

**CITY OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA**

**PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS PROJECT
CONTRACT #3 – PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT**

ADDENDUM #1

MARCH 14, 2022

THRASHER PROJECT #020-01535

TO WHOM IT MAY CONCERN:

A Pre-Bid Conference was held on Tuesday, March 1, 2022, for the above-referenced project. A copy of the sign in sheet is included within this Addendum. The following are clarifications and responses to questions posed by contractors for the above reference project.

A. GENERAL

1. **THE BID FORM HAS BEEN REVISED. YOU MUST USE THE REVISED BID FORM WHEN PREPARING YOUR BID PACKAGE FOR THIS PROJECT.**

B. SPECIFICATIONS

1. 2.1 Index

2. Bid Form

Added “Major Equipment” section.

3. Specification 013300 – Submittal Procedures

Specification has been revised to incorporate Submittal Exchange. Submittal procedures for this project will be paperless.

4. Specification 233724 – Deep Bed Scrubber

Specification has added to include Deep Bed Scrubber (air scrubber) information.

5. Specification 262934 – Variable Frequency Drives for Submersible Pumps

Specification has been revised to reflect the specifications met by the City's existing VFDs for ease of maintenance.

6. Specification 461405 – SBR Equipment

General revisions have been made to the specification. A Process Performance Guarantee has been attached to this specification.

7. Specification 461802 – Sludge Dewatering Equipment

Removed reference to rotary lobe pump.

8. Specification 333219 – Submersible Non-Clog Pump Station

Specification has been revised to reflect the specifications met by the City's existing lift stations for ease of maintenance.

9. Specification Section – Concrete and Related Specifications

Precast, Post-Tensioned Concrete tank construction will be allowed for the concrete structures including the new ICEAS SBR Reactor tanks and the building structure. The precast concrete design shall consist of post-tensioned wall panels fully conforming to the requirements of ACI 350 including 125 PSI residual compression on the walls. The precast concrete shall have a minimum compressive strength of 5000 PSI at 28 days. A cast-in-place base foundation for the pre-cast tank shall be provided as designed by the tank designer/manufacturer. The Precast Post-Tensioned Concrete tanks shall be designed, fabricated, and erected by a firm having a minimum of 30 years of experience in designing and manufacturing tanks of similar depth and basin size, using ACI 350 compliant precast post-tensioned design. The manufacturer shall document the installation a minimum of ten (10) such well-functioning facilities of equal or greater size including a signed statement that each installation was designed to ACI 350 including 125 PSI of residual compression on the wall. The tank designer/manufacturer shall submit complete design calculations provided by a licensed professional engineer in the State of West Virginia for review and acceptance by the Project Engineer. All costs associated with the redesign of the structures and mechanical integration shall be the full responsibility of the Contractor. The tank designer/manufacturer shall guarantee that the structure and all concrete will be free from all defects in design, material, and workmanship for a period of three (3) years from the date of plant start -up.

The pre-approved tank designer/manufacturer is Dutchland, Inc. of Gap, Pennsylvania. This request was submitted by Micah Boyer of Dutchland, Inc., mboyer@dutchlandinc.com, Mobile Phone (717) 598-9081.

C. DRAWINGS

1. Sheets 8-14 and 16-21
 - a. Scale correction for profiles
2. Sheets 36-37 and 41
 - a. Aluminum awning over control panels
3. Sheet 82
 - a. Door layout correction for control & process blower building
4. Sheets 126, 140, and 147
 - a. Door layout corrections for sludge dewatering building

D. QUESTIONS AND RESPONSES

QUESTION

1. Sheet 106 (Structural General Notes) references a geotechnical report by Novel Geo-Environmental, LLC dated November 2017 and the provided geotechnical report is by Terracon dated August 4th, 2020. Which report is to be referenced for this project?

RESPONSE

Please reference the geotechnical report by Terracon dated August 4th, 2020.

QUESTION

2. Sheet 106 (Structural General Notes) lists a maximum allowable bearing capacity of 5,000 psf for the SBR and Post-EQ Basins. The geotechnical report by Terracon dated August 4th, 2020 lists a soil bearing capacity of 2,000 psf for the SBR and Post-EQ Basins. Which allowable bearing capacity is to be used for this structure?

RESPONSE

2,000 psf is the correct bearing capacity.

QUESTION

3. The geotechnical report by Terracon dated August 4th, 2020 indicates groundwater between approximately 10 feet and 17 feet above the SBR and Post-EQ base slabs in the borings in the vicinity of these basins. Pressure relief valves are shown in the base slab on sheet 114 as a means to counter hydrostatic uplift. If the basins are ever drained, there will be a significant amount of groundwater flowing into the tank to relieve the uplift. Is this a concern?

RESPONSE

The storm system, proposed drains, and valves alleviate the concerns regarding groundwater.

QUESTION

4. Volume 2 of the specs for Ripley lists the Rotary Lobe pumps as specification section 432358 in the TOC and the pump spec is referenced in the Belt Filter Press spec but the rotary lobe spec does not appear to be in the bid documents. Can the rotary lobe pump spec be provided?

RESPONSE

The rotary lobe pump was removed in the final stages of design and replaced with a submersible pump. References to the Rotary Lobe specification have been removed.

QUESTION

5. The scale on the Site Grading cross sections doesn't seem to be consistent. The scale located in the lower right-hand corner of the screen indicate 1" = 10' but the elevation lines on the cross sections themselves measure 1" = 20'. Can the correct scale be indicated?

RESPONSE

The scales have been corrected and revised plan sheets have been issued as part of this addendum.

QUESTION

6. The limits of disturbance shown on the plans do not allow enough room to accommodate for the structural excavations required onsite with the layback recommended in the Geotech Report. Is it possible for the limits of disturbance to be expanded to allow for the recommended excavation layback as defined in the Geotech Report?

RESPONSE

The LOD may be expanded further to the east and a revised LOD will be provided in Addendum #2. Additionally, Thrasher has consulted with the geotechnical engineer on record to confirm the layback can be reduced to a 2.5H:1V.

QUESTION

7. Is a job trailer required?

RESPONSE

Yes. A job trailer can be staged at the wastewater treatment plant.

QUESTION

8. Is there a B&O tax?

RESPONSE

Yes, the B&O tax is 1.2%.

QUESTION

9. Is a building permit required?

RESPONSE

No, a building permit is not required.

QUESTION

10. Will this project have Davis-Bacon wages?

RESPONSE

Yes, certified payroll will need submitted..

QUESTION

11. Can the Prime Contractor use a combination price for bidding both contracts?

RESPONSE

No, a combination price will not be considered as part of this project.

QUESTION

12. The press specification calls for a press with a minimum of 5 rows and a total of 13 chicanes for the gravity section. Schematic shows a press with 10 rows of plows. Can you verify which is correct?

RESPONSE

The specification is correct. The schematic is a generic file from the manufacturer used as the basis of design.

QUESTION

13. At the press, conveyors 1,2 & 3 listed as 8', 21' & 10' with angles of 0, 30 and 0 degrees, respectively. Can you please verify those lengths and angles since the drawing refers to the specification page?

RESPONSE

The lengths mentioned within the question are correct.

QUESTION

14. The specification for the headworks calls for channel of 18" wide and 54" high. The drawing indicates a 3' wide channel. Can you please verify correct dimensions?

RESPONSE

The channel width varies. Please refer to Sheet 106 of the Bid Plan Set.

QUESTION

15. The specification calls for freeze protection on the washer compactor, but the unit appears to be indoors. Can you verify freeze protection for the washer compactor is unnecessary?

RESPONSE

The unit was initially designed to be outdoors, but we have since enclosed the headworks in a building. Please disregard freeze protection. The specification will be revised as part of this addendum.

QUESTION

16. The Shallow Foundations section of the geotechnical report by Terracon dated August 4th, 2020 lists an anticipated settlement of 0.4” corresponding to a 1,000 psf contact stress for the SBR and Post-EQ basins. The contact stress of 1,000 psf seems low for this structure. What would the anticipated total and differential settlements be for the SBR and Post-EQ tanks assuming a contact pressure of 1,800 psf?

RESPONSE

The greater contact pressure of 1,800psf will move projected settlement to 0.5-inches, which is within tolerances.

E. CLARIFICATIONS

1. The Bid Form has been updated to include Major Equipment.
2. A Process Performance Guarantee for the SBR Equipment has been attached to Specification 461405 – SBR Equipment.
3. Submittal procedures for this project will be paperless.
4. Specification 262934 – Variable Frequency Drives for Submersible Pumps has been revised for conformance with the City of Ripley’s VFDs at existing pump stations. Please review the revised specification for appropriate equipment.
5. Specification 333219 – Submersible Non-Clog Pump Station has been revised for conformance with the City of Ripley’s pumps at existing pump stations. Please review the revised specification for appropriate equipment.
6. The process performance guarantee has been revised in Specification 461405 – SBR Equipment.

7. “Or equal” equipment items **must** meet the same specifications as equipment used as basis of design. If a second manufacturer is named, it is still required to meet **all** the specifications. For example, in the SBR Equipment specification, substitution of stainless-steel equipment and appurtenances will not be accepted. Experience requirements must be met. Any engineering adjustments needed to use a manufacturer that is not the basis of design, will be at Contractor’s expense.

If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 2:00 p.m. on Wednesday, March 30, 2022 at 203 S Church St, Ripley, WV 25271.

Sincerely,

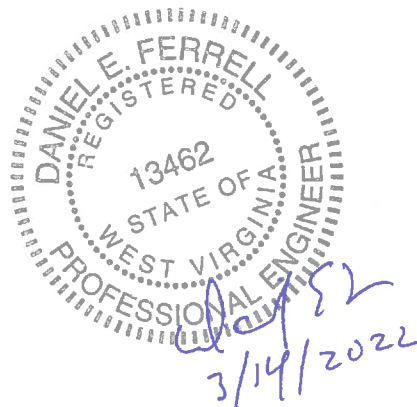
THE THRASHER GROUP, INC.



DANIEL E. FERRELL, P.E.

Project Manager

Enclosures: Pre Bid Meeting Sign In Sheet
Intent to Bid List
Index Volume 2
C-410 Bid Form
Specification 013300 – Submittal Procedures
Specification 233724 – Deep Bed Scrubber
Specification 262934 – VFD's for Submersible Pumps
Specification 333219 – Submersible Non-Clog Pump Station
Specification 461405 – SBR Equipment
Specification 461802 – Sludge Dewatering Equipment
Process Performance Guarantee
Plan Sheets



CITY OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA
PHASE II - PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS
CONTRACT #1 - PROPOSED FORCEMAIN FROM EVANS WWTP TO PLAZA PUMP STATION
CONTRACT #3 - PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT

MANDATORY PRE-BID CONFERENCE
Tuesday, March 1, 2022, 10:00am

Thrasher Project #020-01535

Name	Representing	Phone #	Email Address
Todd Olson	O2 Water Resources	304-291-0077 304-680-3663	tolson@O2WR.COM
Tim Carr	JF Allen	304 472-8890	tcarr@jfallenco.com
Tony Closson	JF Allen Company	304-460-7424	Tclosson@JFallenCo.Com
TIM HAYSLETT	HAYSLETT CONST.	304-757-9348	whayslett@aol.com
Joanna Mueller	Ordens Construction	304-722-4237	griffinm@ordersconstruction.com
GLEN COOK	TRITON CONSTRUCTION	304-757-2100	john.rose@tritonwv.com
Les Putillion	Ampco Inc	304 539-8497	Mgrading@aol.com
Bryan Reice	P2o Contracting Inc	304.745.8506	Fullpage33@aol.com

Name	Representing	Phone #	Email Address
DAN FERRALL	The Thrasher Group	304.326.6135	DFerrall@theThrasherGroup.com
Anthony Urso	The Thrasher Group	304-848-6496	aurso@the-thrasher-group.com
Mark Stolle	Foster	304.206.7808	mark@fostersupply.com
Ben Bragg	WV Paving	304.550.1583	ben.bragg@wvpaving.com
Bryan Bar	Mendon Paving, Inc	304-712-1279	Bryan@MendonPaving.com
Ernie Guffey	Glenn Johnston, Inc	412-757-4642	eguffey329@gmail.com
Eric Minster	Rain For Rent	304-707-3100	eminster@rainforrent.com
Jonathan Wiseman	Precision Pump	304 741-5090	jwiseman@ppvs.com
Micha Boyer	Dutchland Inc	717 598 9081	mboyer@dutchlandinc.com
Randy Carpenter	Carpenter Reclamation, Inc	304-984-1115	RCarpenter@aol.com
DANNY LUSK	W.C. WEIL CO. AQUA AEROBIC SYST.	304-776-5665	dlusk@wcweil.com
Tom Miles	Aqua-Aerobic	(215) 704-1705	tmiles@aquaaerobic.com

Fred Ruder

**CIT OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA**

**PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS
CONTRACT 3 – PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT**

PRIME CONTRACTORS INTENT TO BID LIST

Thrasher Project #020-01535

MARCH 7, 2022

Glenn Johnston, Inc.
Ernest Guffey/PM
1055 Center Street
McKeesport, PA 15132
Phone: 412-751-4642
Fax: 412-751-2093
Email eguffey329@gmail.com

Hayslett Construction Co Inc
Tim Hayslett
P O Box 447
Hurricane, WV 25526
Phone: 304-757-9348
Fax: 304-757-9561
Email whayslett@aol.com

Orders Construction Co
Joanna Mueller/Estimator
P O Box 1448 St Albans, WV 25177
501 6th Ave St Albans, WV 25177
Phone: 304-722-4237
Fax: N/A
Email gniffinm@ordersconstruction.com

Triton Construction, Inc
John Rose/Estimator
P O Box 1360 St Albans, WV 25177
1944 Winfield Rd St Albans, WV 25177
Phone: 304-590-2449
Fax: 304-755-1401
Email john.rose@tritonwv.com

**PROPOSED
CITY OF RIPLEY
JACKSON COUNTY, WEST VIRGINIA
PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS PROJECT
CONTRACT #3 – PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT**

VOLUME 2

- I N D E X -

TECHNICAL SPECIFICATIONS

Hangers and Supports	220529
Pipe Insulation	220719
Valves	221113
Domestic Water Piping	221116
Plumbing Specialties	221119
Sanitary Waste and Vent Piping	221316
Electric, Domestic Water Heaters	223300
Plumbing Fixtures	224000
Emergency Plumbing Fixtures	224500
Common Motor Requirements for HVAC Equipment	230513
Sleeves and Sleeve Seals for HVAC Piping	230517
Escutcheons for HVAC Piping	230518
Vibration Controls for HVAC	230548.13
Identification for HVAC Piping and Equipment	230553
Testing, Adjusting, and Balancing for HVAC	230593
Duct Insulation	230713
Facility Natural-Gas Piping	231123

Metal Ducts	233113
Air Duct Accessories	233300
Flexible Ducts	233346
HVAC Power Ventilators	233423
Air Outlets and Inlets	233713
HVAC Gravity Ventilators	233723
Deep Bed Scrubber	233724
Gas-Fired Unit Heaters	235533.16
Split-System Air Conditioners	238126
Wall and Ceiling Unit Heaters	238239.19
Basic Electrical Materials and Methods	260500
Conductors and Cables	260523
Grounding and Bonding	260526
Raceways and Boxes	260533
Dry-Type Transformers (1000V and Less)	262200
Switchboards	262300
Panelboards	262416
Motor Control Centers	262419
Mini-Power Zones (1000V and Less)	262600
Wiring Devices	262726
Fuses	262813
Enclosed Switches and Circuit Breakers	262816

Enclosed Controllers	262913
Variable-Frequency Drives for Submersible Pumps	262934
Transfer Switches	263200
Packaged Engine Generators	263213
LED Interior Lighting	265101
Site Clearing	311000
Earth Moving/Excavation	312000
Dewatering	312319
Erosion and Sedimentation Control	312500
Asphalt Paving	321216
Stone Surfacing Material	321217
Landscaping	329119
Sewer and Manhole Testing	330130.13
Manholes and Structures	330513
Site Water Utility Distribution Piping	331116
Disinfecting of Water Utility Distribution	331300
Pre-EQ Basin Pumps	333218
Submersible Non-Clog Pump Station	333219
Submersible Pump for Digester Decant	333220
Couplings, Adapters and Specials for Process Piping	400506
Hangers and Supports for Process Piping	400507
Ductile Iron Process Pipe	400519
Stainless Steel Process Pipe and Tubing	400523

Thermoplastic Process Pipe	400531
Common Requirements for Process Valves	400551
Identification for Process Piping	400553
Aluminum Slide and Weir Gates	400559.21
Plug Valves	400562
Butterfly Valves	400564
Swing Check Valves	400565.23
Supervisory Control and Data Acquisition (SCADA) System	401250
Process Piping Insulation	404213
Magnetic Flow Meters	407113
Ultrasonic Level Meters (Continuous and Point Type)	407213
Identification for Water and Wastewater Equipment	460553
Pre-Screening Equipment	461215
Grit Removal Equipment	461216
Non-Potable Water Packaged Pumping System	461320
Sequencing Batch Reactor (SBR) Equipment	461405
Sludge Dewatering Equipment	461802
Chlorination/Dechlorination Gas Feed Equipment	463111
Lime Feed Equipment	463643
Miscellaneous Equipment	469000
Safety Equipment	470000
FEDERAL WAGE RATES	

ACCOMMODATION OF HIGHWAYS

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

*City of Ripley
203 South Church Street
Ripley, WV 25271*

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Bid Opening Requirements

Note: Bid Opening Requirements (BOR-12) includes the American Iron and Steel Certification which needs to be filled out and signed by the Contractor. This certification also references two (2) Exhibits located in the Supplemental General Conditions (C-800) which were issued as part of RUS Bulletin 1780-35.

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

GENERAL

The Bidder shall take notice of and shall be responsible for any local or state taxes levied and applicable, and the cost for the same shall be included as part of the submitted Bid.

The total Bid cost stated includes a complete operating installation including furnishing and installation of any and all changes or additions in plans, piping, mechanical work, additional electrical work, accessories, controls, etc. necessary to accommodate alternative equipment systems or materials used in construction.

MAJOR EQUIPMENT

The bidder shall list on schedule "A" equipment included as part of this bid, the manufacturer of each item of major equipment listed and referenced to the specifications.

The total bid price shall include furnishing and installing all equipment and accessories of the manufacture as listed on schedule "A".

If the contract is awarded based on this bid, all items of equipment systems listed in schedule "A" will be utilized in construction and guaranteed by the undersigned and his surety to meet the performance requirements.

SCHEDULE "A"

MAJOR EQUIPMENT

DESCRIPTION OF ITEM	MANUFACTURER
Specification 262934 VFDs for Submersible Pumps	
Specification 333219 Submersible Non-Clog Pump Station	
Specification 401250 SCADA Equipment	
Specification 461215 Pre-Screening Equipment	
Specification 461216 Grit Removal Equipment	
Specification 461405 SBR Equipment	
Specification 461802 Sludge Dewatering Equipment	
Specification 463111 Chlorine Gas Feed Equipment	
Specification 463643 Lime Feed Equipment	

BID PROPOSAL

The Bidder agrees to perform all required Work described in the detailed Specifications and as shown on the Plans for the complete construction and placing in satisfactory operation the Phase II – Proposed Sanitary Sewer System Improvements project, Contract #3 – Proposed 1.2 MGD Wastewater Treatment Plant. The Project "Sequence of Construction" has been detailed in the Drawings and Specification

Division 1, Project Summary, Section 011000. The Bidder agrees to perform all the Work proposed for the total of the following Bid prices.

3.01 *Lump Sum Bids*

- A. Bidder will complete the Work in accordance with the Contract Documents for the lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02 and shown in the bid schedule.
- B. Lump Sum Bids may be one of the following:
 - 1. Lump Sum Price (Single Lump Sum)
 - 2. Lump Sum Price (Base Bid and Alternates)
 - 3. Lump Sum Price (Sectional Lump Sum Bids)
- C. All specified cash allowance(s) are included in the price(s) set forth in the bid schedule, and have been computed in accordance with Paragraph 13.02 of the General Conditions.
- D. All specified contingency allowances are included in the price(s) set forth in the bid schedule, and have been computed in accordance with Paragraph 13.02 of the General Conditions.

3.02 *Unit Price Bids*

- A. Bidder will perform the following Work at the indicated unit prices as shown in the Bid Schedule.
- B. Bidder acknowledges that:
 - 1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and
 - 2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.03 *Total Bid Price (Lump Sum and Unit Prices)*

BID SCHEDULE

PROPOSED

**PHASE II – PROPOSED SANITARY SEWER SYSTEM IMPROVEMENTS PROJECT
 CONTRACT #3 – PROPOSED 1.2 MGD WASTEWATER TREATMENT PLANT
 FOR THE**

**CITY OF RIPLEY
 JACKSON COUNTY, WEST VIRGINIA**

NOTE: Bid PRICE amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern. Bids shall include sales tax and all other applicable taxes and fees.

