	On/Off	R, G, RTM
<u>Equipment Control Interface:</u>					
	<u>Description</u>				<u>Type</u>
<u>SCADA Interface:</u>					
	<u>Description</u>				<u>Type</u>
	Panel Power Fail				DO
	Blower Run				DO
<u>Panel Control Logic:</u>					
-	Blower equipment is manually actuated at the LCP by the operator by turning the motor control to the "ON" position.				

END OF SECTION

SUPERVISORY CONTROL & DATA ACQUISITION SYSTEM

PART 1 GENERAL

1.01 SCOPE

- A. The work to be accomplished under this section shall consist of furnishing the equipment necessary for a complete automatic control and monitoring system to function as specified herein and as shown on the drawings. The system integrator shall furnish a completely integrated all solid-state radio telemetry base Supervisory Control and Data Acquisition (SCADA) system. The complete system shall be designed, fabricated, programmed, tested, started up, and warranted by a single supplier to insure a single source of responsibility.
- B. Scope of Work: This section covers a radio SCADA system to include:
 - 1. Interface of proposed equipment at the WWTP as outlined within the Drawings and Specifications.
 - 2. Alarm dialer for remote communication of alarms.
 - 3. (1) Industrial Front Panel Computer with HMI SCADA Software
 - 4. Interface of low-level operational data between existing WTP SCADA platform and proposed WWTP SCADA platform, permitting observation of operational data from either site.
- C. General/Electrical Contractor Shall Supply
 - 1. All equipment required in other sections of the specifications.
 - 2. All labor for installation of the RTU and radio equipment.
 - 3. Conduit and conductors to interface local control panels, local equipment, power supply and antennas.
- D. System Integrator Shall Supply:
 - 1. Engineering submittal and shop drawings prior to installation.
 - 2. Operation and maintenance manuals, as detailed in this section.
 - 3. All start-up labor and services, as required for equipment specified in this section.
 - 4. All the paper work and fees necessary to obtain any required FCC radio licenses in the name of the Owner.
 - 5. All user licenses and fees for software supplied in this system with licenses in the name of the Owner.
 - 6. Operator training as detailed in this section.

E. Owner Shall Supply:

1. Access and easements as needed for all sites.
2. 120 VAC power at all sites.
3. Internet connectivity at the WWTP.

1.02 QUALITY ASSURANCE

A. Manufacturer's Qualifications: The system specified herein shall be the product of a manufacturer who can demonstrate at least ten (10) years of satisfactory experience in furnishing and installing comparable radio based telemetry/control systems for water and wastewater installations.

B. The manufacturer of this system shall maintain a 24-hour available inventory of all replaceable modules to assure the Owner of prompt maintenance service and a single source of responsibility. The manufacturer shall certify this to the Engineer in writing at the time of bidder pre-qualification.

C. Pre-Bid Approval:

1. The Base Bid approved systems integrator for this project is:

Micro-Comm, Inc.	Local Contact:
15895 S. Plfumm Rd	Hydro-Dynamics, Inc.
Olathe, KS 66066	(513) 899-9992

2. Other integrators desiring to bid this project as "alternate" integrators must seek pre-bid approval by providing a submittal ten (10) days prior to the bid date. Submissions that fail to include a complete submittal as detailed shall be deemed unresponsive. The Engineer and the Owner shall be the sole judge as to whether the alternate equipment is considered an approved equal. Approval of an alternate system by the Engineer will not relieve the alternate system of strict adherence to these specifications. The pre-bid submittal shall include the following:

- a. An installation list with the names and phone numbers of both the Owner and Engineer for at least ten projects of similar size and complexity.
- b. A "statement of compliance" detailing paragraph by paragraph the bidder's compliance to these specifications.
- c. Block diagrams for the various sites in the proposed system showing the selected pieces of hardware equipment to be used.
- d. Sample electrical drawings for typical sites proposed in this contract.
- e. A product performance data sheet shall be included for each hardware component in the system (i.e. antennas, radios, coaxial cables & arrestors, programmable controllers, power supplies, time delays and relays, and the various sensors required) and each software component (programming & configuration software and operator display console software).

- f. Radio path study for each radio path in the system. Bidders shall satisfy themselves that the necessary radio frequency(s) can be obtained. The radio path study provided by each bidder shall utilize either:
 - 1) Computer generated techniques utilizing a USGS 3 second terrain database to plot the path profiles for each radio path with elevation samples at not more than 200 foot increments.
 - 2) Actual field measurements to showing the necessary antenna heights, transmitter power, and antenna gains required to insure a 20db fade margin as detailed in these specifications. The physical path analysis shall be made using temporary equipment installations and a radio communications analyzer to measure actual path margins. The bidder shall include in his bid, all the calculations used to extrapolate the measured data. The bidder is expected to obtain the necessary temporary FCC license for the study.
 - g. Communications diagram for the entire system showing normal CTU-RTU communications paths and Peer-to-Peer back-up communications paths.
- D. Approval Agencies: The control system and its components shall comply with all applicable requirements of the following:
 - 1. Electrical Code Compliance (National & Local)
 - 2. UL 508A
 - 3. NEMA Compliance
 - 4. IEEE Compliance
 - 5. EIA Compliance
 - 6. FCC Compliance

1.03 RELATED SECTIONS

- A. Section 16010 – General Electrical Provisions
- B. Section 16020 – Conduit Systems
- C. Section 16030 – Wire and Cable
- D. Section 16035 – Instrument Wire and Cable
- E. Section 16170 – Process Control Panels and Hardware
- F. Section 16171 – Panel Mounted Devices and Instruments
- G. Section 15270 – Flow Meters
- H. Division 11 – Process Equipment

1.04 SUBMITTALS

- A. Submit under provisions of Section 01300 and Section 16010.
- B. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.
- C. Submit manufacturer's installation procedures under provisions of Section 01300.
- D. Complete submittal shall be provided to the engineer for approval prior to equipment fabrication. The submittal data shall include the following:
 - 1. Product Data - Provide product data sheets for each instrument and component supplied in the system. The data sheets shall show the component name as used on reference drawings, manufacturer's model number or other product designator, input and output characteristics, scale or ranges selected, electrical or mechanical requirements, and materials compatibility.
 - 2. Shop Drawings - Provide drawings for each panel showing the wiring diagrams for control circuits and interconnections of all components. The drawings shall include wiring diagrams for all remote devices connected to the panel.
 - 3. Panel Layout Drawings - A front panel and sub-panel layout shall be included as part of each control panel drawing. Components shall be clearly labeled on the drawing.
 - 4. Installation Drawings - Typical installation drawings applicable to each site in the system shall be included.
 - 5. Operator Interface Software - The submittal shall include a generic but detailed technical description of the Operator's Interface Software as proposed for this system including:
 - a. Sample text screens and menus
 - b. Sample graphics screens
 - c. Sample report logs and printed graphs

1.05 MAINTENANCE INFORMATION

- A. Maintenance Data Manuals: Submit maintenance manuals and "as built" drawings on all items supplied with the system. The manuals and drawings are to be bound into one or more books as needed. In addition to "as built" engineering submittal data and drawings, the manual shall include trouble shooting guides and maintenance and calibration data for all adjustable items.

1.06 JOB CONDITIONS

- A. All instruments and equipment shall be designed to operate under the environmental conditions where they are to perform their service. The equipment shall be designed to handle lightning and transient voltages as normal environmental hazards. The environmental conditions are as follows:

- 1. Outdoor - The equipment will be exposed to direct sunlight, dust, rain, snow, ambient temperatures from -20 to +120 degrees F, relative humidity of 10 to 100 percent, and other natural outdoor conditions. The installations shall be hardened to withstand normal vandalism.
- 2. Indoor - The equipment will be capable of operating in ambient temperatures of +32 to +130 degrees F and relative humidity of 20 to 100 percent.