Item #	Qty.	UNIT	DESCRIPTION	UNIT PRICE	UNIT PRICE WRITTEN IN WORDS	TOTAL PRICE
1	1	LS	Mobilization/Demobilization			
2	1	LS	Erosion & Sediment Control			

Item #	Qty.	UNIT	DESCRIPTION	UNIT PRICE	UNIT PRICE WRITTEN IN WORDS	TOTAL PRICE
3	1	LS	1.2 MGD ADF/4.5 MGD Peak treatment plant consisting of: new 6.0 MGD screening and grit removal system; new SBR treatment system including two (2) 80' x 80' SBR basins and one (1) 41' x 80' Post EQ basin; new 25' x 60' -6" chlorine contact tank; new 23' -6" x 41' Post Aeration Basin; new 75' x 75' Aerobic Digester; new SBR, Pre-EQ, Digester and Post EQ Blowers; new Chlorine/NPW Building; non-chlorination/dechlorination disinfection feed equipment; non-potable water booster equipment; new 18" DIP outfall; new Control/Blower Building; new Sludge Dewatering Building with 1.0 meter belt filter press, sludge feed pump, polymer feed system, lime feed system and conveyor; SBR process equipment valve vaults; influent flowmeter vault; plant process piping; painting; site work; asphalt paving; gravel pavement; mechanical and electrical work; all necessary instrumentation and controls; SCADA; emergency generator; perimeter fence; and all other associated work and necessary appurtenances for a complete operable system.			
4	2350	LF	24" Diameter Concrete Caissons for Shallow Structures			
5	1	LS	0.5 MG Pre equalization tank consisting of 0.5 MG concrete tank, 1 mixer, 2 return pumps, excavation, base stone and all appurtenances as shown. Item 5 limits of piping are shown on plans.			
6	Allowance		ALLOWANCE NO. 1 - To provide all labor, equipment, materials, and services to provide capital improvements required by the electric company to provide adequate electrical service to the project site including additional power poles, transformers, meters, cable and/or conduit and other electrical accessories for the allowance amount of:	\$35,000.00	Thirty-five Thousand Dollars and Zero Cents	\$35,000.00

Item #	Qty.	UNIT	DESCRIPTION	UNIT PRICE	UNIT PRICE WRITTEN IN WORDS	TOTAL PRICE
7	Allowance		ALLOWANCE NO. 2 - To procure, deliver and install office furniture in the newly constructed Control/Building as authorized by the Owner and Engineer:	\$15,000.00	Fifteen Thousand Dollars and Zero Cents	\$15,000.00
8	Allowance		ALLOWANCE NO. 3 - To procure, deliver and install office lab equipment in the newly constructed Control/Building as authorized by the Owner and Engineer:	\$15,000.00	Fifteen Thousand Dollars and Zero Cents	\$15,000.00

TOTAL BID: _____ (Words) _____ (\$ _____) (Figures)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

DEDUCTIVE ALTERNATE #1 BID SCHEDULE

Item #	Qty.	UNIT	DESCRIPTION	UNIT PRICE	UNIT PRICE WRITTEN IN WORDS	TOTAL PRICE
5	1	LS	0.5 MG Pre equalization tank consisting of 0.5 MG concrete tank, 1 mixer, 2 return pumps, excavation, base stone and all appurtenances as shown. Item 5 limits of piping is shown on plans.			

TOTAL ADDITIVE ALTERNATE #1 BID: _____ (Words) _____ (\$ _____) (Figures)

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

3.04. *Method of Award*

If at the time this contract is to be awarded, the lowest total bid submitted by a qualified, responsive, responsible Bidder does not exceed the amount of funds then estimated by the Owner, as available to finance the contract, the construction contract will be awarded. If such bids exceed such amount, the Owner may reject all bids.

The owner may award the contract on the Total Base Bid submitted by a qualified, responsive, responsible Bidder less the amount(s) of the Deductive Alternate(s) subtracted in numerical order, as listed in the contract to produce the lowest bid within the funds available for financing. Awarding on the basis of Deductive Alternate(s) will not change the lowest Bidder.

- A. Unit prices have been computed in accordance with paragraph 13.03.A of the General Conditions.
- B. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

~~ARTICLE 4 — BASIS OF BID — COST-PLUS FEE~~

~~4.01 The Contract Price will be the Cost of the Work, determined as provided in Paragraph 13.01 of the General Conditions, together with the following fee, and subject to the Guaranteed Maximum Price.~~

~~4.02 Contractor's Fee~~

- ~~A. Contractor's fee will be [number] percent of the Cost of the Work. No fee will be payable on the basis of costs itemized as excluded in Paragraph 13.01.C of the General Conditions.
 - ~~1. The maximum amount payable by Owner as a percentage fee (Guaranteed Maximum Fee) will not exceed \$[insert cap amount], subject to increases or decreases for changes in the Work.~~~~
- ~~B. Contractor's fee will be determined by applying the following percentages to the various portions of the Cost of the Work as defined in Article 13 of the General Conditions. No fee will be payable on the basis of costs itemized as excluded in Paragraph 13.01.C of the General Conditions:~~

Costs	Percent
Payroll costs (See Paragraph 13.01.B.1, General Conditions)	
Materials and Installed Equipment cost (GC 13.01.B.2)	
Amounts to be paid to Subcontractors (GC 13.01.B.3)	
Amount to be paid to special consultants (GC 13.01.B.4)	
Other costs (GC 13.01.B.5)	

- ~~1. The maximum amount payable by Owner as a percentage fee (Guaranteed Maximum Fee) will not exceed \$[insert cap amount], subject to increases or decreases for changes in the Work.~~
- ~~C. Contractor's fee will be the fixed sum of \$[number].~~

4.03 *Guaranteed Maximum Price*

A. ~~The Guaranteed Maximum Price to Owner of the Cost of the Work including Contractor's Fee will not exceed \$[Bidder fill in GMP].~~

Deleted

ARTICLE 5 PRICE PLUS TIME BID

5.01 *Price Plus Time Contract Award (Stipulated Price Contract)*

A. ~~The Bidder to which an award of the Contract will be made will be determined in part on the basis of the Total Bid Price and the total number of calendar days to substantially complete the Work, in accordance with the following:~~

	Description		Amount
A	1. Total Bid Price		\${number}
	2. Total number of calendar days to substantially complete the Work	{number} days	
	3. Liquidated Damages Rate (from Agreement)	\${number}/day	
B	4. Adjustment Amount (2 x 3)		\${number}
A+B	5. Amount for Comparison of Bids		\${number}

B. ~~The purpose of the process in the table above is only to calculate the lowest price plus time (A+B) bid amount for bid comparison purposes. The price for completion of the Work (the Contract Price) is the Total Bid Price.~~

C. ~~Bonds required under Paragraph 6.01 of the General Conditions will be based on the Contract Price.~~

5.02 *Price Plus Time Contract Award (Cost Plus Fee with Guaranteed Maximum Price Contract)*

A. ~~The Bidder to which an award of Contract will be made will be determined in part on the basis of the Guaranteed Maximum Price and the total number of calendar days to substantially complete the Work, in accordance with the following:~~

	Description		Amount
A	1. Guaranteed Maximum Price		\${number}
	2. Total number of calendar days to substantially complete the Work	{number} days	
	3. Liquidated Damages Rate (from Agreement)	\${number}/day	
B	4. Adjustment Amount (2 x 3)		\${number}
A+B	5. Amount for Comparison of Bids		\${number}

B. ~~The purpose of the process in the table above is only to calculate the lowest price plus time (A+B) bid amount for bid comparison purposes. The price for completion of the Work (the Contract Price) is based on the cost of the Work, plus a fee, subject to a guaranteed maximum price, as set forth in the Agreement.~~

C. ~~Bonds required under Paragraph 6.01 of the General Conditions will be based on the Contract Price.~~

Deleted

ARTICLE 6—TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

~~6.02 Bidder agrees that the Work will be substantially complete on or before [Bidder inserts date], and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before [Bidder inserts date].~~

Deleted

~~6.03 Bidder agrees that the Work will be substantially complete within [Bidder inserts number] calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within [Bidder inserts number] calendar days after the date when the Contract Times commence to run.~~

Deleted

6.04 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7—BIDDER’S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

7.01 *Bid Acceptance Period*

A. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

7.02 *Instructions to Bidders*

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

7.03 *Receipt of Addenda*

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

ARTICLE 8—BIDDER’S REPRESENTATIONS AND CERTIFICATIONS

8.01 *Bidder’s Representations*

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work, **including all American Iron and Steel requirements.**

4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

8.02 *Bidder's Certifications*

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
 - a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

- b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
- c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
- d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

BIDDER hereby submits this Bid as set forth above:

Bidder:

(typed or printed name of organization)

By: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

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

Attest: _____
(individual's signature)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Date: _____
(typed or printed)

Address for giving notices:

Bidder's Contact:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Phone: _____

Email: _____

Address: _____

Bidder's Contractor License No.: (if applicable) _____

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract Documents, including General and Supplementary Conditions, and all related Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical Samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.
- C. Electronic Submittal: Any submittal transmitted electronically to Engineer for review.

1.4 SUBMITTALS

- A. Schedule of Submittals: Submit a Schedule of Submittals, arranged in chronological order by required dates established by the construction schedule. Include time required for review, ordering, manufacturing, fabrication and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and additional time for handling and reviewing submittals required by those corrections. Submittals shall be provided for all equipment provided for the project.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Engineer's Digital Data Files: Electronic copies of digital data files (PDF) of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.
 - 1. Engineer will furnish Contractor one (1) set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings.
 - a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

- b. Contractor shall execute a data licensing agreement in a form acceptable to Owner and Engineer.
 - c. Digital data drawing files (PDF) will be provided to the Contractor if required in writing and a waiver provided by the Engineer has been signed by the Contractor.
 - B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow twenty (20) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow twenty (20) days for review of each resubmittal.
 - D. Electronic Submittals
 1. Summary
 - a. Shop drawing and product data submittals shall be transmitted to Engineer in electronic (PDF) format using Submittal Exchange, a website service designed specifically for transmitting submittals between construction team members.
 - b. The Contractor shall provide the name, email, and function of any and all team members that must be included in the Submittal Exchange workflow, prior to the submission of submittals.
 - c. Engineer will provide the Project Link for Submittal Exchange, to the Contractor for access to the project interface.
 - d. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - e. The electronic submittal process is not intended for color samples, color charts, or other physical material samples.
 2. Procedure
 - a. Submittal Preparation – Contractor may use any or all of the following options:
 - 1) Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the Submittal Exchange website.
 - 2) Subcontractors and Suppliers provide paper submittals to Contractor who electronically scans and converts to PDF format
 - 3) Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor, and Contractor submits to Engineer via Submittal Exchange.

- b. Contractor shall review and apply an electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer/product, dimensions and coordination of information with other parts of work, and any material compliance requirements, such as American Iron and Steel certifications.
- c. Contractor shall transmit each submittal to Engineer using the Submittal Exchange website, www.submittalexchange.com – at the link provided by Engineer.
- d. Engineer review comments will be made available on the Submittal Exchange website for downloading. Contractor will receive email notice of completed review.
- e. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.
- f. Electronically submitted shop drawings shall follow the following format:
 - 1) Filenames for the shop drawing submittals shall follow a “XXXXX.YYY-Z.Description” convention where XXXXX is the specification section number, YYY is the submittal number, -Z is the submittal number/version, and Description is a short description of what the submittal includes. Submittals shall be consecutively numbered in direct sequence of submittal. Resubmittals shall be consecutively numbered (-Z location) with the first submittal number with a “-0” and the first Resubmittal numbered with a “-R1”
 - 2) All files shall be delivered in PDF format with a minimum resolution of 300 dpi unless otherwise requested by Engineer. Scanned-in material shall be scanned in color and any markings by Contractor shall be made in RED ink. Pages shall be rotated to the appropriate position for easy reading on a computer monitor such that the majority of text is horizontal.
 - 3) Shop Drawings shall be updated as individual files. Files combined into a ZIP folder are not acceptable. All pages of one submittal should be contained in a single electronic file (PDF).
 - 4) Files shall be delivered without security features activated.
 - 5) The file shall open to a cover page containing, at a minimum the following information:
 - a) Contractor’s stamp – approving the information has been reviewed
 - b) Name, email, and telephone number of the individual who may be contacted for further information.
 - c) Project number
 - d) Submittal number
 - e) Submission Date, if resubmittal, all previous submission dates.
 - f) Index detailing contents and the total number of pages in the submittal
 - g) Number and title of appropriate Specification Section.
 - h) Drawing number and detail references, as appropriate.
 - i) Location(s) where product is to be installed, as appropriate.
 - j) Other necessary identification.
- g. Once a shop drawing has been marked “No Exceptions Taken” or “Make Corrections Noted” Contractor shall distribute to its foreman, superintendent, subcontractors, suppliers, and others as necessary.
- h. Engineer will distribute to Resident Project Representative and Owner.

E. Paper Submittals: Paper Submittals are only allowed for items at Engineer’s discretion. Rebar submittals shall be full size paper submittals.

1. Place a permanent label or title block on each submittal item for identification.
2. Indicate name of firm or entity that prepared each submittal on label or title block.
3. Provide a space approximately 6 inches by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
4. Include the following information for processing and recording action taken:
 - 1) Contractor's stamp – approving the information has been reviewed
 - 2) Name, email, and telephone number of the individual who may be contacted for further information.
 - 3) Project number
 - 4) Submittal number
 - 5) Submission Date, if resubmittal, all previous submission dates.
 - 6) Index detailing contents and the total number of pages in the submittal
 - 7) Submittal number shall follow a "XXXXX.YYY-Z.Description" convention where XXXXX is the specification section number, YYY is the submittal number, Z is the resubmittal number, and Description is a short description of what the submittal includes. Submittals shall be consecutively numbered in direct sequence of submittal. Resubmittals shall be consecutively numbered with the first submittal number with a "-0" and the first Resubmittal numbered with a "R1"
 - 8) Number and title of appropriate Specification Section.
 - 9) Drawing number and detail references, as appropriate.
 - 10) Location(s) where product is to be installed, as appropriate.
 - 11) Other necessary identification.
5. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
6. One (1) Electronic Copy: Shall be submitted to Engineer upon being marked as "No Exceptions Taken" or "Make Corrections Noted".
7. Transmittal for Paper Submittals: At Engineer's Discretion, assemble each paper submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use sample form provided at the end of this Specification section or provide locations on Contractor's form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Engineer.
 - 6) Name of Contractor.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of Subcontractor, manufacturer, and Supplier.
 - 9) Category and type of submittal.
 - 10) Submittal purpose and description.

- 11) Specification Section number and title.
 - 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 13) Drawing number and detail references, as appropriate.
 - 14) Indication of full or partial submittal.
 - 15) Transmittal number, numbered consecutively.
 - 16) Submittal and transmittal distribution record.
 - 17) Remarks.
 - 18) Signature of transmitter.
- F. Options: Identify options requiring selection by Engineer.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with “No Exceptions Taken” or “Make Corrections Noted” notation from Engineer’s action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, Subcontractors, Suppliers, fabricators, installers, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project Site. Access to the Submittal Exchange Site is adequate for all Electronic Submittals. Use only final action submittals that are marked with the “No Exceptions Taken” or “Make Corrections Noted”.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements

1. Action Submittals: Submit in PDF format through Submittal Exchange. When physical hard copies are necessary, submit six (6) paper copies of each submittal unless otherwise indicated. Engineer will return three (3) copies.
2. Informational Submittals: Submit via Submittal Exchange all Requests for Information (RFI). When physical paper copies are necessary, submit (2) paper copies of each submittal unless otherwise indicated. Engineer will not return copies.
3. Submit one (1) copy of all submittals via email as PDF electronic files.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

- a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product Specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
- C. Shop Drawings/Submittals: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submittals shall be prepared and submitted for all equipment provided on the project.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as a minimum (Submittals shall also include all data specified in their respective individual specification sections):
 - a. A list of the applicable specification sections and the referencing sections and/or drawings used to prepare the submittal. The submittal shall be complete with addendum updates included, with each specification compliance marked to indicate requested deviations from specification requirements, if necessary. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated and, therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. The submittal shall be accompanied by a detailed, written justification for each deviation. Failure to include a copy of the marked-up specification sections with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
 - b. Identification of products. All data not pertaining to the specific project shall be deleted or marked out.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.

- h. Seal and signature of professional Engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-½ inches by 11 inches, but no larger than 30 inches by 42 inches.
 - 3. Submit Shop Drawings/Submittals in the following format:
 - a. Submit PDF electronic file via Submittal Exchange. Submit paper copies, as requested by Engineer.
- D. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 - Quality Requirements.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.
- F. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- G. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- H. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Contractor's Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

- B. Owner Submittal Review: The Engineer will provide one (1) copy of each submittal to the Owner for their review and comments. Upon receiving comments, the Engineer will proceed with Item C.
- C. Action Submittals: Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- D. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

Submittal Transmittal Form attached

END OF SECTION 013300

SUBMITTAL TRANSMITTAL

Submittal Description: _____

Submittal No.:¹ _____

Spec Section or Drawing Number: _____

OWNER:	Routing	Sent	Received
	Contractor/CM		
PROJECT:	CM/Engineer		
	Engineer/CM		
CONTRACTOR:	CM/Contractor		

We are sending you Attached Under separate cover via _____
 Submittals for review and comment Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review action	Reviewer initials	Review comments attached

Reviewer Action= NET = No exceptions taken; MCN = Make corrections noted; R&R = Revise and resubmit; R = Rejected Attach additional sheets if necessary.

Contractor

Certify either A or B:

- A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related Work, specified (no exceptions).
- B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

No.	Deviation
Certified by: _____	
Contractor's Signature	

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SECTION 233724 – DEEP BED SCRUBBER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Deep Bed Scrubber (DBS)
- B. The Contractor shall provide all equipment and work indicated below unless otherwise noted and any additional work to produce a completely finished job as required by the Engineer.
- C. The Deep bed scrubber units shall be UL certified as a complete assembly.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. This specification defines the requirements for a Deep Bed Scrubber (DBS)
- B. The Deep Bed Scrubber shall contain dry chemical medias
- C. The airflow capacity shall be 3,500 CFM with an external static pressure of 1.0 IWG.
- D. The Deep Bed Scrubber shall be designed to operate at 99.5+% gas removal efficiencies.
- E. The Deep Bed Scrubber shall be arranged for horizontal airflow through vertically oriented, separate media beds. The media beds shall be arranged in series to assure maximum contaminant removal efficiency.

2.2 MANUFACTURER

- A. The manufacturer shall provide vessels to meet the minimum values specified for dimension, design and intent of this specification. The vessel, blower and media shall function as a system and shall be the end product of the manufacturer to achieve standardization in appearance, operation, maintenance, spare parts and manufacturer's services.

- B. The manufacturer shall have a minimum of ten (10) years experience in the design, fabrication and testing of systems that are 99.5+% efficient at removing gaseous contaminants.
- C. Manufacturer shall be Purafil, Inc. or an Engineer Approved Equal.

2.3 MATERIALS

- A. The Deep Bed Scrubber housing shall be fabricated of 3003 H14 Aluminum.
- B. The unit shall be provided with side access hatches and gaskets for servicing of components. Powder coated zinc alloy latches shall have a positive locking action and shall include an encapsulated standard steel shaft
- C. All hinges shall be constructed of stainless steel.
- D. Housing materials shall be weatherproof and suitable for outdoor operation.

2.4 PRE-FILTER

- A. Unit to be designed to accommodate a medium efficiency (30%) pleated particulate filter with high service life.
- B. Hinged access doors with gaskets shall allow for the filter to be replaced.
- C. Pressure taps and gages shall be installed to permit a local read out of the pre-filter pressure drop.

2.5 BLOWERS

- A. Unit to be furnished with a WEG TEFC motor and blower with a direct drive airfoil wheel to assure even, quiet airflow.
- B. The Deep Bed Scrubber shall contain an enclosed blower assembly for outdoor operation.
- C. Motor HP will be determined based on the unit configuration.
- D. Blower and wiring shall comply with UL 507. Unit to be wired to an external UL junction box for single point electrical connection.