1.07 DELIVERY, STORAGE, & HANDLING

- A. All items shall be stored in a dry sheltered place, not exposed to the outside elements, until ready for installation. All items shall be handled with appropriate care to avoid damage during transport and installation.

1.08 SEQUENCING & SCHEDULING

- A. Coordination: The Systems Integrator shall coordinate with other electrical and mechanical work including wires/cables, raceways, electrical boxes and fittings, controls supplied by others, and existing controls, to properly interface installation and commissioning of the control system.
- B. Sequence: Sequence installation and start-up work with other trades to minimize downtime and to minimize the possibility of damage and soiling during the remainder of the construction period.

1.09 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01700.

1.10 DISTRIBUTED CONTROL OPERATION

- A. General: The control system shall use "Programmable Logic Controllers" (PLCs) at all locations in the system as detailed later in these specifications. Each site in the system shall have a unique digital address. The Central Processing Units (CPUs) and Input/output (I/O) cards used in each of the PLCs shall all be identical, fully interchangeable without reprogramming by the operator. The PLCs shall be "self-initializing" and "self-restoring" so that operator intervention is not required after power interruptions, transients from lightning storms, or component changes.

The system shall be composed of a Central Terminal Unit (CTU) that monitors the operation of multiple Remote Terminal Units (RTUs). The CTU shall be composed of a PLC (as described above) and one or more Operator Display Consoles (ODCs) with Human-Machine-Interface (HMI) software to display, alarm, record, all data received and for operator input for changes to the system.

The control system shall be capable of implementing multiple modes of communications in a single system to include radio, high-speed data highway, fiber optic, and Ethernet communications as details in these specifications.

- B. Standard Control Software Features: The supplied software shall not be a one-of-a-kind system, but rather a comprehensively designed software platform that provides a number of built in features that monitor local & remote inputs combined with standard software algorithms to provide an integrated system as follows:
1. Monitor local Hand/Off/Automatic (HOA) selector switch positions (i.e. on existing pump control panels) and integrate the switch position in to the control logic such that a HOA in HAND or OFF shall be considered by the control system as 'un-available'.
 2. Provide for communication of pressure, flow and related data readings sourced from existing and/or new equipment to designated locations to support operation of local equipment control panels.

PART 2 PRODUCTS

2.01 ENCLOSURES

- A. Enclosures shall be NEMA 1 for indoor and NEMA 4X for outdoor locations. Enclosure shall be fabricated from a minimum of 14-gauge cold rolled steel with a baked enamel finish in the manufacturer's standard color. Units shall include a single gasket front door. Hinges, locking hasp and door clamping hardware shall be included.

2.02 INCOMING POWER REQUIREMENTS & UPS

- A. Controls shall operate from a source of 120 volts, 1 phase, 60 Hz. Each panel shall be accompanied with an uninterruptible power supply (UPS). The UPS shall condition the power as well as provide 500 VA of power during outages. A 6-amp control power circuit breaker shall be employed as both a method of equipment protection and as a means of power disconnection. The circuit breaker shall be a single pole, thermal, magnetic type with a 10,000 Amp Interrupt Current rating. The circuit breaker shall be UL listed.

2.03 POWER SUPPLIES

- A. All DC power supplies required for operation shall be provided. Units shall provide sufficient voltage regulation and ripple control to assure powered components can operate within their required tolerances.

2.04 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS) – DATA COMMUNICATIONS AND SIGNAL WIRING

- A. The system manufacturer shall provide transient voltage and surge suppression for all PLC data communication devices whenever the communications cable is located outside the building in which the panel resides. This also applies to all outdoor panels with communications cables exiting the PLC panel enclosure. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum DC operating voltage of 9.6 VDC, a clamping voltage of 81V, and an 8 x 20 US surge current rating of 1000 amps.
- B. Transient voltage and surge suppression shall also be provided for 10-32 VDC instrumentation signal systems. The TVSS units shall be employed when the signal cable extends beyond the boundaries of the building in which the PLC panel is located. The TVSS unit shall be UL 497B listed. The TVSS unit shall have a maximum operating voltage of 32 VDC, a clamping voltage of 100V, and an 8 x 20 US surge current capability of 1000 amps.
- C. TVSS units shall be as manufactured by Leviton, Inc., of Little Neck, New York, Model 3803-485/DHP or equal for PLC communications and Model 3420-009/035 for 10-32 VDC signal wiring or equal.

2.05 NETWORK DATA LINE SURGE SUPPRESSORS

- A. Provide transient surge suppressors for all leased telephone line, and Ethernet connections that are included as a part of this system. Unit shall have connection capabilities for RJ45, 100 BASE-T, 10 BASE-T, Token Ring, and RS-422 connections. The unit shall have a nominal clamping voltage of 7.5 volts and a Peak Pulse Current rating of 750 amperes. Unit shall be as manufactured by Tripp Lite, Inc., Model DNET-1 or equal.

2.06 TELEPHONE LINE SURGE SUPPRESSORS

- A. Provide the following for all dial-up connected to data modems or automated alarm dialing equipment that are included as a part of this system. Unit shall have connection capabilities for RJ11 or RJ45. The unit shall have a nominal clamping voltage of 260 volts and a Peak Pulse Current rating of 1020 amperes. Unit(s) shall be as manufactured by Tripp Lite, Inc., Model DTEL2 or equal.

2.07 HIGH SPEED DATA RADIOS (900MHZ MAS & 900MHZ SPREAD SPECTRUM)

A. General

1. Specific communications paths in the system may utilize a "high-speed data radio" to provide fast data update and control implementation. The radios shall operate in the 928-952MHz licensed frequency bands (or optionally in the unlicensed 900MHz Spread Spectrum Radio band). The radios shall provide half duplex or simplex operation as required by the control system.
2. The high-speed data radios shall have integral digital data modems that provide 9600bps data transmissions with a 10mS data turn-around time. Connection to the RTUs shall be via a standard DB-25F connector with a RS-232 interface. The radios shall be synthesized and fully field programmable and include a built-in time-out timer to disable the transmitter. Programmability shall include transmit and receive frequency, output power, time-out timer (1-255sec or off), RTS-CTS delay (1-255mS), PTT delay (0-31mS), and squelch tail eliminator. The units shall be tuned to FCC specifications for the specific frequency assigned.

B. Un-Licensed Spread Spectrum Data Radios

1. The un-licensed data radios shall have 1-watt of output power and integral digital data modems to insure a high level of quality and reliability. The radios shall be adjustable to .6 watts output power as may be required by the FCC for ERP (Effective Radiated Power) restrictions. The high-speed data radios shall have integral digital data modems that provide 9600bps to 2mbps data transmissions with a 10mS data turn-around time. Connection to the RTUs shall be via a standard DB-9F RS232 (and/or optional RJ45 Ethernet) interface. All connections to the radio shall be plug-in. The data radios shall have the following specifications:

Transmitter:

RF output power	1 watt (adjustable to .6watt)
Spurs & Harmonics	-65 dBc
Frequency stability	$\pm 0.00015\%$ (-30 to +60 degrees C)
Emission	12F2 (with 5kHz DEV max)

Receiver:

Bit Error Rates (BER)	1x10 ⁻⁶ at -110dbm @ 9600 baud or 1x10 ⁻⁶ at -99dbm @ 256bps for Ethernet Radios
IF Selectivity	-100 dB
Inter-modulation	-75 dB
Frequency stability	$\pm 0.00015\%$ (-30 to +60 degrees C)
Receive bandwidth	12kHz as required to match the transmitter