2.6 MEDIA BED

- A. Each media bed shall be contained between separate corrosion resistant support grids and perforated sheet metal to provide media support while imposing a minimum resistance to airflow

- B. The media containment sections shall be separated to assure filling and removal of individual beds as required. New media shall be poured in bulk into the top of the unit through access hatches. Spent media shall be removed from the bottom of the unit through discharge ports.
- C. The Media beds will have a fill chute to compensate for media settling.

2.7 FINAL FILTER

- A. Unit will be designed to accommodate a high efficiency (95%) final filter.
- B. Hinged access doors with gaskets shall allow for the filter to be replaced.
- C. Pressure taps and gages shall be installed to permit a local read out of the pre-filter pressure drop.

2.8 INSTRUMENTATION

- A. Differential Pressure
 - 1. A gage shall be included with the scrubber to permit local read-out of pressure drop through the pre-filter and final filter section (shipped separately for field installation).
- B. Gauges to be Magnehelic type.

2.9 SPARE PARTS

- A. 1 set of all replaceable pre-filters and final-filters to be provided.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install DBS, plumb, and at indicated alignment with adjacent work.
- B. Secure unit to concrete pad.

3.2 CONNECTIONS

- A. Connection requirements are specified in Section 233113 "Metal Ducts."

3.3 WARRANTY

- A. Manufacturer shall provide a warranty against defective or deficient equipment, workmanship, and materials under normal use, operation and service. The warranty shall be provided for a

period of one year from date of start up or eighteen months from ship date; whichever occurs first.

3.4 ANALYTICAL SERVICES

- A. The manufacturer shall be able to provide in-house lab analysis of the equipment media predicting the remaining life cycle of the unit.

END OF SECTION 233724

SECTION 262934 - VARIABLE FREQUENCY DRIVES FOR SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and all related Specification Sections apply, to this Section.

1.2 SUMMARY

- A. Section includes: Variable Frequency Drives (VFDs)

1.3 RELATED REQUIREMENTS

- A. Section 333219 – Submersible Non-Clog Pump Station

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Performance Data
 - 1. Based on actual tests of similar equipment and include sufficient data to demonstrate suitability of the VFD for the conditions specified.

1.5 CLOSEOUT SUBMITTALS

- A. Closeout Submittals must be received by Engineer and Owner before the equipment specified in this Section can be considered Substantially Complete.
- B. Operation and maintenance data.
- C. Manufacturer's representative reports from equipment start-up.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 674 for submersible sewage pumps suitable for use in classified locations.

- C. Materials and Workmanship shall be in accordance with the following standards as referenced herein.
 - 1. ANSI - American National Standards Institute.
 - 2. ASTM - American Society for Testing and Materials.
 - 3. AWS - American Welding Society.
 - 4. HI - Hydraulic Institute.
 - 5. IEEE - Institute of Electrical and Electronics Engineers.
 - 6. NEMA - National Electrical Manufacturers Association.
 - 7. AFBMA - Anti-Friction Bearing Manufacturers Association.
 - 8. API - American Petroleum Institute.

- D. VFD shall have a minimum design life of 10 years. Must be part of the submitted documentation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery

- 1. Ship all units assembled as much as practical.
- 2. Label all units with all labeling intact and legible with item name, model number, size, and manufacturer's name.

B. Storage

- 1. Store all units, accessories, and components in the manufacturer's original package, under cover and protected from damage.

C. Handling

- 1. Handle all units and components in accordance with the manufacturer's instructions.
- 2. Use lifting rings and canvas harnesses for lifting to prevent scratching or abrading finished surfaces.
- 3. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover, to protect units from dirt, water, construction debris, and traffic.
- 4. Handle carefully, in accordance with manufacturer's written instructions, to avoid damage to components, enclosure, and finish.

PART 2 - PRODUCTS

2.1 SYSTEM OVERVIEW

- A. A Variable Frequency Drive (VFD) shall be provided and sized for the appropriate voltage and horsepower indicated on the Drawings and specified in other Sections. The VFD and VFD Control System shall be of a design purposely for wastewater pumping and functionally pre-programmed for the specific pump model used. The VFD shall provide all level control functionality, hand/auto operation, pump alternation, pump over temperature monitoring, seal

leakage monitoring and phase conversion if necessary. The Facemeyer #15 VFDs shall provide smart technology to include pump self-cleaning, sump cleaning, pipe cleaning algorithms shall also include capability to monitor station inflow, pump speed and energy consumption in order to automatically operate the lift station at optimal energy efficiency. Include external H-O-A control module for integration of H-O-A switches.

- B. The VFD shall be a Flygt, ABB or engineers approved equal.
- C. The VFD's and controls shall be mounted in a NEMA 4X Stainless Steel enclosure.
- D. The enclosure shall have a NEMA 4X Stainless Steel ventilation system.
- E. The enclosure shall have a thermostatically controlled heater to prevent low temperatures and condensation.
- F. The enclosure shall have an internal circulation fan or air conditioner to prevent heat buildup.

2.2 HARDWARE

- A. The VFD shall incorporate the following characteristics:
 - 1. VFD shall be 480 volts, 60 Hz, 3 Phase.
 - 2. Supply Frequency: 48-62 Hz
 - 3. Phase Imbalance: 3% maximum
 - 4. Inrush Current: less than motor rated current
 - 5. Power Cycles: 120/hour
 - 6. Output Power: .75 to 100 HP at 480 VAC.
 - 7. Overload Capacity: 110% for 60 sec., 125% for 2 sec
 - 8. Output Frequency: up to 80 Hz
 - 9. Ambient Temp.:
 - a. Storage -4 to 140 deg F
 - b. Operating 14 to 104 deg F
 - 10. Humidity: 95% max, non-condensing
 - 11. Enclosure: IP 55
 - 12. Digital Inputs: 10-30VDC internal or external supply, NPN
 - 13. DI Response time: < 4ms
 - 14. Power Supply: 24VDC, 100mA, Short Circuit protected
 - 15. Analog Inputs: 0/4-20mA, 0/24V, 30VDC max
 - 16. AI Resolution: 12 bits + sign
 - 17. AI Response Time: < 4ms
 - 18. AI Accuracy: > 1% of full scale Analog Outputs: 4-20mA, 0-10VDC
 - 19. Relay Outputs: 250VAC/6A, 30VDC/5A
 - 20. Operator Interface: LCD Screen, 7 pushbuttons
- B. The VFD shall be for wall mounting within a cabinet. Stainless Steel Legs may be required.
- C. The VFD shall have an air ventilated system, with or without fan driven ventilation having a maximum ambient temperature of up to 90 degrees Fahrenheit without derating.

2.3 USER INTERACE / MENUS

- A. The VFD or VFD control system shall incorporate an LCD screen to display drive operating status, alarms, liquid level and parameters. The VFD shall include 7 pushbuttons with the following functions: Pump Start, Pump Stop, Hand (Manual) Operation, Auto Operation, Menu Access, Increase Value, and Decrease Value.
- B. Pump Start Level, Operating Parameter Adjustment and Alarm History shall be accessed via menu structure. Menu shall have 4 levels of security, limiting access to qualified personnel only.
- C. The LCD screen shall display status information in 4 modes: Off, Standby, Active Auto and Active Manual. The information shown shall be as follows:
 - 1. OFF: Firmware Version, Status (“OFF”)
 - 2. STANDBY: Status and Name, Pump Running Hours, Operating Mode, Sump Level
 - 3. ACTIVE AUTO: Status and Name, Pump Running Hours, Operating Mode, Motor Freq. Power, Sump Level
 - 4. ACTIVE MANUAL: Status and Name, Pump Running Hours, Operating Mode, Motor Freq., Power, Sump Level
- D. VFD Operational Functionality
 - 1. High/Low Level Sump Control
 - a. The VFD shall provide automatic level control via means of a submersible pressure transducer (4-20 mA DC). User-programmable Start Level shall indicate the point at which the pump will start. Upon activation the pump shall run at maximum speed for a pre-determined period, then ramp down to the energy efficient optimal speed, calculated by the VFD. When the water level reaches the Stop Level, the pump shall stop. The optimal speed shall either be calculated by the VFD or manually entered by the user.
 - b. In case of high inflow, the VFD shall increase pump speed until the water level begins to decrease. When the water level reaches the Stop Level, the pump shall stop.
 - c. In case of very high inflow when a single pump is unable to overcome the inflow conditions even at maximum speed, the lag pump shall be activated and run at maximum speed until the Stop Level is reached. If water levels continue to rise, a High Level Alarm shall be activated via the transducer connected to the VFD.
 - d. The VFD shall incorporate a minimum speed function that prevents the pump from operating at speeds too low to move water based on the pump curve and field testing.
 - 2. Run Time Averaging
 - a. The VFD or VFD control system shall provide capability to balance run times for even wear. This shall be an internal function of the VFD and not require external devices, such as an alternating relay. The function shall operate by determining a “random” start level based on the Start Level setting. Each VFD shall determine its own random start level independent of each other. New random start levels will be determined every 24 hours. The pump with the lowest random start level shall

be first to start on any given pump cycle. The pump with the next to the lowest random start level (lag 1 pump) shall remain in standby capacity in case the lead pump shall not be able to lower the water level as described in the section above. The pump with the highest random start level (lag 1 pump) shall remain in standby capacity in case the lead pump is not able to lower the water level as prescribed. By recalculating the random start levels every 24 hours, balanced run times are accomplished.

3. Pump Cleaning Function

- a. The VFD or VFD control system shall incorporate a “self-cleaning” function to remove debris from the impeller. The cleaning shall be triggered by three circumstances:
 - 1) Soft Clogging: When motor current equals 20% or greater above rated current for a period of 7 seconds.
 - 2) Hard Clogging: When motor current equals 80% or greater above rated current for a period of 0.01 seconds.
 - 3) Schedule Cleaning: The VFD is preprogrammed to perform cleaning once every 5 days.
- b. Cleaning cycle shall consist of forced stopping, reversal and forward runs timed to allow for debris to fall from the impeller. After cleaning cycle is complete, VFD shall resume automatic operation.

4. Sump Cleaning Function

- a. The VFD or VFD Control System shall incorporate a sump cleaning function to ensure surface solids and greases are regularly removed from the sump. The sump cleaning function shall be performed once every 24 hours when enabled by the operator. Sump cleaning consists of the following functions
 - 1) Sump cleaning is triggered when internal timer expires and during a normal pump down cycle.
 - 2) Pump is automatically ramped to maximum speed
 - 3) Pump runs at maximum speed for designated time (default value is 2 minutes, user adjustable)
 - 4) When Sump Cleaning timer expires, pump is shut off and resumes normal operation

5. Pipe Cleaning Function

- a. The VFD shall incorporate a pipe cleaning function to avoid discharge pipe sedimentation and clogging due to reduced pump speed. This shall be an automatic feature that initiates with every pump cycle when enabled by the operator. Upon reaching Pump Start Level, the VFD shall operate the pump at 100% speed for a 6-8 second period (operator-adjustable) before ramping down to the most energy efficient speed for the duration of the cycle.

6. Energy Efficiency Function

- a. The VFD shall provide a function that automatically calculates the most energy efficient speed for the pump based on station inflow characteristics. This shall be accomplished by means of an algorithm that records energy consumption every cycle and compares it to the previous cycle. These comparisons are then used to calculate the optimal speed whereby the most water is pumped using the least amount of energy. By continually comparing succeeding periods, the optimal speed is constantly adjusted to account for changes inflow without requiring operator adjustment, multiple set points, etc.
- b. The energy efficient function will also be based on specific pump curve information that will prevent the VFD from running off of the system curve for the pump. This will ensure maximum hydraulic efficiency as well as electrical efficiency is maintained.

7. Alarms & Monitoring

- a. The VFD or VFD Control System shall provide alarms and monitoring for the VFD, pump and sump. Alarms shall be presented on the LCD display, via a Summary Alarm relay and via Modbus registers. All alarms, when occurring, shall remain active until reset. Alarms shall have a built-in 4 second delay to prevent nuisance tripping. Alarms shall be as follows:
 - 1) Pump Monitoring:
 - a) Pump Over Temperature (thermal contacts in motor stator)
 - b) Pump Seal Leak
 - 2) Sump Monitoring:
 - a) High Sump Level (via level float switch or submersible transducer)
 - b) Sensor Error (High Level float switch active while submersible transducer reports water level below Start Level)
 - 3) VFD Monitoring (includes, but not limited to):
 - a) Drive Overcurrent
 - b) Drive Overload Trip
 - c) Drive Overvoltage
 - d) Drive Undervoltage
 - e) Drive Overtemperature (internal)
 - f) Drive Overtemperature (ambient)
 - g) Drive Undertemperature (ambient)
 - h) External Trip (E-Stop)
 - i) Input Phase Loss
 - j) Drive Output Max Torque Exceeded

8. External Communication

- a. The VFDs shall include a provision for external communication to a higher-level system. Communication shall be via 2-wire RS-485 connection to the VFD. Communication shall be available as MODBUS RTU.

- b. Serial communication capabilities shall include, but not be limited to set Start and Stop Level, pump clean interval, speed and ramp times, as well as level control parameters.
- c. The communication telegram shall include process variable feedback like sump level, power (kW), output speed/frequency, current (A), percent torque, relay outputs, digital inputs, and drive status and fault information.

PART 3 - EXECUTION

A. INSTALLATION

1. Install VFDs according to manufacturer recommendations and as shown in the Drawings.

B. START-UP

1. Start-up shall be provided for each VFD by a factory authorized service professional. A start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

C. PRODUCT SUPPORT

1. Factory trained service personnel that are trained on the VFD products offered shall be locally available at both the specifying and installation locations.
2. A toll free 24/365 technical support line connected to factory support personnel located in the US shall be available. Technical support offered only through the local sales office is not acceptable.
3. Training shall include installation, programming and operation of the VFD, and serial communication. Factory authorized start up and owner training to be provided locally upon request.

D. WARRANTY

1. The VFD Product Warranty shall be 24 months from the date of manufacture. A 36 month warranty shall be available with authorized factory start up and drive registration. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.
2. Extended Warranty shall be available for purchase for up to 72 months from date of manufacture.

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SECTION 333219 – SUBMERSIBLE NON-CLOG PUMP STATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 01, and all related Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Pumps
- 2. Accessories

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Wiring Diagrams: For power, signal, and control wiring.
- C. Shop Drawings
- D. Performance Data
 - 1. Based on actual tests of similar equipment and include sufficient data to demonstrate suitability of both the pump and driver for the conditions specified.
 - 2. The data shall include the type and make of pump, size, capacity, motor horsepower, motor speed, and performance curve, with design duty points clearly indicated.

1.4 CLOSEOUT SUBMITTALS

- A. Closeout Submittals must be received and accepted by Engineer and Owner before the Project can be considered Substantially Complete.
- B. Operation and maintenance data.
- C. Provide duplicate or photocopies of stamped nameplates of each pump provided.
- D. Manufacturer's representative reports from equipment start-up.
- E. Spare parts: Repair kit for each pump containing at a minimum the following:
 - 1. O-ring kit
 - 2. Bearings

3. Upper and Lower Seals

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (NEC), by a qualified testing agency, and marked for intended location and application.
- B. UL Compliance: Comply with UL 674 for submersible sewage pumps suitable for use in classified locations.
- C. Materials and Workmanship shall be in accordance with the following standards as referenced herein.
 - 1. ANSI - American National Standards Institute.
 - 2. ASTM - American Society for Testing and Materials.
 - 3. AWS - American Welding Society.
 - 4. HI - Hydraulic Institute.
 - 5. IEEE - Institute of Electrical and Electronics Engineers.
 - 6. NEMA - National Electrical Manufacturers Association.
 - 7. AFBMA - Anti-Friction Bearing Manufacturers Association.
 - 8. API - American Petroleum Institute.
- D. Shop Pump Test
 - 1. Submit performance test data based on testing of each pump furnished that is 30 HP and over, unless noted otherwise.
 - 2. Perform performance tests in accordance with the Test Code of the HI except as modified herein, and demonstrate compliance with the operating conditions specified.
 - 3. Notify and afford the Engineer the opportunity to witness the test on pumps larger than 100 hp.
 - 4. Base the pump test acceptance criteria on HI Level 11A11 performance.
- E. Shop Motor Tests
 - 1. Tests shall be performed in accordance with ANSI/IEEE Standard 112 and ANSI C52.1, parts 12 and 20 (NEMA MG1).
 - a. For every motor furnished 30 HP and larger and less than 200 HP, submit a routine test report and certified data.
 - 2. Test Report Requirements.
 - a. Routine Test Report. Includes running light current, power input, and high potential based on test data from each motor furnished that requires it.
 - b. Certified Data. Includes motor efficiency and power factor at 100 percent, 75 percent, and 50 percent of full load based on test data of a motor of identical design.
 - c. Full Certified Test Report. Includes full-load heat run, percent slip, running light current, locked rotor current, starting torque, efficiency and power factor at 100 percent, 75 percent, 50 percent full load, and winding resistance and

high potential tests based on test data from each motor furnished that requires it.

3. Notify and afford Engineer the opportunity to witness any required Full Certified Tests.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. Ship all units assembled as much as practical.
2. Label all units with all labeling intact and legible with item name, model number, size, and manufacturer's name.

B. Storage

1. Store all units, accessories, and components in the manufacturer's original package, under cover and protected from damage.
2. Maintain a grease coating on all bearings and shafts to prevent corrosion.
3. Turn pump shafts at intervals recommended by the pump manufacturer.

C. Handling

1. Handle all units and components in accordance with the manufacturer's instructions.
2. Use lifting rings and canvas harnesses for lifting to prevent scratching or abrading finished surfaces.

PART 2 - PRODUCTS

2.1 PUMPS

A. Vertical Permanent Pumps:

1. Description: Factory-assembled and -tested sewage pump unit. Pumps shall be heavy duty, suitable for continuous, efficient, and dependable service under operating conditions imposed by the installation and specific pump specification
 - a. All pumps of a given type shall be manufactured by Flygt or KSB.
 - b. All castings shall be free of warp, fins, gas and pit holes, and other defects that might impair strength or appearance.
 - c. All welding shall be in accordance with the standards of the AWS
2. Pump type: Vertical Permanent, meeting the requirements for Class 1, Division 1, explosion-proof, end-suction, single-stage, close-coupled, centrifugal sewage pump.
3. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to existing support. Castings shall have a minimum tensile strength of 30,000 pounds per square inch (psi) and conform to the applicable ASTM standard
 - a. All steel shall conform to the applicable ASTM standard

- b. Pumps and motor casing shall have O-ring gaskets at all casing and motor cover joints.
- c. Suction and discharge opening shall be not less than 14 inches in diameter.
- d. Provide the casing with a replaceable wearing ring.

4. Pump and Motor Conditions:

- a. Pump must be capable of meeting flows of 170 GPM at 29 ft. of head
- b. Pump motor must stay above 40 Hz when meeting all flows
- c. Phase: 3 Phase
- d. Voltage: 460 volts

5. Impeller: Cast iron or equivalent, Class 35B, dynamically balanced, non-clog, multi-vane, back-swept, semi-open design for solids handling. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across spiral grooves located on the volute suction which shall keep them clear of debris, maintaining an unobstructed impeller leading edge and sustaining a high level of hydraulic efficiency. The leading edges of the impeller shall be hardened to Rc 60 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater.

- a. Provide with replaceable impeller wear ring constructed of stainless steel dissimilar to casing wear ring.

6. Pump and Motor Shaft: Pump and motor shaft shall be a solid continuous shaft. The pump shaft is an extension of the motor shaft. Pieced shafts or the use of couplings shall not be acceptable. The pump shaft shall be of AISI 431 stainless steel and shall be completely isolated from the pumped liquid.

- a. Bearing housings shall be rigidly supported, and exclude dirt and foreign matter from the bearings.
- b. Designed for a minimum L10 life of 100,000 hours at the operating point in accordance with ABMA.

7. Seals: Mechanical.

- a. Equip each pump with two independent mechanical seals separated by an oil reservoir.
- b. The lower seals shall be tungsten carbide.

8. Pump Bases

- a. Mount pump and motor on engineer approved cast iron or fabricated steel base.
- b. Sufficiently reinforce and brace the base to withstand all shock loads and resist all wearing and buckling during pump operation.

9. Nameplate: Attach a stamped stainless steel nameplate to each pump in a clearly visible, easily accessible location. Stamp each nameplate with the following for each pump.

- a. Manufacturer's name.
- b. Model number.
- c. Serial number.