2. The data radios shall be Microwave Data Systems MDS Orbit or equal.

C. Antenna & Coaxial Cable

1. The radio antennas at all locations shall be a seven to nine element Yagi, constructed with 3/8" diameter solid aluminum rod elements and aluminum pipe element support with a type N coaxial connector. The antenna shall have a minimum 9.0db forward gain with a 20.0db front-to-back ratio. The antenna shall be wind rated for a 100-MPH wind speed. The antennas shall be MC-Yagi, Celwave PD688S, Celwave PD10108, or equal.
2. Directional antennas shall be cabled to the transmitter enclosure connection by a Amphenol 9913 low loss (less than 4.3db per 100ft @ 900MHz) coaxial cable with semi-solid polyethylene dielectric or heliax cable as needed to maintain the required 20db of operational pad. The coaxial cable shall have a combination braided copper and aluminum foil shield with coverage of 100% and a long life weather resistant polyvinyl chloride jacket. The antenna coaxial cable connection shall be a constant impedance weatherproof Type N connector, taped with a weather resistant electrical tape to insure a lifetime watertight assembly. The coaxial cable shall be Belden 9913 cable or heliax type cable as needed.
3. Omni-directional antennas used at data repeater sites shall be center-fed collinear antennas to insure consistent gain and impedance across the operating frequency band and provide a minimum of 7.5dBd gain. The antenna shall be constructed of copper alloy radiating elements encased in a weatherproof fiberglass low loss housing and permanently attached to a 6061-T6 aluminum support pipe. The Omni-directional antenna shall be a Celwave PD1109 or equal.

D. Antenna Lightning Protection

1. Coaxial connection to remote and central unit enclosures shall be by means of a type N coaxial type bulkhead lightning arrestor. The units shall be rated at 1 kilowatt with a minimum 500V and maximum 2000V-breakdown voltage. Coaxial lightning arrestors shall be a PD-395, r PolyPhaser IS-B50LU-CO, or equal.

E. Antenna Mounting Systems

1. Antennas shall be mounted at a height above ground that is consistent with FCC rules and regulations and provides adequate signal fade margin as described earlier. Antennas must be a minimum of 15 feet above ground and mounted as follows:
 - a. Above Ground Structures: The antenna shall be mounted on a 10' long X 1-1/2" diameter galvanized mast with top mounted weather-head. The mast assembly shall be secured to the side of the building or equipment rack structure with Uni-strut clamps.

2.08 INDUSTRIAL HMI FRONT PANEL TOUCH-SCREEN DISPLAY UNIT

- A. The HMI Front Panel Touch Screen Display Unit shall be a 19" (1920x1080 native resolution) diagonal backlit Color Active Matrix Display with Graphical Touch-Screen interface. The display shall have either a capacitive or 5-wire resistive touchscreen with a touch accuracy of 2mm. The unit shall have a "runtime" version of the SCADA HMI software installed in the Main HMI Computer. The unit shall automatically monitor all the PLCs in the network and receive expansion/revision updates from the Main HMI computer. The unit shall have a minimum of 8GB of RAM memory, 100GB HDD, serial communications port, parallel printer port, and a Gigabit Ethernet port. The operator interface shall be graphical and provide for display of all data monitored and operator input of setpoints and operating commands in the SCADA system. The Graphical Touch-screen unit shall be supplied and mounted on the front of the PLC enclosure if detailed in the specific PLC I/O requirement list. The unit shall maintain the Nema 4 rating of the PLC enclosure. The computer shall be a Dell OptiPlex 7060 mini with a Hope HIS-ML19.5 Industrial Touchscreen or equal.

PART 3 EXECUTION

3.01 FCC LICENSING

- A. The system manufacturer/supplier shall be responsible for collecting all information, generating all paper work, and paying all fees required for modifying the license on behalf of the Owner.

3.02 EQUIPMENT EXAMINATION

- A. The control system shall be completely tested prior to shipment. The entire control system shall be "Burned In" at the factory for a period of at least 20 days. The component equipment shall be computer tested and temperature cycled at zero degrees and at fifty degrees centigrade.
- B. All local indicators, transmitters and converters shall be inspected that the correct scales have been supplied.
- C. Inspect area to assure the locations for the equipment to be installed are suitable for their application.