- d. Design capacity, gallons per minute (gpm). This shall be in a larger font size from the other information.
- e. Design head, feet.
- f. Design speed, revolutions per minute (rpm).
- g. Voltage
- h. Hertz
- i. Full load amps

2.2 MOTORS

- A. Manufacturer: FLYGT or KSB.
- B. Motor: NEMA B design, with built-in thermal overload protection, leak detection, and lifting eye or lug. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C.
- C. Pump motor power and control cable shall be a single unit, and be suitable for submersible pump applications, which shall be indicated by a code embossed on the cable.
 - 1. Provide cable strain relief assemblies as indicated on the Drawings
 - 2. Cable shall be sized in conformance with NEC; shall be of adequate length; and include a grounding plug and cable-sealing assembly for connection at pump.
- D. Performance
 - 1. Rated for variable speed or continuous duty and normal starting torque, unless otherwise specified or shown.
 - 2. Temperature rise shall be in accordance with NEMA limits for the class of insulation, service factor, and enclosure specified.
 - 3. Performance shall conform to the requirements of NEMA MG1 Part 12 and shall be expressed as indicated in NEMA MG1-12.30, and a report for routine tests shall be submitted based on IEEE Test Procedure 112, Method B.
 - 4. Minimum 1.15 service factor rating unless noted otherwise.
 - 5. The pump brake horsepower (bhp) requirements shall not exceed the motor nameplate horsepower (hp) under the operating conditions.
 - 6. NEMA Premium Efficiency type except for submersible motors.
 - 7. Inverter Duty: All motors for variable-speed duty shall have the following features in addition to those listed above.
 - a. Designed for use on pulse width modulated variable-frequency drives (VFDs) without external filters or cable length limitations.
 - b. Inverter-grade, NEMA Design B, 1,600-volt, Class F insulated moisture resistant windings.
 - c. Service factor of 1.0 when operated from a VFD.
 - d. Normally closed thermostat on stator windings.
 - e. Meeting requirements of NEMA MG1 Part 31.
 - 8. Designed for continuous 24 hours per day operation.
 - 9. Capable of sustaining a minimum of 10 starts per hour.

E. Assembly and Fabrication

1. Minimum NEMA Class F insulation.
2. Enclosure shall have liquid cooled outer jacket
3. Provide and mark motor terminals as required for the application described in NEMA MG1 Section 2 and required in Division 26, "Electrical."

F. Motor Nameplate

1. Attach a stamped stainless steel nameplate to each motor clearly visible showing operational data in accordance with NEMA MG-1.

2.3 ACCESSORIES

A. Anchor Rods

1. Anchor rods, washers, and nuts shall be Type 316 stainless steel and shall be of ample size and strength for the intended purpose. Size and number shall be as recommended by the manufacturer.

B. Pressure Gauges: Pressure gauges shall be as specified on the Contract Drawings.

C. Suction Hand Hole Reducer

1. Pump shall come complete with a suction-mounted, flanged cast iron eccentric reducer with a large hand hole.

D. Thermal Motor Protection. Include temperature switches for all size motors.

1. Temperature Switches

- a. Equip the motor with three embedded temperature switches in the stator.
- b. Temperature switches shall be normally closed (NC) configuration.
- c. Connect temperature switch wiring to terminals in the motor conduit compartment.
- d. Incorporate temperature switch operation with the motor control.
- e. Provide motor terminal box of adequate size to allow installation of motor terminal kits without interfering with terminals or damaging control wiring.

E. Moisture Sensor: Include a Flygt FLS 518 89 02 leakage sensor in the stator housing.

F. Shaft Seals (as required)

1. Split-Face Mechanical Seals

- a. A temperature rating of 250 degrees Fahrenheit (°F) or higher.
- b. Hydraulically balanced.
- c. Materials of Construction.

- 1) Seal Faces. Silicon carbide/silicon carbide or tungsten carbide/silicon carbide.

- 2) Hardware, Glands, and Sleeves. 316 stainless steel.
- 3) Elastomers. EPR, Viton.
- 4) Springs. Hastelloy C or ElgHoy.

d. Subject to compliance with the Specifications, provide the seals from Flygt.

2. Cartridge Single Seals.

- a. A temperature rating of 250° F. or higher.
- b. Hydraulically balanced.
- c. Materials of Construction.

- 1) Seal Faces: Silicon carbide/silicon carbide or tungsten carbide/silicon carbide.
- 2) Hardware, Glands, and Sleeves. 316 stainless steel.
- 3) Elastomers. EPR or EPDM.
- 4) Springs. Hastelloy C.

d. Subject to compliance with the specifications, provide the seals from Flygt.

3. Throat Bushings

- a. Provide a close-fit throat bushing.
- b. Subject to compliance with the Specifications, provide the bushings from Flygt.

2.4 Electrical Components

A. Panel Enclosure

1. Electrical control equipment shall be mounted within a NEMA 4X stainless steel, dead front type control enclosure. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs.
2. All control devices and instruments shall be secured to the sub-plate with machine screws and lockwashers. Mounting holes shall be drilled and tapped; self-tapping screws shall not be used to mount and component. All control devices shall be clearly labeled to indicate function.
3. Pump station controls shall conform to third party safety certification. The panel manufacturer shall be certified to apply a serialized UL label listed for "Enclosed Industrial Control Panels". The enclosure, and all components mounted on the sub panel or control cover shall conform to UL descriptions and procedures.

B. Variable Frequency Drives

1. Refer to Section 262934 – Variable-Frequency Drives for Submersible Pumps.

C. Branch Components

1. All motor branch and power circuit components shall be of highest industrial quality. The short circuit current rating of all power circuit devices shall be a tested combination or evaluated per the National Electrical Code Article 409. The lowest rated power circuit component shall be the overall control panel short circuit rating and shall not be less than the fault current available. The minimum control panel rating shall not be less than 10 Ka, rms symmetrical. Control assemblies operating at 120 volts nominal or less may be provided with transformers which limit the fault current and may be rated less than the minimum required short circuit rating.

2. Circuit Breakers and Operating Mechanisms

- a. A properly sized heavy duty circuit breaker shall be furnished for each pump motor. The circuit breakers must be sealed by the manufacturer after calibration to prevent tampering.
- b. An operating mechanism installed on each motor circuit breaker shall penetrate the control panel door. A padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

3. Phase Monitor

- a. The control panels shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, high voltage, low voltage, and voltage unbalance. An adjustable time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart, following an adjustable time delay, when power conditions return to normal.

4. Transient Voltage Surge Suppressor

- a. The control panel shall be equipped with a transient voltage surge suppressor to minimize damage to the pump motors and control from transient voltage surges. The suppressor shall utilize thermally protected silicon-oxide varistors encapsulated in a non-conductive housing. Mechanical indicators shall be provided on each phase to indicate protection has been lost. The suppressor shall have a surge current rating of 100,000 Amps per phase and a 100Ka interrupting rating

5. Voltage Alert Indication

- a. The control panel shall include a voltage alert indicator to reduce the risk of electrical arc flash by pre-verifying the electrical isolation from outside of the control panel. Hardwired to the main incoming point of termination, the indicator shall be powered by the same voltage that it indicates utilizing redundant circuitry, thereby flashing whenever voltage is present. An eight detector display shall

visually alert the presence of dangerous AC or DC potentials occurring between any combinations of the monitored input lines.

D. Control Circuit

1. A normal duty thermal-magnetic circuit breaker shall protect all control circuits by interrupting control power.
2. Pump mode selector switches shall permit manual start or stop of each pump individually or permit automatic operation under control of the liquid level control system. Manual operation shall override all shutdown systems, except the motor overload relays. Selector switches to be heavy duty, oil-tight design with contacts rated NEMA A300 minimum.
3. Pump alternation shall be integral to the liquid level controller. Provisions for automatic alternation or manual selection shall also be integral to the liquid level controller.
4. Six digit elapsed time meter shall be displayed.
5. A high pump temperature protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. An indicator light will be lit indicating the motor stopped due to high pump temperature. The motor shall remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.
6. A moisture protection circuit shall override the level control and shut down the pump motor(s) when required to protect the pump from excessive temperature. An indicator light will be lit indicating the motor stopped due to high pump temperature. The motor will remain locked out until the pump has cooled and circuit has been manually reset. Automatic reset of this circuit is not acceptable.
7. A duplex ground fault receptacle providing 115 VAC, 60 Hz, single phase current, will be mounted on the side of the control enclosure. Receptacle circuit shall be protected by a 15 ampere thermal-magnetic circuit breaker.
8. The panel shall be equipped with a 3 KVA stepdown transformer to supply 115 volt, AC, single phase for the control and auxiliary equipment. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker, sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door and a padlockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position. An additional mechanism(s) shall be provided on the circuit breaker permitting the breaker to be operated and/or locked with the control panel door in the open position.

9. Wiring

- a. All wiring, workmanship, and schematic wiring diagrams shall comply with applicable standards and specifications of the National Electric Code (NEC).

- b. All user serviceable wiring shall be type MTW or THW, 600 volts, color coded as follows:
 - 1) Line and Load Circuits, AC or DC power.....Black
 - 2) AC Control Circuit Less Than Line Voltage.....Red
 - 3) DC Control Circuit.....Blue
 - 4) Interlock Control Circuit from external source..... Yellow
 - 5) Equipment Grounding Conductor.....Green
 - 6) Current Carrying Ground.....White
 - 7) Hot With Circuit Breaker Open.....Orange
- c. Control circuit wiring inside the panel, with exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Power wiring to be 14 gauge minimum. Motor branch wiring shall be 10 gauge minimum.
- d. Motor branch and other power conductors shall not be loaded above the temperature rating of the connected termination. Wires must be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be ring tongue type with nylon insulated shanks. All wires on the sub-plate shall be bundled and tied. All wires extending from components mounted on door shall terminate at a terminal block mounted on the back panel. All wiring outside the panel shall be routed through conduit.
- e. Control wires connected to door mounted components must be tied and bundled in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall allow the door to swing full open without undue stress or abrasion. Bundles shall be held on each side of hinge by mechanical fastening devices.

10. Grounding

- a. The contractor shall provide an earth driven ground connection to the pump station at the main grounding lug in accordance with the National Electric Code (NEC).

11. Equipment Marking

- a. Permanent corrosion resistant name plate(s) shall be attached to the control and include following information:
 - 1) Equipment serial number
 - 2) Control panel short circuit rating
 - 3) Supply voltage, phase and frequency
 - 4) Current rating of the minimum main conductor
 - 5) Electrical wiring diagram number
 - 6) Motor horsepower and full load current
 - 7) Motor overload heater element
 - 8) Motor circuit breaker trip current rating

9) Name and location of equipment manufacturer

- b. Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified.
- c. Switches, indicators, and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.

2.5 LIQUID LEVEL CONTROL

- A. The manufacturer of the liquid level control system must be ISO 9001:2008 revision certified, with scope of registration including design control and service after sales activities.
- B. The manufacturer of the liquid level control system must be ISO 9001:2000 revision certified, with scope of registration including design control and service after sales activities.
- C. The level control system shall start and stop the pump motors in response to changes in wet well level, as set forth herein.
- D. The level control system shall operate as a submersible transducer type system.
 - 1. The level control system shall utilize alternation to select first one pump, then the second pump, then the third pump (if required), to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle, or in the event of excessive run time.
 - 2. The level control system shall utilize an electronic pressure switch which shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the electronic pressure switch shall stop this pump. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second and/or third pump (if required) when the liquid reaches the "lag pump start level", or "standby pump start level" so that all pumps are operating. These levels shall be adjustable.
 - 3. Panel manufacturer will supply one 115-volt AC alarm light fixture with vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rainwater from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose for installation by the contractor.
 - 4. Panel manufacturer will supply one 115-volt AC weatherproof alarm horn with projector, conduit box, and mounting base. The design must prevent rainwater from collecting in any part of the horn. The alarm horn will be shipped loose for installation by the contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site Verification of Conditions. Before installation of equipment, verify that:
 - 1. All clearances have been met.
 - 2. Bases, anchors, supports, and openings are located correctly and are of the proper size and material.
- B. Variations: Correct any variations from the requirements shown or required by the manufacturer at no additional cost to the Owner. Submit all methods of correction in writing.

3.2 PREPARATION

- A. Protect all surface areas from damage. Protect all finished floors with a waterproof, oil-resistant cover to prevent staining from oil and/or grease.

3.3 INSTALLATION

- A. General: Install all pumps and components in accordance with the manufacturer's instructions and the conforming Shop Drawings, including all gasket seals, isolation dampeners, cleanouts, drains, gauges, motors, controls, and power wiring.
- B. Piping as shown is typical for the specified pump. Actual pump piping connections shall vary among pump manufacturers. Coordinate pump piping connections with pump supplier and piping supplier.
- C. Set anchor rods in accordance with the approved manufacturer's conforming submittals.
- D. Lubrication: Furnish and apply an initial supply of grease and oil as recommended by the manufacturer. Grease and oil the equipment throughout all testing until substantial completion.
- E. Base: Anchor and grout the base in accordance with the manufacturer's recommendations. Connect base drain to nearest floor drain.
- F. Interface with Other Products
 - 1. Install and connect all piping.
 - 2. Perform field quality control as specified in this specification.

3.4 REPAIRS AND RESTORATION

- A. Repair or replace any damage to the pump or motor or chips, dents, scratches, stains, or other disfiguring of surrounding floors, walls and/or accessories to the satisfaction of the Owner and/or Engineer at no additional cost to the Owner.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service and Start-Up
 - 1. A qualified representative of each equipment manufacturer shall start up the pumps in accordance with Section 017900, "Demonstration and Training".
 - 2. Representative shall spend at least 1 day performing the required services for each type of pump.
- B. Noise and Vibration limitations. For an acceptable installation, the pump and motor combination shall operate without excessive vibration, noise, or bearing temperatures, under the specified conditions. Guidelines to establish excessive pump vibration shall be as described in ANSI/HI 9.6.4.

3.6 CLEANING

- A. Clean the pump, motor, accessories, and surrounding areas of all foreign material, grease, and oil stains.
- B. Remove all rags, sticks, debris, and construction materials. Replace damaged equipment components in like kind at no additional cost.
- C. After cleaning, provide protective covering for each piece of equipment.

3.7 SPARE PARTS

- A. Spare parts shall be submitted by Contractor before the equipment will be considered Substantially Complete.
- B. Spare parts shall include the following:
 - 1. O-Ring kit
 - 2. Bearings
 - 3. Upper and Lower Seals

END OF SECTION 432520

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SECTION 461405 – SEQUENCING BATCH REACTOR (SBR) EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section contains the requirements for Sequencing Batch Reactor (SBR) equipment for the treatment of wastewater. This section also includes Pre-EQ Basin mixing and Post-EQ Basin aeration equipment.
- B. This section also specifies the overall performance requirements and operation of the SBR treatment equipment.
- C. Any equipment bid as an “or equal” must adhere to the equipment specified. Substitutions for stainless steel equipment and appurtenances will not be allowed.

1.2 SUBMITTALS

- A. Submit the following in accordance with Section 013300 – Submittal Procedures.
- B. Product data for the SBR equipment and accessories.
- C. Shop Drawings: Submit plans, elevations, and details for work not fully shown by product data; include rough-in dimensions and service connection details.
- D. Design Calculations: The equipment manufacturer shall submit calculation verifying the design of the proposed SBR system.
- E. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

1.3 SYSTEM SOURCE & QUALITY ASSURANCE

- A. Basis of Design: The Drawings and Specifications have been developed based on SBR equipment manufactured by Aqua-Aerobic Systems, Inc. of Rockford, Illinois. Any costs resulting from changes made necessary by the approval of other SBR equipment shall be borne by the Contractor.

This shall include all design work and drawing and specification revisions by the Engineer. Also, the Contractor shall submit drawings to the Engineer for approval showing all changes made necessary by the other equipment.

- B. The SBR System shall be supplied by a company of good reputation that is regularly engaged in the manufacture and fabrication of SBR wastewater treatment systems. The manufacturer's experience shall include a minimum of ten (10) installations where equipment of similar size and design has been in operation successfully in a similar process for a minimum of five (5) years. As a minimum, the supplier shall be the manufacturer of the following components: mixers, decanters, retrievable diffuser, diffusers and controls.
- C. The Contractor shall assign full responsibility for the functional operation of all SBR System components to a Single Source Supplier. This Supplier shall be responsible for all engineering necessary in order to select, furnish, inspect the installing contractor's equipment installation and connections, calibrate, and place into operation the SBR System along with all other equipment and accessories as specified herein.

1.4 ELECTRICALLY ACTUATED VALVE QUALITY ASSURANCE

- A. Actuated valves shall be tested to Aqua-Aerobic Systems test protocol prior to shipment. Testing shall consist of the following:
 - 1. Project and nameplate data verification per assembly documentation.
 - 2. Limit switch and torque switch setup and cycle test.
 - 3. Hydrostatic test (two pressurization cycles) for all plug and butterfly valves.

1.5 MIXER QUALITY ASSURANCE

- A. The floating mixer(s) shall be shop inspected and tested prior to shipment. Testing shall consist of the following:
 - 3. Project and nameplate data verification per assembly documentation.
 - 2. Dynamic balancing.
 - 3. Final inspection.

1.6 CONTROL PANEL QUALITY ASSURANCE

- A. All Control panels shall be UL certified. Testing by manufacturer's electrical engineering prior to releasing for shipment shall be completed. Testing shall consist of the following:
 - 1. Point to point testing of all wiring prior to application of power.
 - 2. Intended supply voltage shall be applied to the enclosure.
 - 3. All components shall be tested for proper operation and calibration.
 - 4. The PLC and operator interface program shall be loaded and functionally checked.
 - 5. All components shall be checked to confirm proper mounting specifications have been followed.
 - 6. Enclosure shall be inspected for defects and repaired if necessary.
 - 7. All labeling of wires and devices are correct, properly installed and clean.

- B. The manufacturer shall finalize the factory checkout by completing a control panel checklist to document all testing completed above.
- C. Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

1.7 SYSTEM OPERATION AND MAINTENANCE MANUALS

- A. Complete system Operation and Maintenance manuals shall be available in hardcopy and electronic form. The electronic form shall be provided in .pdf format and be fully bookmarked. Manuals shall address:
 - 1. General project information.
 - 2. Installation and start-up.
 - 3. Process design and operational control description.
 - 4. Mechanical, electrical and field instrumentation component descriptions.
 - 5. Maintenance and troubleshooting.
 - 6. Mechanical and electrical drawings.

1.8 MOTOR COMPLIANCE

- A. Motors shall be in compliance with the Energy Independence and Security Act of 2007 (EISA 2007).

1.9 SPECIFICATION PRECEDENCE

- A. The specifications for equipment and controls under this section supersede specifications for equipment and controls specified elsewhere in the contract documents and drawings. Purchased components such as gear reducers, pumps, motors, valves, and actuators shall be provided with standard recommended manufacturers paint, unless otherwise specified within this section.
- B. The SBR area electrical classification shall be Nonclassified. Motors within the basin shall be rated for a temperature code T2A (280 Deg.C).

1.10 WARRANTY

- A. The Manufacturer shall provide a written warranty against defects in materials and workmanship. Manufacturer shall warrant the goods provided by the Manufacturer to be free from defects in materials and workmanship under normal conditions and use for a period of one (1) year from the date of Substantial Completion. This warranty shall not apply to any goods or part which has been altered, applied, operated or installed contrary to the Manufacturer's instructions or subject to misuse, chemical attack/degradation, negligence or accident.

1.11 SBR FUNCTIONAL REQUIREMENT

- A. The manufacturer of the SBR system shall be completely responsible for the proper design of their system, including but not limited to; diffused aeration equipment, transfer pumps, mixers, decanters, and controls. All equipment shall perform as specified and the completed installation shall operate in accordance with the requirements of the plans and specifications.
- B. As an alternate to the specified AquaEndura maintenance free unit herein specified, the manufacturer shall supply one (1) complete power section for each AquaEndura unit specified. The power section shall include a motor and shaft section, diffusion head or motor base and propeller complete and assembled. The complete power section shall include storage protection and motor space heaters.
- C. The aeration system is defined as the aeration device working in conjunction with a mixer. The aeration system shall be designed to provide oxygen distribution to the entire basin. It shall also ensure mixing to promote suspension of all biological solids in the basin without the introduction of air. No change in the basin geometry shall be allowed. The velocity and mixing in the basin shall be sufficient to ensure complete biological solids suspension and dispersion.
- D. The aeration system for the aeration basins shall be capable of providing mixing such that when operated under any combination of the specified design conditions it shall suspend all biological floc and mixed liquor suspended solids throughout the liquid mass in each basin. The aeration system shall further be capable of maintaining complete aerobic conditions and suspension of all biological floc and suspended solids throughout the liquid mass in each basin.

1.12 PERFORMANCE AND DESIGN STANDARDS

- A. The equipment furnished under this section shall be a complete SBR treatment system.