3.03 PREPARATION

- A. Contractor and System Integrator shall coordinate on installation of related components, verifying interface of equipment, scales, etc.

3.04 SYSTEM START-UP

- A. The system manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.

3.05 TRAINING

- A. The manufacturer shall supply "Factory" personnel for start-up service as needed to insure satisfactory operation. The training shall be conducted include a minimum of two days of on-site training sessions. Subsequent trips to the job site to correct defects shall be made at no charge to the Owner during the warranty period.
- B. The initial training session shall be conducted during start-up as needed until the Owner and Engineer are satisfied that the operators are comfortable with the operation and maintenance of the system. Training shall be done on site with the Owner's personnel.

3.06 SUBSTANTIAL COMPLETION

- A. The Engineer will recommend substantial completion to the Owner only after completion of the start-up and initial training phase of the project. The Engineer shall make an inspection of the system to determine the status of completion. Substantial completion will be awarded only when the system is providing usable service to the Owner. If the system is commissioned in phases, the Contractor may request substantial completion for the completed phases.

3.07 WARRANTY/SUPPORT PROGRAM

- A. The control system manufacturer shall supply a five (5) year parts and labor warranty and comprehensive support program for all items and software supplied under this section (except as noted below). Power surges and lightning damage shall be included as part of the warranty.
- B. The warranty shall begin from the time of "substantial completion" as issued by the Engineer and Owner. The manufacturer shall provide a 24-hour response to calls from the Owner. The manufacturer, at his discretion, may dispatch replacement parts to the Owner by next-day delivery service for field replacement by the Owner. Any damage to the control system caused by the actions of the Owner in attempting these field replacements shall be the sole responsibility of the system manufacturer. If, during the warranty period, satisfactory field repair cannot be attained by field replacement of parts by the Owner, the system manufacturer shall dispatch "factory" personnel to the job site to complete repairs at no cost to the Owner.

- C. The support program shall begin from the time of "substantial completion" as issued by the Engineer and Owner. The support program shall include free updating of all software as needed and providing free phone support from the integrator throughout the warranty period.

PART 4 DETAILED EQUIPMENT DESCRIPTION

4.01 EQUIPMENT SUPPLY – GENERAL

- A. Panels and Enclosures: Panels and enclosures required for SCADA equipment are to be supplied by the System Integrator.
- B. Flow Meters/Level Sensors: Flow meters and/or level sensors specified as requiring interface are either existing or are to be supplied and installed by the Contractor. Requirements for SCADA system interface are to be coordinated with the System Integrator.
- C. PLC, Radio Telemetry Equipment, Antennas, etc.: All equipment required as a part of the SCADA system and necessary for communication between sites shall be supplied by the System Integrator.

4.02 EQUIPMENT SCHEDULE – EX. OPERATIONS BUILDING (CTU)

- A. Radio: High Speed Data Radio (900mHz Spread Spectrum)
- B. Panel: Wall-mounted, located interior to the existing Operations Building.
- C. Antenna: The CTU antenna(s) shall be mounted on a 10' long X 1-1/2" diameter mast secured to the side of the WTP structure with rigid conduit and a weather-head run to the CTU-PLC enclosure. The antenna(s) should be mounted as close as possible to the CTU-PLC enclosure.
- D. I/O Requirements:
 - 1. Discrete Outputs:
 - a. – 4) spares
 - 2. Discrete Inputs:
 - a. Power Failure
 - b. – 8) spares
 - 3. Analog Inputs:
 - a. – 4) spares
- E. Ethernet IP Data Network

1. The CTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.

F. Front Panel Computer (ODC) Requirements:

1. The Industrial Front Panel Computer and SCADA HMI software (as detailed earlier) will be the primary control/monitoring/alarm station for the SCADA system.
2. This computer/HMI Software will include all standard day-to-day operation duties, trending, and historical data collection.