The jobsite conditions are:

1.	Average Daily Flow Max. Daily Flow	1.2 MGD 4.0 MGD		
2.	<u>Design Loadings</u> BOD TSS TKN NH ₃ -N Phosphorus	<u>Influent</u> 440 mg/l 320 mg/l 60 mg/l 8 mg/l	<u>Effluent</u> 10 mg/l 10 mg/l 5.0 mg/l	
3.	Wastewater temperature Minimum Maximum	49°F 81°F		
4.	Ambient air temperature Minimum Maximum	35°F 94°F		
5.	Jobsite elevation	596 feet MSL		

6.	Alpha (maximum value allowed)	0.85
7.	Beta (maximum value allowed)	0.95
8.	F/M ratio	0.086 lb BOD ₅ /lb MLSS - Day
9.	MLSS at low water level	4500 mg/l
10.	Maximum Cycles at Max. Daily Flow	5/day/basin
11.	Oxygen Requirements	1.25 lbs O ₂ /lb BOD ₅ applied 4.60 lbs O ₂ /lb NH ₃ -N applied
12.	Minimum Hourly AOR	344.4 lbs O ₂ /hr
13.	Actual Oxygen Required	8,267 lbs/day
14.	Air Flowrate/Basin	2,413 SCFM
15.	Minimum Aeration Time	2.4 hrs/cycle at maximum daily flow
	Minimum Mixing Time	2.98 hrs/cycle at maximum daily flow
	Minimum Settling Time	0.75 hrs/cycle at maximum daily flow

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers:

1. The Owner and Engineer believe the following manufacturers are capable of producing equipment and products, which will satisfy the requirements of this Section. This statement, however, shall not be construed as an endorsement of a particular manufacturer's product, nor shall it be construed that a named manufacturer's standard product will comply with the requirements of this Section. It shall be the responsibility of the contractor to coordinate with the "selected" equipment manufacturer by use of this specification and all related design drawings for any necessary adjustments, modifications or alterations to standard products to ensure that the product complies with all sections of this specification. Candidate manufacturers include Aqua-Aerobic Systems, Inc. and Alfa Laval.

2.2 PRE-EQUALIZATION BASIN

A. The Pre-EQ Basin shall be erected in one basin as shown on the Drawings.

1. Basin Quantity: 1
2. Inside Diameter: 110'-0"
3. Side Water Depth:

- a. Maximum Operating Level: 21.1 ft.
- b. Top of Wall: 23.0 ft.

B. ENDURA® SERIES DDM MIXER

- 1. Furnish AquaDDM® mechanical floating mixer and related equipment accessories as described herein for each new basin. Each mixer shall consist of a motor, direct-drive impeller driven at a constant speed, an integral flotation unit, and impeller volute. The Endura Series shall incorporate design enhancements that provide for three (3) years without routine maintenance (greasing).

Mixer Quantity	1 per Basin
Mixer Properties	
Zone of Complete Mix	105 ft
Direct Pumping Rate	18,200 gpm
Recirculation Rate	600,000 gpm
Motor	
Size	40 HP
RPM	900 RPM
Efficiency	Premium
Mounting Base Materials	304 SS
Float	
Diameter (minimum)	114.5 inches
Shell Material	FRP Skin
Impeller Volute Material	304 SS

- 2. **PERFORMANCE**

- a. Each mixer shall meet the requirements summarized above. Complete mix shall be defined as maintaining biological suspension of all mixed liquor suspended solids with the specified MLSS concentration without the introduction of air.

- 3. **MIXER DRIVE MOTOR**

- a. The motor shall be vertical P base design, totally enclosed fan cooled TEFC, and generally rated for severe duty. The motor shall in all cases equal or exceed standard NEMA specifications. A minimum service factor of 1.15 shall be furnished.
- b. The motor winding shall be nonhygroscopic, and insulation shall equal or exceed NEMA Class "F". A lip seal shall be provided below the bottom bearing to prevent moisture from penetrating around the motor shaft. A condensate drain shall be located at the lowest point in the lower-end bell housing. Unit shall have a one-piece motor shaft continuous from the top motor bearing, through the lower bearing and down to and through the propeller. The shaft shall be manufactured from 17-4 PH stainless steel.
- c. Motor bearings shall be regreasable. Sealed bearings are not acceptable. Top bearing shall be shielded on the bottom side only. Bottom bearing shall be open. The top and bottom motor bearings shall be of combined radial and axial thrust

type. The lower motor bearing inner brace shall be locked to the motor shaft via a special washer and locking nut arrangement. The shaft shall be threaded just below the lower bearing and shall have a keyway cut into the motor shaft. This key shall accept a tab from the inner diameter of the locking washer, and the locking nut shall have recesses to accept a tab from the outer diameter of the locking washer to prevent the nut from backing off. Snap ring type bearing retainers will not be acceptable.

- d. Submerged motors, jet pumps, submerged gear motors or gearboxes shall not be acceptable.

4. MOTOR MOUNTING BASE

- a. The motor shall be securely mounted onto a solid 304 stainless steel base which is integral with the motor base extension. All submerged wetted motor mounting base components shall be constructed of 304 stainless steel.
- b. The upper portion of the motor mounting base, immediately below the lower motor bearing, shall include two independent acting air seals. The two seals shall be capable of sealing off the flow of air from the suction action of the pumped flow, and prevent backflow of liquid during impeller reversal. The lower end of the motor base extension shall be provided with a rotating backflow seal that will prevent grit from being introduced into the anti-deflection insert reservoir, but shall allow liquid to contact the shaft. The backflow seal shall not require scheduled lubrication or maintenance.

5. FLOATATION

- a. Each unit shall be equipped with a modular float with a central float passage of a size to allow installation and removal of the pump impeller. The float shall be foamed full of polyurethane foam of the closed cell type, and shall be totally sealed to prevent the foam from being in contact with the external environment.

6. IMPELLER

- a. The impeller shall be designed to pump the liquid from near the surface and direct it down toward the vessel/basin bottom. The impeller shall be a two-blade marine type precision casting of 316 or 15/5 stainless steel and shall be specifically designed for the application intended. It shall be dynamically and hydraulically balanced. The propeller must be attached to the motor shaft with a hardened stainless steel pin and set screw. Impeller shall be capable of being reversed to cause back flow liquid movement without causing damage to the mixer chassis and without causing upflow liquid damage to the motor bearing and windings. No liquid spray or other liquid leakage upward onto the surface of the motor support surface or flotation chassis will be allowed.

7. INTAKE VOLUTE ASSEMBLY

- a. The impeller shall operate in a volute made of 304 stainless steel plate, minimum 3/16 inch thick.

8. VIBRATION

- a. The entire rotating assembly including the motor rotor, shaft, shaft accessories, and impeller shall be dynamically balanced within 2.0 mils peak-to-peak horizontal displacement measured at the upper and lower motor bearing. Measurements shall be taken at a frequency equivalent to the motor RPM. Measurements shall be taken with the motor in a vertical, shaft down position with the entire power section mounted on resilient pads.

9. MOORING SYSTEM

- a. Each unit shall be provided with a mooring system, as described below:

Mooring Type	Restrained
Mooring Point Quantity	Two (2)
Mooring Post	
Diameter	6 inch
Base Plate Material	Galvanized Steel
Floor Connection	304 SS Adhesive Anchors
Mooring Frame Material	Galvanized Steel
Anchor Supply	Adhesive Anchors by SBR Manufacturer
Power Cable Size	
Unit	#4-four Conductor

10. CABLE MOORING SYSTEM

- a. The system shall consist of vertical pylons with base plate. Each pylon shall be filled with concrete by the installing contractor.
- b. Furnished, as part of the unit, shall be a triangular mooring frame. The frame shall permit the assembly to move up and down following the change in liquid level while restrained within the vertical pylons. Removable 304 stainless steel U-bolts shall be attached to each frame and fit around the pylons.

11. RESTRAINED MOORING ELECTRICAL SERVICE CABLE

- a. Each unit shall include power cable wired into the motor conduit box and terminating at the basin wall. Electrical cable shall be supplied with kellems grips at the motor and basin wall terminations. Electrical cable floats for flotation of power cables shall be provided. Attachment of cable and supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

C. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	PVC
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable assembly consisting of support pipe and EPDM hose. Removable assembly shall be supported by steel supports and guide rail, and anchors. Field attachment of the guide rail and supports to the basin shall be the responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.
3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

D. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

2.3 SBR STRUCTURE

A. The SBR system shall be field erected in two basins as shown on the Drawings:

1. Basin Quantity: 2
2. Inside Dimensions: 80 ft. x 80 ft.
3. Side Water Depth:
 - a. Minimum Operating Level: 12.6 ft. SWD
 - b. Maximum Operating Level: 21.0 ft. SWD

c. Top of Wall: 23.0 ft.

B. INFLUENT PLUG VALVE

1. Furnish electrically operated flanged plug valve(s) for each basin to control the influent flow.

Valve Quantity	1 per Basin
Valve Size	16 inch
Valve Model	Milliken 601
Actuator	Auma
Actuator Power	Three (3) Phase
Actuator Type	Open/Close Service
Compartment House	Yes

2. Valves shall be a 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, coated non-lubricated ductile or cast iron plug with 80 % port opening, assembled and tested with an electric actuator. Valve actuator shall include motor winding protection, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbutton(s), selector switch(es), and light(s). Field wiring and junction/box disconnect shall be provided by the installing contractor.

C. ENDURA® SERIES DDM MIXER

1. Furnish AquaDDM® mechanical floating mixer(s) and related equipment accessories as described herein for each new basin. Each mixer shall consist of a motor, direct-drive impeller driven at a constant speed, an integral flotation unit, and impeller volute. The Endura Series shall incorporate design enhancements that provide for three (3) years without routine maintenance (greasing).

Mixer Quantity	1 per Basin
Mixer Properties	
Zone of Complete Mix	85 ft
Direct Pumping Rate	12,450 gpm
Recirculation Rate	411,000 gpm
MLSS	4500 mg/l or less
Motor	
Size	25 HP
RPM	900 RPM
Efficiency	Premium
Mounting Base Materials	304 SS
Float	
Diameter (minimum)	94.5 inches
Shell Material	FRP Skin
Impeller Volute Material	304 SS

2. PERFORMANCE

a. Each mixer shall meet the requirements summarized above. Complete mix shall

be defined as maintaining biological suspension of all mixed liquor suspended solids with the specified MLSS concentration without the introduction of air.

3. MIXER DRIVE MOTOR

- a. The motor shall be vertical P base design, totally enclosed fan cooled TEFC, and generally rated for severe duty. The motor shall in all cases equal or exceed standard NEMA specifications. A minimum service factor of 1.15 shall be furnished.
- b. The motor winding shall be nonhygroscopic, and insulation shall equal or exceed NEMA Class "F". A lip seal shall be provided below the bottom bearing to prevent moisture from penetrating around the motor shaft. A condensate drain shall be located at the lowest point in the lower-end bell housing. Unit shall have a one-piece motor shaft continuous from the top motor bearing, through the lower bearing and down to and through the propeller. The shaft shall be manufactured from 17-4 PH stainless steel.
- c. Motor bearings shall be regreasable. Sealed bearings are not acceptable. Top bearing shall be shielded on the bottom side only. Bottom bearing shall be open. The top and bottom motor bearings shall be of combined radial and axial thrust type. The lower motor bearing inner brace shall be locked to the motor shaft via a special washer and locking nut arrangement. The shaft shall be threaded just below the lower bearing and shall have a keyway cut into the motor shaft. This key shall accept a tab from the inner diameter of the locking washer, and the locking nut shall have recesses to accept a tab from the outer diameter of the locking washer to prevent the nut from backing off. Snap ring type bearing retainers will not be acceptable.
- d. Submerged motors, jet pumps, submerged gear motors or gearboxes shall not be acceptable.

4. MOTOR MOUNTING BASE

- a. The motor shall be securely mounted onto a solid 304 stainless steel base which is integral with the motor base extension. All submersed wetted motor mounting base components shall be constructed of 304 stainless steel.
- b. The upper portion of the motor mounting base, immediately below the lower motor bearing, shall include two independent acting air seals. The two seals shall be capable of sealing off the flow of air from the suction action of the pumped flow, and prevent backflow of liquid during impeller reversal. The lower end of the motor base extension shall be provided with a rotating backflow seal that will prevent grit from being introduced into the anti-deflection insert reservoir, but shall allow liquid to contact the shaft. The backflow seal shall not require scheduled lubrication or maintenance.

5. FLOATATION

- a. Each unit shall be equipped with a modular float with a central float passage of a size to allow installation and removal of the pump impeller. The float shall be

foamed full of polyurethane foam of the closed cell type, and shall be totally sealed to prevent the foam from being in contact with the external environment.

6. IMPELLER

- a. The impeller shall be designed to pump the liquid from near the surface and direct it down toward the vessel/basin bottom. The impeller shall be a two-blade marine type precision casting of 316 or 15/5 stainless steel and shall be specifically designed for the application intended. It shall be dynamically and hydraulically balanced. The propeller must be attached to the motor shaft with a hardened stainless steel pin and set screw. Impeller shall be capable of being reversed to cause back flow liquid movement without causing damage to the mixer chassis and without causing upflow liquid damage to the motor bearing and windings. No liquid spray or other liquid leakage upward onto the surface of the motor support surface or flotation chassis will be allowed.

7. INTAKE VOLUTE ASSEMBLY

- a. The impeller shall operate in a volute made of 304 stainless steel plate, minimum 3/16 inch thick.

8. VIBRATION

- a. The entire rotating assembly including the motor rotor, shaft, shaft accessories, and impeller shall be dynamically balanced within 2.0 mils peak-to-peak horizontal displacement measured at the upper and lower motor bearing. Measurements shall be taken at a frequency equivalent to the motor RPM. Measurements shall be taken with the motor in a vertical, shaft down position with the entire power section mounted on resilient pads.

9. MOORING SYSTEM

- a. Each unit shall be provided with a mooring system, as described below:

Mooring Type	Cable
Mooring Point Quantity	Four (4)
Cable Mooring	
Cable Material	304 SS
Hardware/Anchor Material	304 SS
Anchor Supply	By SBR System Manufacturer
Power Cable Size	#8-four Conductor

10. RESTRAINED MOORING SYSTEM

- a. Each unit shall be provided with a restrained mooring system complete with mooring cable, clips, thimbles, quick disconnects, anchors (if necessary), and extension springs as shown on the drawings. Field attachment of mooring points to the tank shall be the responsibility of the installing contractor.

11. CABLE MOORING ELECTRICAL SERVICE CABLE

- a. Each unit shall include power cable wired into the motor conduit box and terminating at the basin wall. Electrical cable shall be supplied with kellems grips at the motor and basin wall terminations. Electrical cable(s) shall be attached with cable ties provided by the equipment supplier. Attachment of cable and supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

D. DECANTER ASSEMBLY

- 1. Furnish floating decanter(s) and related equipment accessories as described herein for each basin. Each decanter shall consist of an integral flotation unit, a stainless steel movable weir assembly, and an electric motor-driven actuator to open and close the weir.

Quantity	1 per Basin
Unit Size	12x11
Performance Requirements	
Max. Allowable Water Level (HWL)	21.0 ft
Min. Allowable Water Level (LWL)	12.6 ft
Decant Pipe Centerline	1.5 ft Below LWL
Decant Rate (Avg. from HWL to LWL)	6,250 gpm
Weir Actuator	
Linear Weir Actuator	Three Phase
Weir Actuator Closing Force	6,000 lbs
Power Section Material	Painted Steel
Junction Box Rating	NEMA 4X
Power Cable(s) Required	#16 AWG Ten-Conductor #12 AWG Four-Conductor
Heater and Thermostat Cable	#12 AWG Three-Conductor
Weir	
Shape	Circular
Material	304 SS
Decanter Float Reserve Buoyancy	3,000 lbs
Discharge Line	
Type	Pipe
Diameter	20 inches
Mooring System	
Pylon Quantity	2 per Unit
Pylon Diameter	4 inch
Support Quantity	3 per Unit
Support Diameter	4 inch
Pylon/Support Material	Galv. Steel
Base Plate Material	Galv. Steel
Floor Connection	304 SS Adhesive Anchors
Mooring Frame Material	Galv. Steel
Discharge Pipe	
Elbow Material	304 SS
Pipe Material	304 SS
Flex Joint/Hinge Material	304L SS
Flex Joint Rating	12,000 cycles, minimum

Decant Valve	1 per Basin
Valve Size	20 inch
Valve Model	Milliken Fig. 511A
Decant Valve Actuator	Auma
Actuator Power	Three Phase
Actuator Type	Open/Close Service
Compartment Heater	Yes
Valve Extension	
Extension Length	15 Feet
Extension Material	Stainless Steel

2. PERFORMANCE

- a. Each decanter shall be capable of withdrawing decant fluid from 4-6 inches beneath the liquid surface, regardless of liquid depth, down to the minimum allowable water level specified below. The decant liquid shall be drawn through an adjustable weir opening of 2-6 inches. The weir shall be circular in shape and permit liquid to enter the decanter from the entire 360 degrees without obstruction.
- b. The centerline of each decant pipe must be located at the elevation stated within this section by the installing contractor.

3. WEIR ACTUATOR

- a. Weir actuator shall include a reversible electric motor operated linear actuator. The actuator shall be capable of operating with a closing force as required above and shall operate from a remote power source as required above. Adjustable limit switches shall be included to permit adjustment of the weir opening. A spring shall be included to provide for travel after the weir has closed and provide desired closure pressure. A corrosion resistant removable cover shall be included to provide protection to the actuator and motor during normal operation. Power cable(s) as specified above shall be provided from the junction box of the unit to the basin wall. Supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

4. WEIR

- a. The weir shall include vortex control baffles permanently affixed to the weir. The weir shall be attached to the actuator through a removable single shaft or linkage which shall also function as the torque restraint.

5. FLOATATION

- a. Each new unit shall be equipped with a modular float constructed of fiberglass filled with closed cell polyurethane foam having a minimum 2.0 lbs./ft³ density. Float shall be completely sealed to prevent the foam from being in contact with the external environment. Float shall have adequate reserve buoyancy to ensure stability and to provide support flotation required during decanter servicing. A urethane type seal shall be molded into the bottom of the float assembly to receive the decanter weir.

6. DECANter DISCHARGE PIPE

- a. Each decanter shall include a stainless steel elbow with schedule 10 stainless steel discharge pipe as specified above. The installing contractor shall provide a ¾" valve with hose bib connection on the decant line between the decanter and the decant valve.
- b. Each decanter shall include two stainless steel flex joints sized at the same diameter as the discharge pipe. Flex joints shall be constructed of stainless steel flanges and 321 stainless steel bellows. Flex joints shall utilize heavy duty stainless steel hinges with over-travel stops and full perimeter welds. Flex joints shall carry a minimum rating as specified above per EJMA calculations, the Elastic Joint Manufacturer's Association. Flex joints shall be full port diameter, and not reduce flow area of the nominal pipe size. Flex joints shall be fully crated and provided with shipping bars that immobilize and protect the flex joint prior to final installation. Flex joints constructed of plastic or rubber material are not acceptable.
- c. All piping, supports, gaskets, and hardware beyond the terminating flange of the decant pipe flexible joint shall be supplied by the installing contractor.

7. DECANter RESTRAINED MOORING SYSTEM

- a. Furnished as part of the decanter assembly shall be a mooring frame, which shall permit the assembly to move up and down following the change in liquid level while restrained within the vertical pylons.
- b. Each decanter shall be moored with a restrained mooring system consisting of vertical pylon(s) with base plate and/or supports as specified above. Each pylon/support with base plate shall be attached to the basin floor and filled with concrete by the installing contractor.
- c. Mooring post supports, if specified within this section shall be provided for attachment to the basin wall by the installing contractor.

8. DECANter FLOW CONTROL VALVE

- a. Furnish electrically operated butterfly valve(s) as specified above for each basin to control the decant flow rate. Valve(s) shall be an AWWA C-504 Class 150B electrically operated butterfly valve(s) with ANSI Class 125# flanged end ASTM ductile or cast iron body and disk with a 316 stainless steel edge, EPDM seat, 304 stainless steel shaft assembled and tested with an electric actuator. Valve actuator shall include motor winding protection, manual override, and limit switch feedback in the open and closed position. Actuator(s) include local controls consisting of pushbutton(s), selector switch(es), and light(s). Field wiring and junction/box disconnect shall be provided by the installing contractor.
- b. Each valve shall include valve stem extension. Intermediate valve supports and hardware required for mounting of the extension shall be provided by the installing contractor.

E. SLUDGE WASTE PUMP

1. Furnish submersible non-clog pump(s) for each basin as specified herein. Each pump shall be equipped with a submersible electrical motor connected for three phase operation. Pump housing shall be painted cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of galvanized steel lifting chain of adequate strength to permit rising and lowering the pump. **The pumps shall be KSB or Flygt.**

Pump Quantity	1 Per Basin
Pump Function	Sludge
Motor Size	5 HP
Pump Flow Rate	200 GPM
Required TDH	28 ft
Discharge Valve	
Actuator Type	Manual
Manufacturer	Millken
Diameters	
Discharge Connection Elbow	4 inches
Discharge Pipe	4 inches
Valve(s)	4 inches
Materials of Construction	
Lifting Chain	Galvanized Steel
Upper Guide Bars and Brackets	Galvanized Steel
System Manufacturer Termination Point	Pump Discharge Elbow
Tank Connection	304 SS Adhesive Anchors

2. The pump shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the basin or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.
3. An upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall follow guide bars into the operating position and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.
4. Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection specified above shall be the responsibility of the installing contractor.
5. Each pump shall include a discharge valve to control the design transfer flow rate. Valve shall have a 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM or neoprene coated ductile iron plug. The valve shall be a

non-lubricated type with a port area of at least 80% of full pipe size.

6. Each pump shall include a Nibco F-918-B check valve with cast iron body and bronze disk to prevent backflow.
7. Valve(s) shall be provided loose for installation within the discharge piping by the installing contractor. Valve gaskets and hardware shall be supplied by the installing contractor.
8. Field attachment of the pump to the basin shall be the responsibility of the installing contractor.

F. PUMP HOIST ASSEMBLY

1. Furnish portable hoist assembly(ies) as specified herein. Each hoist shall be rated for a safe load of 500 lbs., lift of 30 feet, 36" minimum reach and a 60" maximum reach. Hoist shall consist of 1/4" diameter 304 stainless steel cable, painted steel lifting hook, zinc plated winch, painted cast iron sheave, and 304 stainless steel snap hook.

Hoist	
Quantity	3 (1-SBR Process Pumps, 1-Digester Decant Pump, Post EQ Pumps)
Materials of Construction	Painted Steel
Socket	
Quantity	8
Materials of Construction	Painted Steel
Tank Connection	304 SS Adhesive Anchors

2. Field attachment/welding of the platform socket(s) shall be the responsibility of the installing contractor.

G. RETRIEVABLE FINE BUBBLE AIR DIFFUSER ASSEMBLIES

1. The aeration system shall be a fine bubble diffused air system and shall be a retrievable configuration as shown on the contract drawings.

Airflow per Basin	2,413 SCFM
Assembly Quantity	8 per Basin
Diffuser Rack Size	25 Duplex Tubes
Materials of Construction	
Manifold	304 SS
Vertical Air Column	Galv. Steel
Threaded Flange	Galv. Steel
Quick Disconnect Adapter	Ny-Glass
Track/Beam Assembly	Galv. Steel
Diffuser Hoist Assembly	Galv. Steel
Valve Seat	EPDM
Tank Connection	304 SS Adhesive Anchors

2. Furnish retrievable air diffuser assemblies for each basin. Each assembly shall consist of membrane diffusers, frame assembly, manifold weldment, vertical air column,

track/beam, flexible air line, isolation valve, and lifting mechanism. Duplex diffuser tubes total that specified herein shall be provided for each diffuser rack. The 4" diffuser manifold weldment shall be constructed of stainless steel. The entire assembly shall be located such that each diffuser centerline is twelve (12) inches above the basin floor.

3. Air diffuser assemblies shall be of the tubular, non-clog, fine bubble type with a flexible perforated air release membrane. Disc and panel diffuser designs are not acceptable. The diffuser membrane shall be constructed from EPDM rubber and be suitable for continuous or intermittent aeration. Each membrane shall be held in place by two 304 stainless steel band clamps. The membrane shall include UV inhibitor and compounds designed for resistance to chemical attack, weathering, fatigue, and aging. The diffuser assemblies shall have double backflow prevention to prevent liquid from passing into the aeration header. Backflow prevention shall consist of self sealing slits and membrane clamping over the circumference of the diffuser support pipe. The membrane exterior surface shall be smooth as to inhibit biological film growth. The membrane shall inflate during aeration and deflate when the airflow is discontinued, further restricting biological film growth. The membrane shall be cleanable in place with water from a high pressure wash. Each diffuser membrane shall be supported over its' full length and circumference by a support tube. Tube diffuser shall be of non-buoyant design. Diffusers which are of buoyant design are not acceptable.
4. Each diffuser assembly shall include a 3" diameter wire reinforced EPDM flexible air line with quick disconnect end fittings, and a threaded flange, elbow and quick disconnect adapters. All air distribution piping, gaskets, and hardware beyond the threaded flange shall be supplied by the installing contractor. The vertical track/beam shall support the lifting mechanism assembly during operation and servicing.
5. Each assembly shall include a diffuser hoist assembly with base socket to receive a portable electric winch. A total of (one) portable electric winch shall be provided for the diffuser assemblies. The winch mechanism shall be of sufficient design capacity to raise the diffuser rack assembly to the servicing position. The portable electric winch shall operate from a single phase, electrical supply rated for 12.6 full load amps. The winch shall be provided with a total of 8 feet of electrical cable. Supply of electrical power supply, wiring and junction box for winch shall be the responsibility of the installing contractor.
6. Each diffuser assembly shall include a 3" diameter manually operated isolation butterfly valve for connection to the main air distribution piping by the installing contractor. Valve gaskets and hardware are to be provided by the installing contractor.
7. Valve shall be a butterfly valve with cast iron body, seat as specified herein, disk and one piece stainless steel shaft.
8. Anchoring the diffuser assemblies to the basin shall be the responsibility of the installing contractor.

H. BLOWERS

1. Furnish three phase rotary lobe type, rotary compressors as described below with premium efficient, T.E.F.C. U.S. Electric, Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	3
Motor Size	100 HP
Manufacturer	Aerzen
Model Number	GM 35S
Airflow Rate	1,209 SCFM per Blower
Max. Discharge Gauge Pressure	10.7 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	6 inches
Seat Material	Viton

2. Each motor shall include a single phase normally closed motor winding thermostat.
3. Each blower assembly shall be complete and mounted on a base weldment with four-corner anti-vibration mountings, designed for direct application on a concrete slab or other solid foundation. Each assembly shall be suitable for shipment as a complete unit, factory assembled (less discharge pipe fittings) as much as possible to facilitate shipping and handling.
4. Equipment shall include a blower, electric motor, belts and sheaves, inlet package, discharge silencer, discharge check valve, rubber inlet sleeve and discharge connection, pressure relief valve, butterfly discharge isolation valve, and rubber expansion joint. A personnel protection guard shall be included over the belts and sheaves.
5. Equipment shall include local control panel, factory installed.

I. AIR CONTROL VALVES

1. Furnish operated butterfly valve(s) to control the air flow as outlined herein.

Valve Quantity	2 Shared for all Blowers
Valve Size	10 inch
Valve Model	Milliken AWWA Class 150B
Connection Type	Flanged
Materials of Construction	
Valve Seat	EPDM
Disk	Ductile Iron with 316 SS Edge
Valve Actuator	Auma
Actuator Power	Single Phase
Actuator Type	Open/Close Service
Compartment Heater	Yes

J. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral

cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	304 SS
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable mounting pipe assembly. Pipe, supports and anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.
3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

K. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

L. PROCESS CONTROL INSTRUMENTATION

Manufacturer	Hach
Controller	
Quantity	1 per Basin
Model	SC4500
Max. Inputs per Controller	2 per Controller
Probes	
DO	
Quantity	1 per Basin
Model	Hach LDO
Probe Mounting	
Materials of Construction	304 SS

1. Controller
 - a. The controller will communicate with the main PLC via 4-20 mA signals. The controller will have a NEMA 4X enclosure with corrosion-resistant finish and shall be AC powered from a 100-230VAC, power source. Each probe module shall

include a sun shield.

2. Sensors

- a. Furnish one sensor of each type specified above per basin. Sensors shall be suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless supports and stainless steel anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. Field wiring, conduit, and installation of cable shall be the responsibility of the installing contractor.

M. SPARE PARTS

- 1. The following spare parts shall be supplied by the SBR equipment manufacturer:

<u>Qty.</u>	<u>Description</u>
1	Decanter linear actuator with capacitor.
1	Decanter limit switch with arm.
1	Input card.
1	Output card.
50	Membrane Kits
1	Crimping Tool
1	Blower Inlet Filters per Blower
1	Sets V-belts per Blower

2.4 POST-EQUALIZATION BASIN STRUCTURE

- A. The Post-Equalization/Holding basin shall be field erected as shown on the contract drawings and summarized below:

- 1. Basin Quantity: 1
- 2. Inside Dimensions:
 - a. Basin Width: 41 feet
 - b. Basin Length: 80 feet
- 3. Side Water Depth:
 - a. Minimum Operating Level: 1.5 ft. SWD
 - b. Maximum Operating Level: 10.6 ft. SWD
- 4. Top of Wall: 23 feet

B. FIXED PVC COARSE BUBBLE DIFFUSER SYSTEM

- 1. The aeration system shall be a coarse bubble diffused air system and shall be a fixed configuration as shown on the drawings.

Airflow per Basin	519 SCFM
Riser Pipe Diameter	6 inches
Materials of Construction	
Diffuser	Schedule 80 PVC
Manifold	Schedule 80 PVC
Supports	Galvanized
Riser Pipe	Galvanized
Tank Connection	304 SS Adhesive Anchors

2. Furnish one (1) fixed coarse bubble diffuser system for each basin. The diffuser system shall consist of diffusers, supports, manifold, and riser pipe. Diffuser pipes shall be not less than three-inch nominal diameter. Each diffuser section shall be supplied with uniformly-spaced machined orifices located on the top of each section. Size and number of orifices shall be provided to ensure a uniform air distribution.
3. Each diffuser section (and manifold pipe) shall be supported at span lengths not greater than 6 feet by supports. No unsupported end shall be longer than 2 ft. Diffuser sections shall be secured to the supports with a corrosion resistant retainer. Support brackets shall be adjustable to provide header leveling within $\pm 1/4$ inch of a fixed elevation for each aeration basin.
4. Diffuser system shall be field assembled by the installing contractor. All submerged PVC joints 8" and smaller shall be socket welded joints. Expansion joints shall be included to compensate for thermal expansion for PVC manifold runs longer than 40 feet. Pipe sizing, location and supports shall be as shown on the drawings. Diffuser sections and internal manifold piping shall have flange connections for disassembly.
5. The riser pipe shall terminate in a flanged connection at the top of the basin wall. All piping, gaskets, and hardware beyond the riser pipe's flanged connection shall be the provided by the installing contractor.
6. Attachment to the basin shall be the responsibility of the installing contractor.

C. BLOWERS

1. Furnish three phase rotary lobe type, rotary compressors as described below with premium efficient, T.E.F.C. U.S. Electric, Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	1
Motor Size	25 HP
Manufacturer	Aerzen
Model Number	GM 15L
Airflow Rate	520 SCFM per Blower
Max. Discharge Gauge Pressure	5.1 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	4 inches
Seat Material	Viton

2. Each motor shall include a single phase normally closed motor winding thermostat.
3. Each blower assembly shall be complete and mounted on a base weldment with four-corner anti-vibration mountings, designed for direct application on a concrete slab or other solid foundation. Each assembly shall be suitable for shipment as a complete unit, factory assembled (less discharge pipe fittings) as much as possible to facilitate shipping and handling.
4. Equipment shall include a blower, electric motor, belts and sheaves, inlet package, discharge silencer, discharge check valve, rubber inlet sleeve and discharge connection, pressure relief valve, butterfly discharge isolation valve, and rubber expansion joint. A personnel protection guard shall be included over the belts and sheaves.

D. POST-EQ TRANSFER PUMP

1. Furnish submersible non-clog pump(s) for each basin as specified herein. Each pump shall be equipped with a submersible electrical motor connected for three phase operation. Pump housing shall be painted cast iron. Pump shall include an adequate length of multi-conductor chloroprene jacketed type SPC cable suitable for submersible pump applications. The power cable shall also be sized according to NEC and ICEA standards. The pump shall be supplied with a mating cast iron discharge elbow. Each unit shall be fitted with an adequate length of galvanized steel lifting chain of adequate strength to permit rising and lowering the pump. **The pumps shall be KSB or Flygt.**

Pump Quantity	4 Per Basin
Pump Function	Transfer
Motor Size	12 HP
Pump Flow Rate	926 GPM
Required TDH	29 ft
Discharge Valve	
Actuator Type	Manual
Manufacturer	Millken
Diameters	
Discharge Connection Elbow	6 inches
Discharge Pipe	6 inches
Valve(s)	6 inches
Materials of Construction	
Lifting Chain	Galvanized Steel
Upper Guide Bars and Brackets	Galvanized Steel
System Manufacturer Termination Point	Pump Discharge Elbow
Tank Connection	304 SS Adhesive Anchors

2. The pump shall be capable of handling raw, unscreened sewage. The discharge connection elbow shall be permanently installed with the discharge piping. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter the basin or pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

3. An upper guide bar bracket shall be provided with each pump. The entire weight of the pumping unit shall follow guide bars into the operating position and pressed tightly against the discharge connection elbow with metal-to-metal contact. No sealing of the discharge interface by means of a diaphragm, O-ring, or other devices shall be acceptable. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 ft.
4. Supply of all discharge piping, supports, gaskets, and hardware beyond the flanged connection specified above shall be the responsibility of the installing contractor.
5. Each pump shall include a discharge valve to control the design transfer flow rate. Valve shall have a 125# flanged end connection, ASTM A-126 Class B cast iron body with welded in nickel seat, EPDM or neoprene coated ductile iron plug. The valve shall be a non-lubricated type with a port area of at least 80% of full pipe size.
6. Each pump shall include a Nibco F-918-B check valve with cast iron body and bronze disk to prevent backflow.
7. Valve(s) shall be provided loose for installation within the discharge piping by the installing contractor. Valve gaskets and hardware shall be supplied by the installing contractor.
8. Field attachment of the pump to the basin shall be the responsibility of the installing contractor.

E. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	PVC
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable assembly consisting of support pipe and EPDM hose. Removable assembly shall be supported by steel supports and guide rail, and anchors. Field attachment of the guide rail and supports to the basin shall be the responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

F. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

G. PROCESS CONTROL INSTRUMENTATION

Manufacturer	Hach
Controller	
Quantity	1 per Basin
Model	SC4500
Max. Inputs per Controller	2 per Controller
Probes	
DO	
Quantity	1 per Basin
Model	Hach LDO
Probe Mounting	
Materials of Construction	304 SS

1. Controller
 - a. The controller will communicate with the main PLC via 4-20 mA signals. The controller will have a NEMA 4X enclosure with corrosion-resistant finish and shall be AC powered from a 100-230VAC, power source. Each probe module shall include a sun shield.
2. Sensors
 - a. Furnish one sensor of each type specified above per basin. Sensors shall be suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless supports and stainless steel anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. Field wiring, conduit, and installation of cable shall be the responsibility of the installing contractor.

2.5 AEROBIC DIGESTER BASIN STRUCTURE

- A. The Aerobic Digester/Sludge Holding basin shall be field erected as shown on the contract drawings and summarized below:

Basin Quantity	1
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Inside Dimensions:	
Basin Width	82 feet
Basin Length	82 feet
Side Water Depth	
Maximum Operating Level:	21 feet SWD
Top Of Wall:	23 feet

B. ENDURA® SERIES DDM MIXER

1. Furnish AquaDDM® mechanical floating mixer(s) and related equipment accessories as described herein for each basin. Each mixer shall consist of a motor, direct-drive impeller driven at a constant speed, an integral flotation unit, and impeller volute. The Endura Series shall incorporate design enhancements that provide for three (3) years without routine maintenance (greasing).

Mixer Quantity	1 per Basin
Mixer Properties	
Zone of Complete Mix	115 ft.
Direct Pumping Rate	25,100 gpm
Recirculation Rate	830,000 gpm
Motor	
Size	50 HP
RPM	900 RPM
Efficiency	Premium
Mounting Base Materials	304 SS
Float	
Diameter (minimum)	114.5 inches
Shell Material	FRP Skin
Impeller Volute Material	304 SS

2. PERFORMANCE

- a. Each mixer shall meet the requirements summarized above. Complete mix shall be defined as maintaining biological suspension of all mixed liquor suspended solids with the specified MLSS concentration without the introduction of air.

3. MIXER DRIVE MOTOR

- a. The motor shall be vertical P base design, totally enclosed fan cooled TEFC, and generally rated for severe duty. The motor shall in all cases equal or exceed standard NEMA specifications. A minimum service factor of 1.15 shall be furnished.
- b. The motor winding shall be nonhygroscopic, and insulation shall equal or exceed NEMA Class "F". A lip seal shall be provided below the bottom bearing to prevent moisture from penetrating around the motor shaft. A condensate drain shall be located at the lowest point in the lower-end bell housing. Unit shall have a one-piece motor shaft continuous from the top motor bearing, through the

lower bearing and down to and through the propeller. The shaft shall be manufactured from 17-4 PH stainless steel.

- c. Motor bearings shall be regreasable. Sealed bearings are not acceptable. Top bearing shall be shielded on the bottom side only. Bottom bearing shall be open. The top and bottom motor bearings shall be of combined radial and axial thrust type. The lower motor bearing inner brace shall be locked to the motor shaft via a special washer and locking nut arrangement. The shaft shall be threaded just below the lower bearing and shall have a keyway cut into the motor shaft. This key shall accept a tab from the inner diameter of the locking washer, and the locking nut shall have recesses to accept a tab from the outer diameter of the locking washer to prevent the nut from backing off. Snap ring type bearing retainers will not be acceptable.
- d. Submerged motors, jet pumps, submerged gear motors or gearboxes shall not be acceptable.

4. MOTOR MOUNTING BASE

- a. The motor shall be securely mounted onto a solid 304 stainless steel base which is integral with the motor base extension. All submersed wetted motor mounting base components shall be constructed of 304 stainless steel.
- b. The upper portion of the motor mounting base, immediately below the lower motor bearing, shall include two independent acting air seals. The two seals shall be capable of sealing off the flow of air from the suction action of the pumped flow, and prevent backflow of liquid during impeller reversal. The lower end of the motor base extension shall be provided with a rotating backflow seal that will prevent grit from being introduced into the anti-deflection insert reservoir, but shall allow liquid to contact the shaft. The backflow seal shall not require scheduled lubrication or maintenance.

5. FLOATATION

- a. Each unit shall be equipped with a modular float with a central float passage of a size to allow installation and removal of the pump impeller. The float shall be foamed full of polyurethane foam of the closed cell type, and shall be totally sealed to prevent the foam from being in contact with the external environment.

6. IMPELLER

- a. The impeller shall be designed to pump the liquid from near the surface and direct it down toward the vessel/basin bottom. The impeller shall be a two-blade marine type precision casting of 316 or 15/5 stainless steel and shall be specifically designed for the application intended. It shall be dynamically and hydraulically balanced. The propeller must be attached to the motor shaft with a hardened stainless-steel pin and set screw. Impeller shall be capable of being reversed to cause back flow liquid movement without causing damage to the mixer chassis and without causing upflow liquid damage to the motor bearing

and windings. No liquid spray or other liquid leakage upward onto the surface of the motor support surface or flotation chassis will be allowed.

7. INTAKE VOLUTE ASSEMBLY

- a. The impeller shall operate in a volute made of 304 stainless steel plate, minimum 3/16 inch thick.

8. VIBRATION

- a. The entire rotating assembly including the motor rotor, shaft, shaft accessories, and impeller shall be dynamically balanced within 2.0 mils peak-to-peak horizontal displacement measured at the upper and lower motor bearing. Measurements shall be taken at a frequency equivalent to the motor RPM. Measurements shall be taken with the motor in a vertical, shaft down position with the entire power section mounted on resilient pads.

9. MOORING SYSTEM

- a. Each unit shall be provided with a mooring system, as described below:

Mooring Type	Pivotal
Pivotal Mooring Arm	
Material	304 SS
Hardware/Anchor Material	304 SS
Anchor Supply	By SBR System Manufacturer
Power Cable Size	
Unit	#4-four Conductor

10. PIVOTAL MOORING SYSTEM

- a. A pivotal mooring system shall be supplied for each unit consisting of a mooring arm extending from the basin sidewall to the unit. The pivotal mooring system including; adhesive anchors (if necessary), mooring cable, clips, thimbles, and quick disconnects shall be supplied as shown on the drawings to assure a consistent location within the basin. Field attachment of the mooring assembly to the tank wall shall be the responsibility of the installing contractor.