G. WTP SCADA System Interface

1. The front panel computer and PLC present at the WWTP shall be configured to display low-level operational data available from the existing WTP SCADA Control System.
2. The existing front panel computer and PLC present at the WTP shall be configured to display low-level operational data available from the existing WWTP SCADA Control System.

4.03 OPERATION DESCRIPTION – EX. OPERATIONS BUILDING (CTU)

- A. No operations or control panel interface is proposed at the existing Operations Building at the time of initial system installation.

4.04 EQUIPMENT SCHEDULE – EX. PUMP BUILDING (RTU 1)

- A. Radio: High Speed Data Radio (900MHz Spread Spectrum)
- B. Panel: Wall-mounted, located interior to the existing Pump Building, Main Level.
- C. Antenna: As required to interface with CTU (Ex. Operations Building).
- D. Front Panel Display Requirements:
1. Keypad & Display assembly to display all inputs and output status.

E. I/O Requirements:

1. Discrete Outputs:
 - a. – 4) spares
2. Discrete Inputs:
 - a. Power Failure
 - b. Sump High Level Alarm
 - c. – 8) spares

3. Analog Inputs:
 - a. Wet Well Level (LT2)
 - b. – 4) spares

4.05 OPERATION DESCRIPTION – EX. PUMP BUILDING (RTU 1)

- A. SCADA panel shall interface with Influent Pump Control Panel located adjacent. Control logic for pump operation and equipment interface shall be resident within the Influent Pump Control Panel.
- B. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Influent Pump Control Panel.

4.06 EQUIPMENT SCHEDULE – RAS PUMP STATION (RTU 3)

- A. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
- B. Panel: Mounted on the Electric Service Panel assembly located adjacent to the RAS Pump Station. Exterior exposure.
- C. Antenna: As required to interface with CTU (Ex. Operations Building).
- D. Front Panel Display Requirements:
 1. Keypad & Display assembly to display all inputs and output status.
- E. I/O Requirements:
 1. Discrete Outputs:
 - a. – 4) spares
 2. Discrete Inputs:
 - a. Power Failure
 - b. – 8) spares
 3. Analog Inputs:
 - a. RAS Flow Rate / Total
 - b. WAS Flow Rate / Total
 - c. RAS Control Valve Position
 - d. WAS Control Valve Position
 - e. – 8) spares

4.07 OPERATION DESCRIPTION – RAS PUMP STATION (RTU 3)

- A. SCADA panel shall interface with RAS Pump Station Control Panel located at the site. Control logic for pump operation and equipment interface shall be resident within the RAS Pump Station Control Panel.
- B. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the RAS Pump Station Control Panel.

4.08 EQUIPMENT SCHEDULE – BLOWER AREA (RTU 2)

- A. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
- B. Panel: Mounted on the Electric Service Panel assembly located adjacent to the Aerobic Digester Blowers. Exterior exposure.
- C. Antenna: As required to interface with CTU (Ex. Operations Building).
- D. Front Panel Display Requirements:
 - 1. Keypad & Display assembly to display all inputs and output status.
- E. I/O Requirements:
 - 1. Discrete Outputs:
 - a. – 4) spares
 - 2. Discrete Inputs:
 - a. Power Failure
 - b. – 8) spares
 - 3. Analog Inputs:
 - a. – 4) spares
- F. Ethernet IP Data Network
 - 1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.

4.09 OPERATION DESCRIPTION – BLOWER AREA (RTU 2)

- A. SCADA panel shall interface with Digester Blower Local Control Panel located at the site. Control logic for equipment operation and equipment interface shall be resident within the Digester Blower Local Control Panel.
- B. SCADA panel shall interface via an Ethernet connection with the Oxidation Ditch Local Control Panel located remote from the site. Control logic for equipment operation and interface shall be resident within the Oxidation Ditch Local Control Panel PLC.