11. PIVOTAL MOORING ELECTRICAL SERVICE CABLE

- a. Each unit shall include power cable wired into the motor conduit box and terminating at the basin wall. Electrical cable shall be supplied with kellems grips at the motor and basin wall terminations. Electrical cable(s) shall be attached with cable ties provided by the equipment supplier. Attachment of cable and supply of junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.

C. BLOWERS

1. Furnish three phase rotary lobe type, positive displacement blowers as described below with premium efficient, T.E.F.C., Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	1
Motor Size	75 HP
Manufacturer	Aerzen
Model Number	GM 35S
Airflow Rate	1007 SCFM per Blower
Max. Discharge Gauge Pressure	9.7 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	6 inches
Seat Material	Viton

2. Blowers shall be supplied with discharge temperature gauge with switch, discharge pressure gauge and inlet filter differential pressure gauge per manufacturer's standards and include an outdoor sound enclosure.
3. The installing contractor shall provide all air piping from the diffuser termination(s) at the basin(s) to the blowers as shown on the contract drawings. Supply of electrical wiring and junction box/disconnects shall be the responsibility of the installing contractor.

D. FIXED PVC COARSE BUBBLE DIFFUSER SYSTEM

1. The aeration system shall be a coarse bubble diffused air system and shall be a fixed configuration as shown on the drawings.

Airflow per Basin	1007 SCFM
Riser Pipe Diameter	8 inches
Materials of Construction	
Diffuser	Schedule 80 PVC
Manifold	Schedule 80 PVC
Supports	Galvanized
Riser Pipe	Galvanized
Tank Connection	304 SS Adhesive Anchors

2. Furnish one (1) fixed coarse bubble diffuser system for each basin. The diffuser system shall consist of diffusers, supports, manifold, and riser pipe. Diffuser pipes shall be not less than three-inch nominal diameter. Each diffuser section shall be supplied with uniformly-spaced machined orifices located on the top of each section. Size and number of orifices shall be provided to ensure a uniform air distribution.
3. Each diffuser section (and manifold pipe) shall be supported at span lengths not greater than 6 feet by supports. No unsupported end shall be longer than 2 ft. Diffuser sections shall be secured to the supports with a corrosion resistant retainer. Support brackets shall be adjustable to provide header leveling within $\pm 1/4$ inch of a fixed elevation for each aeration basin.

4. Diffuser system shall be field assembled by the installing contractor. All submerged PVC joints 8" and smaller shall be socket welded joints. Expansion joints shall be included to compensate for thermal expansion for PVC manifold runs longer than 40 feet. Pipe sizing, location and supports shall be as shown on the drawings. Diffuser sections and internal manifold piping shall have flange connections for disassembly.
5. The riser pipe shall terminate in a flanged connection at the top of the basin wall. All piping, gaskets, and hardware beyond the riser pipe's flanged connection shall be the provided by the installing contractor.
6. Attachment to the basin shall be the responsibility of the installing contractor.

E. PRESSURE TRANSDUCER

1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	PVC
Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable assembly consisting of support pipe and EPDM hose. Removable assembly shall be supported by steel supports and guide rail, and anchors. Field attachment of the guide rail and supports to the basin shall be the responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.
3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

F. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

2.6 POST AERATION BASIN STRUCTURE

A. The Post-Equalization/Holding basin shall be field erected as shown on the contract drawings and summarized below:

Basin Quantity	1
Inside Dimensions:	
Basin Width	23.5 feet
Basin Length	41 feet
Side Water Depth	
Minimum Operating Level:	12 feet SWD
Maximum Operating Level:	12 feet SWD
Top Of Wall:	17.5 feet

B. FIXED FINE BUBBLE DIFFUSER SYSTEM

1. Aeration system shall be designed to transfer the following minimum amount of oxygen per day at standard conditions in clean water, at the specified submergence, air rate, and pressure.

Airflow per basin	130
Pressure @ Top of Drop Pipe	6.8
Diffuser Submergence	11
Diffuser quantity	130
Diameters	
Riser Pipe	4
Riser Pipe Isolation valve	4
Isolation Valve Manufacturer	Nibco
Materials of construction	
Isolation Valve disk	Aluminum Bronze
Isolation Valve Seat	EPDM
Tank Connection	304 SS anchors

2. Materials and Fabrication

a. Fabricate all welded parts and assemblies from sheets and plates of 304L stainless steel with a 2D finish conforming to ASTM A240, 554, 774, 778. Fabricate non-welded parts and flanges from sheets, plates or bars of 304 stainless steel conforming to ASTM A240 or ASTM A276. Weld in the factory with ER 316L filler wire using MIG, TIG or plasma-arc inert gas welding processes. Provide a cross section equal to or greater than the parent metal. Clean all welded stainless steel surfaces and welds after fabrication to remove weld splatter and finish clean all interior and exterior welds by full immersion pickling and rinse with water to remove all carbon deposits and contaminants to

regenerate a uniform corrosion resistant chromium oxide film per ASTM A380 Section 6.2.11, Table A2.1 Annex A2 and Section 8.3.

3. Drop Pipes

- a. Provide a minimum 12 ga. stainless steel drop pipe from the air main connection to a point 3 feet above the manifold. Provide a stainless steel flange with a 150-pound drilling at the top connection. Provide a stainless steel gasketed coupling for connection to the manifold.
- b. Each riser pipe shall include a manually operated isolation butterfly valve for connection to the main air supply piping by the installing contractor. Valve gaskets and hardware are to be provided by the installing contractor.
- c. Isolation valve shall be a wafer or lug style butterfly valve with cast or ductile iron body, and one piece stainless steel shaft.

4. Manifolds

- a. Provide a manifold for connection to the air distribution headers. Fabricate maximum 30 feet long manifolds with threaded union or flanged joints to connect manifold sections and to connect to the air distribution headers to prevent rotation and blow apart. Fabricate manifolds of Schedule 40 conforming to ASTM D1784, D1785 and D2466. Design piping, pipe joints and supports to resist expansion/contraction thrust forces of the air distribution headers over a temperature range of 125° F. PVC components to be produced from PVC compound with a minimum tensile strength of 7000 psi. Design manifolds to withstand 125° F mean wall temperature. PVC components shall have minimum 1.5 percent titanium dioxide to minimize ultraviolet light degradation. Factory solvent weld all PVC joints and diffuser holders.

5. Air Distribution Headers and Diffuser Holders

- a. Fabricate maximum 24 feet long air distribution headers with diffuser holders factory solvent welded to the crown of the pipe for positive air seal and strength. Fabricate minimum 4 inch diameter air distribution headers conforming to ASTM D3915 and D3034. Connect air distribution header sections with threaded union or flange joints to prevent blow apart and rotation. Design joints with mating halves factory solvent welded to the ends of the air distribution header. Design threaded union joints with spigot and socket ends joined with a threaded ring and sealed with an O-ring gasket. Design union joints with threads of a minimum of 0.013 square inches to provide adequate strength of the socket and retainer ring. Design flange joints with an angle face ring, follower flange with 150 lb drilling and stainless steel hardware. Diffuser holders shall have a continuous contact area of 13 square inches minimum to insure structural integrity. Air distribution headers and diffuser holders to resist a dead load of 200 lbs applied vertically to the outer edge of the diffuser holder. Provide end caps at the end of each air distribution header.

6. Pipe Supports
 - a. Provide each section of manifold and air distribution header with a minimum of two supports. Support spacing to be limited to a maximum of 8 feet. Design all supports to allow for thermal expansion and contraction forces over a temperature range of 125° F and to minimize stress build up in the piping system. Design supports shall be adjustable without removing the air distribution header from the support. Design supports shall include hold down guide straps, support structure and two anchor bolts. Design guide straps with a 2 inch minimum width to eliminate point load on manifold and minimize binding. Design support for a total of 4 inch vertical adjustment for leveling of manifold within ¼ inch of a common plane.
7. Air Distributor and Manifold Supports
 - a. Provide guide and fixed type supports to allow expansion/contraction. Design supports to include hold down straps, support structure, locating plate and single anchor bolt. To prevent improper installation, the locating plate shall be able to be installed in either of two directions relative to the support. Design support for a total of 3 inch vertical adjustment for leveling air distribution headers within ¼ inch of a common plane. Guide straps shall have 1 1/2-inch wide top and bottom contoured bearing surface with chamfered edges to minimize binding and resistance to movement of air distributor under full buoyant uplift load. Design strap with 1/8 inch clearance around distributor so strap is self-limiting and cannot be over tightened.
8. Diffuser Assemblies
 - a. Furnish diffuser assemblies including diffuser, holder, retaining ring and air flow control orifice. Incorporate an integral check valve into the membrane diffuser.
 - b. Test diffuser using primary sampling criteria outlined in Military Standard 105E. Manufacture circular membrane diffuser with integral O-ring of EPDM synthetic rubber compound with precision die formed slits. Add carbon black to the material for resistance to ultraviolet light. Design diffuser as one piece injection molded part with a minimum thickness of 0.080 inches for 9 inch diameter unit. Extractable oil content shall not exceed 10%. Limit the maximum tensile strength of the diffuser to 10 psi when operating at 2.4 SCFM/sq. ft. of material.
 - c. Visual Uniformity: Observe diffusers for uniform air distribution across the active surface of the diffuser at 1.0 SCFM/diffuser and 2 inches submergence. Active surface shall be defined as the perforated horizontal projected area of the diffuser. Factory test diffusers for a dynamic wet pressure (DWP) of 12 inches ± 20% water column @ 1.0 SCFM/diffuser and 2 inches submergence.
9. Diffuser Holders
 - a. Design holder with air flow control orifice, integral diffuser support plate and removable retainer ring. Holder shall provide support for the diffuser and seal the diffuser in the holder to prevent air leakage around the O-ring. Design

retainer ring threads with minimum cross section of 1/8 inch and allow for one complete turn to engage threads.

10. Anchor Bolts

- a. Design a mechanical or adhesive anchor bolt system for embedment in 4000 psi concrete with a pullout safety factor of 4. Condensate evacuation system shall be provided to substantially drain the submerged aeration piping system for each aeration grid.

C. BLOWERS

- 1. Furnish three phase rotary lobe type, positive displacement blowers as described below with premium efficient, T.E.F.C., Class F insulation, Teco, Siemens, or equal motor. The blowers shall be manifolded for individual and/or combined operation.

Blower Quantity	2
Motor Size	7.5 HP
Manufacturer	Aerzen
Model Number	GM 4S
Airflow Rate	130 SCFM per Blower
Max. Discharge Gauge Pressure	6.8 PSIG
Inlet Configuration	Combination Filter/Silencer
Enclosure	Galv. Steel Acoustic Hood with Oil Drip Pan
Discharge Isolation Valve	
Diameter	2 inches
Seat Material	Viton

- 2. Blowers shall be supplied with discharge temperature gauge with switch, discharge pressure gauge and inlet filter differential pressure gauge per manufacturer's standards and include an outdoor sound enclosure.
- 3. The installing contractor shall provide all air piping from the diffuser termination(s) at the basin(s) to the blowers as shown on the contract drawings. Supply of electrical wiring and junction box/disconnects shall be the responsibility of the installing contractor.

D. PRESSURE TRANSDUCER

- 1. Furnish submersible pressure transducer unit(s) constructed of stainless steel as specified herein. Transducer shall utilize a diffused silicone semiconductor sensor protected by an integral stainless steel diaphragm with seal fluid. Transducer output shall be a 4-20 mA signal. Electrical connection shall be 2-wire, loop powered through a shielded integral cable comprised of 22 AWG conductors and separate drain wire.

Quantity	1 per Basin
Model	KPSI Model 700
Mounting Materials of Construction	
Support Pipe	304 SS

Supports	304 SS
Anchors	304 SS
Tank Connection	304 SS Adhesive Anchors

2. Transducers shall be suspended on a removable assembly consisting of support pipe and EPDM hose. Removable assembly shall be supported by steel supports and guide rail, and anchors. Field attachment of the guide rail and supports to the basin shall be the responsibility of the installing contractor. A moisture excluding aneroid bellows shall be supplied loose for installation in the junction box/ disconnect. Attachment and supply of the junction box/disconnect at the basin wall shall be the responsibility of the installing contractor.
3. Field attachment of the pressure transducer mounting brackets to the tank shall be the responsibility of the installing contractor.

E. LEVEL SENSORS

1. Furnish one (1) level sensor assembly consisting of an Anchor Scientific model GSI 40NONC float switch with a smooth, chemical resistant polypropylene casing, and 316 stainless steel mounting bracket for each basin. Each float switch shall be provided with a three conductor electrical cable. Electrical cable shall terminate at a junction box/disconnect located at the basin wall. Field wiring and junction box/disconnect shall be provided by the installing contractor.
2. Field attachment of the level sensor assembly to the tank shall be the responsibility of the installing contractor.

F. PROCESS CONTROL INSTRUMENTATION

Manufacturer	Hach
Controller	
Quantity	1 per Basin
Model	SC4500
Max. Inputs per Controller	2 per Controller
Probes	
DO	
Quantity	1 per Basin
Model	Hach LDO
Probe Mounting	
Materials of Construction	304 SS

1. Controller
 - a. The controller will communicate with the main PLC via 4-20 mA signals. The controller will have a NEMA 4X enclosure with corrosion-resistant finish and shall be AC powered from a 100-230VAC, power source. Each probe module shall include a sun shield.
2. Sensors
 - a. Furnish one sensor of each type specified above per basin. Sensors shall be

suspended on a removable mounting pipe assembly. Stainless steel pipe, stainless supports and stainless steel anchors shall be provided. Field attachment of the pipe and supports to the basin shall be the responsibility of the installing contractor. Field wiring, conduit, and installation of cable shall be the responsibility of the installing contractor.

2.7 CHLORINE SYSTEM CONTROL

- A. The SBR control panel will send a signal to the Chlorination system solenoid valve and chlorinator/dechlorinator control valves to control the disinfection system based on post EQ pumps operating.

2.8 CONTROL PANEL WITHOUT MOTOR STARTERS

- A. The control system shall be designed to optimize the AquaSBR® process while minimizing operator attention and to accommodate the continuous maximum daily flow without adjusting cycle structures. The control software program shall be factory tested prior to installation at the jobsite.
- B. The control system shall be a timer based system with level overrides and shall provide control, sequence, monitoring, and alarm annunciation capabilities. The operator shall be able to access the timer values and set points through the operator interface panel to allow for adjustment of cycle times and system flexibility. The control system shall be designed to automatically accommodate the plant's full range of loads and flows.
- C. A complete control system shall be provided as described in the following and as shown on the contract drawings. The control system shall include 115 volt control circuit breaker, microprocessor control, operator interface display, indicator lights, and HAND-OFF-AUTOMATIC selector switches.
- D. The incoming service of the control system shall be 115 volt, 60 hertz, single-phase. Controls for the equipment listed below shall be provided within the SBR control panel. Elapsed time indication shall be provided through the operator interface of the SBR control panel for equipment indicated by an asterisk (*).

PRE-EQ BASIN EQUIPMENT DESCRIPTION

- (1) 40 HP Mixer(s)*
- (1) Pressure Transducer
- (1) Level Sensor(s)
- (1) Common Alarm

SBR EQUIPMENT DESCRIPTION

- (2) 25 HP Mixer(s)*
- (2) 5 HP Sludge Pump(s)*
- (3) 100 HP Blowers* (VFDs by others)
- (2) Influent Valve(s)
- (2) Decanter Actuator(s)
- (2) Decanter Valve(s)
- (2) Air Control Valves

- (2) 4-20 mA D.O. signal(s)
- (2) 4-20 mA Pressure Transducer(s)
- (2) Level Sensor(s)
- (1) Common Alarm

DIGESTER EQUIPMENT DESCRIPTION

- (1) 50 HP Mixer(s)*
- (1) 75 HP Blowers(s)*
- (1) 4-20 mA Pressure Transducer(s)*
- (1) Level Sensors

POST EQ BASIN EQUIPMENT DESCRIPTION

- (4) 12 HP SBR Transfer Pump(s)* (VFDs by others)
- (1) 25 HP Blower(s)*
- (1) 4-20 mA D.O. Signal(s)
- (1) 4-20 mA Pressure Transducer(s)
- (1) Level Sensor(s)

POST AERATION EQUIPMENT DESCRIPTION

- (2) 7.5 HP Blower(s)*
- (1) 4-20 mA D.O. Signal(s)
- (1) 4-20 mA Pressure Transducer(s)
- (1) Level Sensor(s)

ANCILLARY EQUIPMENT DESCRIPTION

Chlorinators (Provided by others)
Sulfonators (Provided by others)
Water Feed Solenoid Valve – Chlorine Room (Provided by others)

E. CONTROL PANEL WIRING AND ASSEMBLY

- 1. All control enclosures shall be custom assembled and wired in an Underwriters Laboratories (UL) certified cabinet shop using quality materials and labor. Short circuit rating of control enclosure shall be 5 kA RMS symmetrical @ 120VAC maximum.
- 2. All control panel single conductor wire shall be 16 AWG multi-strand machine tool wire (MTW) minimum, with PVC insulation.
- 3. Wire colors are as follows:
 - 208 VAC or higher - Black
 - 120 VAC control power - Red
 - Neutral - White
 - Ground - Green
 - AC Power from remote source - Yellow
 - Neutral from remote source - White with Yellow Stripe
 - 24 VDC (+) - Blue
 - 24 VDC (-) - White with Blue Stripe

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VDC (+) from remote source	-	Orange
VDC (-) from remote source	-	White with Orange Stripe
Intrinsically Safe	-	Light Blue

4. All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing. Wire markers shall be a thermal transfer printable type. The material shall be a self-laminating vinyl. Labels shall be Brady THT-9-427-10 or approved equal.
5. Wiring inside the control panel shall be run in PVC wiring duct rated for continuous temperatures up to 122° F (50°C). Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.
6. Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

F. CONTROL PANEL QUALITY ASSURANCE

1. All Control panels shall be UL certified. Testing by manufacturer's electrical engineering prior to releasing for shipment shall be completed. Testing shall consist of the following:
 - a. Point to point testing of all wiring prior to application of power.
 - b. Intended supply voltage shall be applied to the enclosure.
 - c. All components shall be tested for proper operation and calibration.
 - d. The PLC and operator interface program shall be loaded and functionally checked.
 - e. All components shall be checked to confirm proper mounting specifications have been followed.
 - f. Enclosure shall be inspected for defects and repaired if necessary.
 - g. All labeling of wires and devices are correct, properly installed and clean.
2. The manufacturer shall finalize the factory checkout by completing a control panel checklist to document all testing completed above.
3. Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

G. CONTROL ENCLOSURE

1. The automatic controls shall be provided in a UL listed, NEMA Type 12 mild steel (12 gauge) floor mount enclosure that provides a degree of protection for electrical controls and components from dust, dripping water and external condensation of non-corrosive liquids. The enclosure is intended for indoor installation. Enclosure shall include gasketed overlapping doors with a 3-point latch mechanism operated by an oil tight key-lock handle. The enclosure shall have white polyester powder paint inside with ANSI 61 gray polyester powder paint outside over phosphatized surfaces. The enclosure shall include a painted white mild steel (10 gauge) sub-panel mounted with collar studs. Enclosure shall be manufactured by Hoffman or approved equal.

2. The control enclosure shall be mounted remotely.

H. CORROSION INHIBITOR

1. Each control enclosure assembly shall be provided with corrosion inhibitors to protect interior electrical components from damage caused by high humidity. The corrosion inhibitors shall be installed prior to shipment to provide protection during shipment and storage of the enclosure. The corrosion inhibitor shall be Hoffman AHCI5E or approved equal.

I. MAIN DISCONNECT CIRCUIT BREAKER

1. A UL listed, automatic molded case 3-pole disconnect breaker shall be provided in the control enclosure(s). The primary function of the disconnect switch shall be to provide a means to manually open a circuit and automatically open a circuit under overload or short circuit conditions. The disconnect breaker shall have a door mounted operating mechanism with trip indication. Power distribution connectors shall be mounted integrally to the circuit breaker for multiple load connections. Integral connectors shall be provided. The disconnect circuit breaker shall be a Square D/FAL, HDL, JDL, LAL, MGL, PGL or approved equal.

J. CIRCUIT BREAKER

1. All single phase branch or supplementary circuits shall be protected with a single-pole, C-Curve rated circuit breaker. Circuit breakers shall be rated for 240 VAC maximum, 50/60 Hz and UL 489 listed. Supplementary and branch protection circuit breakers shall be Merlin Gerin Multi 9 or approved equal.