- C. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Digester Blower Local Control Panel and the Oxidation Ditch Local Control Panel.

4.10 EQUIPMENT SCHEDULE – SCREEN / PRESS BUILDING (RTU 4)

- A. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
- B. Panel: Wall-mounted, interior to the Dewatering System Area in the Screen / Press Building.
- C. Antenna: As required to interface with CTU (Ex. Operations Building).
- D. Front Panel Display Requirements:
 - 1. Keypad & Display assembly to display all inputs and output status.
- E. I/O Requirements:
 - 1. Discrete Outputs:
 - a. – 4) spares
 - 2. Discrete Inputs:
 - a. Power Failure
 - b. Main Power Fail (via ATS)
 - c. Generator Run
 - d. Generator Low Fuel
 - e. Common Fault @ Generator
 - f. Transfer Switch in Auto
 - g. Transfer Switch Fault
 - h. Smoke Alarm
 - i. Combustible Gas Detector
 - j. – 16) spares
 - 3. Analog Inputs:
 - a. – 4) spares
- F. Ethernet IP Data Network
 - 1. The RTU Panel shall include an Industrial Ethernet Switch/Router. The Ethernet Switch shall be an N-Tron 708TX or approved equal.

4.11 OPERATION DESCRIPTION – SCREEN / PRESS BUILDING (RTU 4)

- A. SCADA panel shall interface via an Ethernet connection with Press Control Panel located within the building. Control logic for equipment operation and equipment interface shall be resident within the Press Control Panel PLC.

- B. SCADA panel shall interface with the Screen Control Panel located within the building. Control logic for equipment operation and interface shall be resident within the Screen Control Panel.
- C. SCADA panel shall interface with the Compost Blower Local Control Panel located exterior the building. Control logic for equipment operation and interface shall be resident within the Compost Blower Local Control Panel.
- D. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Press Control Panel, the Screen Control Panel and the Compost Blower Local Control Panel.

4.12 EQUIPMENT SCHEDULE – UV AREA (RTU 5)

- A. Radio: High Speed Data Radio (900 MHz Spread Spectrum).
- B. Mounted on the Electric Service Panel assembly located adjacent to the UV Structure. Exterior exposure.
- C. Antenna: As required to interface with CTU (Ex. Operations Building).
- D. Front Panel Display Requirements:
 - 1. Keypad & Display assembly to display all inputs and output status.
- E. I/O Requirements:
 - 1. Discrete Outputs:
 - a. – 4) spares
 - 2. Discrete Inputs:
 - a. Power Failure
 - b. UV System Monitor Bank #1 – Low UV Intensity Alarm
 - c. UV System Monitor Bank #1 – Common Major Alarm
 - d. UV System Monitor Bank #1 – Bank Status
 - e. UV System Monitor Bank #2 – Low UV Intensity Alarm
 - f. UV System Monitor Bank #2 – Common Major Alarm
 - g. UV System Monitor Bank #2 – Bank Status
 - h. Transfer Switch Fault
 - i. – 16) spares
 - 3. Analog Inputs:
 - a. Effluent Flow (LT3)
 - b. – 4) spares

4.13 OPERATION DESCRIPTION – UV AREA (RTU 5)

- A. SCADA panel shall interface with the Post Air Blower Local Control Panel located at the site. Control logic for equipment operation and equipment interface shall be resident within the Post Air Blower Local Control Panel.
- B. SCADA panel shall interface with the River Pump Station Local Control Panel located at the site. Control logic for equipment operation and interface shall be resident within the River Pump Station Control Panel.
- C. SCADA panel shall interface with the Clarifier Local Control Panel located remote from the site. Control logic for equipment operation and interface shall be resident within the Clarifier Local Control Panel.
- D. In addition to local I/O noted, data provided to the WWTP SCADA System for monitoring and alarms shall be as outlined within the specifications outlining the Post Air Blower Local Control Panel, the River Pump Station Control Panel and the Clarifier Local Control Panel.

END OF SECTION