K. FUSE

1. Properly rated fuses and fuse holders shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosure. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse. Fuses shall be rated up to 250 VAC and be Littelfuse or approved equal. Fuse holders for discrete devices shall be rated to 600 VAC and 30 Amps. Fuse holders for analog devices shall be rated to 300 VAC and 15 Amps. Fuse holders shall be Allen Bradley 1492 or approved equal.

L. OPERATOR DEVICE

1. Operator devices (pushbuttons and selector switches) shall be mounted through the control enclosure door for all automatic controlled equipment. Transformer type pilot lights and illuminated pushbuttons shall be provided for indication of an operation status. Lights shall be a 6 VAC incandescent type lamp. Color coding shall be applied as required and is as follows:

Amber – Alarm active, caution
Green – Valve open, motor running
Red – Valve closed
White - Information

2. All operator devices shall be UL Listed, 30.5mm style, NEMA Type 4X rated, oil and water tight with finger safe guards located on the contact blocks to prevent accidental contact with wire connections. Operator device function shall be identified with an engraved white Gravoply nameplate with black letters. Operator devices shall be Allen-Bradley 800H, Square D 9001, or approved equal.

M. HIGH FREQUENCY NOISE FILTER

1. A UL listed active tracking filter shall be provided to protect the PLC and HMI power feeds from high-frequency noise and low-energy transients. It shall be designed for a single phase input voltage of 120/240VAC operating at 47 to 63 Hz. The unit shall reduce normal mode transients to plus or minus 2 volts, provide surge capacity of 45,000 amps and protect in all modes (Line to neutral, line to ground and neutral to ground). The noise filter shall be an Islatrol IC+ or approved equal.

N. GROUND FAULT DUPLEX RECEPTACLE

1. A UL listed ground fault circuit interrupter (GFCI) duplex receptacle shall be provided within the panel for instrument (e.g. programming terminal, modem, etc.) use only. The receptacle shall be protected with a 5 Amp circuit breaker. The receptacle shall carry a 20A / 120VAC rating. The electro-mechanical circuit interrupter shall be double-pole and trip free (GFCI protection and shall not be overridden by holding reset button). Built-in transient suppression shall protect GFCI's internal circuitry from voltage transients. Receptacle shall be Hubbell DRUBGFI20 or approved equal.

O. 24 VOLT DC POWER SUPPLY

1. A UL listed, industrial grade, compact power supply shall be supplied to provide 24 VDC power to such rated components. The power supply shall be DIN rail mounted and functional with input voltage of 100 to 240 VAC (single-phase) incoming control power. The power supply shall have a green LED which shall be illuminated when output voltage is "OK". The power supply shall be an Allen Bradley 1606 or approved equal.

P. CONTROL RELAY

1. UL listed control relays for general control purposes shall be supplied with a pilot light to indicate when the coil is in an energized state. The relay socket shall be panel or DIN rail mounted inside the enclosure. The relays shall provide the following ratings: 120VAC coil, 10A contact rating (thermal), 250 VAC insulation rating and 5 million mechanical life cycles. Relays shall be Allen Bradley 700-HK, Square D, or approved equal.

Q. TERMINAL BLOCK

1. Standard feed-through screw terminal blocks, DIN rail mounted, shall be supplied for all point to point wiring connections. All terminals shall be numbered per the wiring schematic with printed markers. Terminals shall carry a 600V AC/DC voltage rating. Terminal blocks shall be Allen-Bradley 1492-J4 (35A max) and 1492-J16 (85A max) or approved equal.

R. PROGRAMMABLE LOGIC CONTROLLER

1. Automatic operation of the AquaSBR shall be controlled through a programmable logic controller (PLC) mounted inside the main control panel. The PLC components shall consist of a power supply, CPU, discrete input and output modules and analog input and output modules. The processor unit shall include built-in USB and two (2) Ethernet IP communication ports. All input and output points supplied (including unused) shall be wired to terminal blocks. Processor design characteristics shall include: 1.0MB user memory size, real-time clock and calendar, battery backed RAM and an operating temperature range between 32 °F and 140°F. The PLC processor shall be an Allen-Bradley CompactLogix 1769-L33ER or approved equal.
2. Modular equipment shall be provided to complete the PLC system. These Allen-Bradley components include: 1769-PA4 – Power Supply, 1769-IA16 – Discrete input (16 point) modules, 1769-OW16 – Discrete output (16 point) modules and 1769-IF8 – Analog input (8 point) modules, 1769-OF4 – Analog output (4 point) modules.

S. PLC POWER SUPPLY

1. Input voltage range of 85-265 / 170-265 VAC, 47-63 Hz, maximum inrush current of 30 amps, backplane output current of 4 amps @ 5V or 2 amps @ 24V, internal fuse protection, ambient operating temperature of 32°F to 140°F, Class I, Division 2 hazardous location certified, UL Listed.

T. DISCRETE INPUT MODULE

1. Operating voltage of 79 to 132 VAC at 47 to 63 Hz, backplane current draw at 5VDC = 115mA , off-state current 2.5mA maximum, maximum inrush current 250mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

U. DISCRETE OUTPUT MODULE

1. Operating voltage of 5 to 265 VAC at 47 to 63 Hz / 5 to 125 VDC, backplane current draw at 5 VDC = 205mA , at 24VDC = 180mA, off-state current leakage is 1.0mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

V. ANALOG INPUT MODULE

1. Backplane current draw at 5 VDC = 120mA, at 24VDC = 70mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

W. ANALOG OUTPUT MODULE

1. Backplane current draw at 5 VDC = 120mA, at 24VDC = 170mA, LED status indication of each point, ambient operating temperature of 32°F to 140°F, UL Listed.

X. ETHERNET SWITCH

1. An Ethernet switch shall be provided inside the control enclosure to provide connectivity between the PLC, operator interface and plant networking. The switch shall support both 10 and 100 Mbit/s operation and provide for store and forward switching mode. The switch shall have five (5) 10/100Base-T ports with RJ-45 sockets and shall support auto-crossing, auto-negotiation and auto-polarity. Maximum distance between devices shall be 100m.
2. The unit shall be DIN rail mounted and require 24VDC/100mA power. Diagnostic LEDs for power, link status, data, and data rate shall be provided. The Ethernet switch shall be UL listed and manufactured by Hirschmann/Spider 5TX, or approved equal.

Y. REMOTE ACCESS ETHERNET MODEM

1. A UL listed, remote access Ethernet modem shall be supplied to provide connection capability between the Ethernet PLC network to a standard analog phone line. The device shall be complete with 4 RJ-45 10/100 full/half duplex network ports with on RJ-12 modem port capable of line rates (V90) of 56K thru 28K bps. The unit shall meet compliance with FCC Part 68,
2. Part 15-Class b, UL/CSA Certified, CTR 21, CE. Mounting shall be on 35 mm-din rail with an operating input of 8 to 48V DC. The remote access Ethernet modem shall be a Rockwell Automation Model 9300-RADES.

Z. HUMAN MACHINE INTERFACE

1. The operator interface shall be a NEMA Type 12, 13, 4X rated, 10.4" diagonal, color touchscreen display with Ethernet and serial communications. The interface shall be a liquid crystal display (LCD). The display type shall be color active matrix thin-film transistor (TFT) with 800 x 600 pixel resolution. The rated operating temperature shall be 32° to 131° F (0° to 55° C). The operator interface shall be an Allen Bradley PanelView Plus 7 Performance 10".

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect all equipment prior to erection. Repair or replace damaged items as directed by the Engineer, at no additional cost to the Owner. Have only factory-trained manufacturer's representative perform repair work.

3.2 INSTALLATION

- A. General: The installation of the equipment furnished by the manufacturer shall be the responsibility of the installing contractor in accordance with all requirements of the contract documents. The SBR equipment and appurtenances shall be installed by competent and experienced mechanics and electricians. Installation shall be in accordance with the manufacturer's erection drawings and instructions.
- B. The Contractor shall install SBR equipment in accordance with the Manufacturer's drawings and installation manual.

3.3 MANUFACTURER'S REPRESENTATIVES

- A. The equipment manufacturer shall furnish the services of a factory trained representative for a maximum of four (4) trips and fourteen (14) eight-hour days at the jobsite to inspect the installing contractor's equipment installation, supervise the initial operation of the equipment, instruct the plant operating personnel in proper operation and maintenance, and provide process assistance.
- B. If additional service is required due to the mechanisms not being fully operational, at the time of service requested by the contractor, the additional service days will be at the contractor's expense.

Process Performance Guarantee for the SBR Equipment is attached

END OF SECTION 461405

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PROCESS PERFORMANCE GUARANTEE

WASTEWATER TREATMENT PLANT IN RIPLEY, WV

This process and equipment performance and environmental compliance guarantee (this “Guarantee”) dated ____ day of _____, 2022 is between the City of Ripley (the “City”); and the Sequencing Batch Reactor Manufacturer _____ (“Manufacturer”). Throughout this Guarantee, the City and Manufacturer may sometimes be individually referred to as a “Party”, and may sometimes be collectively referred to as the “Parties.”

FACTUAL RECITALS

WHEREAS, the city owns and operates two existing sludge lagoon wastewater treatment plants (WWTP) in Ripley, Jackson County, West Virginia and Evans, Jackson County, WV which treat sewage from approximately 2,260 residential and commercial customers; and

WHEREAS, the City operates the WWTPs pursuant to the WV/NPDES Permit No. WV0045543 (“Permit”), which authorizes the City to discharge treated effluent into the Mill Creek/Ohio River; and

WHEREAS, on December 2, 2021 with an effective date of January 24, 2022, the West Virginia Department of Environmental Protection (“WVDEP”) reissued the Permit and therein set forth effluent requirements; and

WHEREAS, to comply with the current requirements of the Permit, the City wishes to purchase, install and operate an activated sludge treatment system generally referred to as a Sequencing Batch Reactor (SBR) provided that the Supplier guarantees that the equipment and processes employed in connection with the System shall result in the City’s compliance with the current conditions of the Permits; and

WHEREAS, the Manufacturer is willing to sell the System to the City, subject to the foregoing guarantee; and

AGREEMENT

NOW, THEREFORE, and in consideration of the preceding recitals and the mutual covenants contained herein, the parties agree to the following:

PART A – GUARANTEED PERFORMANCE:

1. Provided that the System is installed under the supervision of the Manufacturer, the City consistently operates the System in accordance with wastewater operating and maintenance manual during its ordinary course of business, influent water stream meeting the characteristics set forth herein, sufficient nutrients (a minimum of approximately 5 mg/L nitrogen and 1 mg/L phosphorus shall be present in the influent for every 100 mg/L of BOD) or shall be supplied by the Owner to meet minimum bacterial growth requirements, the Manufacturer covenants and guarantees that the discharges from the secondary treatment system shall meet the Performance Criteria set forth in Tables 1 and 2 attached hereto and incorporated herein.

2. For all mechanical components manufactured and/or assembled by or on behalf of the Manufacturer, Manufacturer covenants and agrees that such components shall be provided to prevent mechanical failure under normal operating conditions. Warranty for Mechanical components shall be in accordance with Specification Section 461405-1.10.B.

TABLE 1: Maximum Daily Effluent Limitations

Parameter	Guaranteed Performance
5 day biochemical oxygen demand (BOD5) mass	200 lb/d
5 day biochemical oxygen demand (BOD5) concentration	20 mg/L
Total Suspended Solids (TSS) mass	600 lb/d
Total Suspended Solids (TSS) concentration	60 mg/L
Total Ammonia (NH3-N) mass	100 lb/d
Total Ammonia (NH3-N) concentration	10 mg/L

TABLE 2: Monthly (30-day) Average Limitations

Parameter	Guaranteed Performance
5 day biochemical oxygen demand (BOD5) mass	100 lb/d
5 day biochemical oxygen demand (BOD5) concentration	10 mg/L
Total Suspended Solids (TSS) mass	300 lb/d
Total Suspended Solids (TSS) concentration	30 mg/L
Total Ammonia (NH3-N) mass	50 lb/d
Total Ammonia (NH3-N) concentration	5 mg/L

PART B – CONDITIONS OF THE GUARANTEE:

The performance guarantees set forth in Part A of this Guarantee are subject to the following conditions:

1. **Installation Requirements.** The System must be erected and started up in accordance with Manufacturer’s drawings, manuals and instructions (written) and Contractor shall provide written documentation confirming such compliance. Prior to start-up, Manufacturer shall review and approve the Contractor’s installation.
2. **Operational and Maintenance Requirements.** The System must be operated and maintained in accordance with Manufacturer’s drawings, manuals and instructions (written) and Owner shall provide written operating and maintenance logs confirming such compliance upon request. The Manufacturer shall provide sample or recommended operation and maintenance checklists with Operation and Maintenance manuals.
3. **Influent Water Quality Requirements.** Owner must supply an influent water quality stream meeting the Influent Water Quality Characteristics set forth in Table 1 attached hereto and incorporated herein and Items a through c below table.

Table 1. Influent Water Characteristics

Parameter	Unit	Target Value	Sampling Interval	Analysis Interval	Test Value
Average Design Flow	MGD	≤ 1.2	Continuous	Continuous	30-day Average
Peak Day Flow	MGD	≤ 4.0	Continuous	Continuous	24-hour Average
Average BOD ₅ (440 mg/l)	lbs/d	≤ 100.08	Composite	1/day	30-day Average
TSS (200 mg/l)	lbs/d	≤ 300.24	Composite	1/day	30-day Average
NH ₃ -N (60 mg/l TKN)	lbs/d	≤ 50.04	Composite	1/day	30-day Average
Acceptable Temperature Range	°C	9.4-27.2	Continuous	Continuous	Daily-Average
Acceptable pH Range	Std. Unit	6.5 to 8.5	Continuous	Continuous	Daily-Average
Dissolved Oxygen	mg/l	7.25	Continuous	Continuous	Instantaneous

a. Influent water quality:

1. Sampling Interval shall mean the frequency in which samples are taken. Composite Samples shall be comprised of an automatic 24 hour collection sample, with continuous flow and/or no periods of in line liquid stagnation between flow intervals.
2. Analysis Interval shall mean the frequency in which the samples taken are analyzed.
3. Test Value shall mean the manner in which the Analysis Interval data is evaluated for purposes of determining whether or not the Target Value has been met.
4. Sufficient alkalinity for complete nitrification will be present or will be supplied by the Owner.

b. Additional Influent Requirements:

1. Inhibitory Matter and Heavy Metals must be less than the threshold limits (or within any ranges specified) as defined on page 227 of WPCF Manual of Practice No. 8, 1977 Edition (See Appendix II).
 2. The influent wastewater shall not contain any substance toxic or inhibitory to the biological treatment process as determined by treatability tests using Method 209; OECD Guideline for Testing of Chemicals, Adopted 22 July 2010.
 3. The influent water stream shall not contain any substances or extreme physical conditions which might interfere with the biological, physical or chemical treatment processes and/or cause damage to the treatment equipment.
 4. During Start-up and Testing, the Manufacturer (through the Contractor) shall be available to guide the Owner in order to operate the treatment system. If analytical testing for the Inhibitory Matter and Heavy Metals noted in subsection. B.3.b.1 and B.3.b.2 above is deemed necessary by the Owner they will be considered "other tests", then the cost of these analytical tests shall also be the responsibility of the Owner. Analytical test results used to validate the system Performance Warranty and copies of the operator's log shall be transmitted to Owner and Engineer for review.
- c. All tests to determine the above characteristics must be taken in accordance with the requirements set forth in Appendix I.

PART C – TECHNICAL SUPPORT:

Technical Phone support for ongoing process operation support shall be at no charge for 24 months from the date of Substantial Completion.

PART D - GUARANTEE REMEDIES AND SUPPLEMENTAL CONDITIONS:

If one of the systems fails to meet the Performance Criteria specified for that System in Part A, and all conditions of Part B have been met, the manufacturer of the system shall, as its sole obligation and as the Owner's sole remedy at no charge to the Owner and subject to the limitation on liability set forth in Part H below, modify, supplement or replace equipment so as to enable the system to achieve the Performance Criteria specified for that system in Part A above. Any modification, supplementing or replacement of equipment will include delivery of same to the job site; providing all necessary labor and equipment for its installation; providing all required supervision and documentation during installation and providing startup services including but not limited to supervision, laboratory testing and reporting same to the owner.

PART E – THE PERFORMANCE TEST:

Performance Testing shall be the means by which each system's ability to meet the Performance Criteria specified for that system in Part A above is determined. In order to demonstrate each system's ability to meet its respective Performance Criteria, the Owner shall conduct

performance testing. Testing to satisfy the Performance Warranty shall be in accordance with the test procedures and conditions set forth in Appendix I. The manufacturer's obligations under this performance guarantee shall be deemed fully satisfied upon demonstration that all of the Performance Criteria specified in Part A above for the system supplied by the manufacturer have been met during the performance tests required to be performed on the system.

- A. Influent testing shall be conducted prior to performance testing to ensure the influent wastewater are reasonably within the limits presented in Part B.
- B. Performance Warranty testing shall be the means by which the System's ability to meet the Effluent Water Characteristics specified in Part A above is determined.
- C. Testing to satisfy the Performance Warranty shall commence on the date provided for in a mutually executed Certificate to Commence Testing. In no event shall the testing commence no more than 30 days after the startup and stabilization period ends.
- D. The start-up and stabilization period shall not exceed thirty (30) days. The performance test shall commence upon completion of the start-up and stabilization period. The Contractor is responsible for providing seed sludge for start-up and stabilization. The Manufacturer shall assist the Contractor to determine acceptable sludge source and developing a sludge seeding plan.
- E. The performance test period shall be for a minimum of thirty (30) days. During the performance test, once a week daily composite samples for influent and effluent shall be obtained in accordance with Appendix 1 below for water quality analysis. The cost of the analytical testing for performance testing for the composite samples shall be paid by the Owner as the testing is required for the plants NPDES operating permit. The composite samples shall consist of five (5) day biochemical oxygen demand (BOD5), total suspended solids (TSS), Alkalinity, Total Kjeldhal Nitrogen (TKN), and Ammonia. The performance test shall be considered a benchmark for future operation, troubleshooting and optimizing the process.
- F. Should an inability to produce the guaranteed results be related to a deficiency or failure in key system components that have not been supplied by the equipment supplier, the guarantee shall be considered unenforceable for the period that it takes to correct the deficiency.
- G. If during a Test Period the Target Values for the Influent Water Characteristics have been satisfied and the systems is not meeting its respective "Design and Operational Requirements" and/or "Effluent Water Characteristics" during the Test Period, but the Plant still meets its monthly NPDES or equivalent discharge permit, then the manufacturer of the non-conforming system obligations under this Warranty Document

shall be deemed satisfied and the applicable performance test successfully completed.
Owner shall provide manufacturers with written notice promptly after such event.

PART H – LIMITATION OF LIABILITY:

The remedies provided by a manufacturer to the Owner pursuant to Part D above shall be the Owner's sole and exclusive remedies for any failure by the Manufacturer to satisfy its respective performance warranty as specified in this Warranty Document. THE MANUFACTURER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE. Notwithstanding anything to the contrary elsewhere in this Warranty Document and notwithstanding the failure of the essential purpose of any remedy expressly provided herein, in no event shall a manufacturer be liable for any indirect, consequential, incidental, special or punitive damages.

The manufacturer's liability shall be limited to direct damages only and shall not exceed seventy-five percent (75%) of the manufacturer's price to the contractor for the individual wastewater treatment plant.

The limitation of liability set forth herein is not in addition to, but is subject to, the liability cap set forth in each Purchase Agreement. Therefore, manufacturer's total cumulative liability under this Warranty Document and each Purchase Agreement, including without limitation any liability for mechanical warranty claims or for any breach or failure to perform any obligation under the Purchase Agreement, shall not exceed the liability limitation set forth herein. The foregoing limitations apply regardless of whether the liabilities or damages arise or are alleged to arise under contract, tort, strict liability or any other theory.

PART F – CONFLICT RESOLUTION:

In the event the performance testing is not successful, the following procedure shall be adhered to obtain compliance with performance testing criteria:

If during a Test Period the Target Values for the Influent Water Characteristics have been satisfied and the System is not meeting the Effluent Water Characteristics, then Owner shall notify the Manufacturer in writing specifying the details of such deficiency and promptly make available to Manufacturer all testing and operational data, including operator logs, which Manufacturer deems relevant so that Manufacturer may evaluate the performance of the System. Manufacturer may recommend operational changes to the Plant or the System. Manufacturer must provide recommended operational changes in writing to the Owner. If the Owner has questions regarding recommended operational changes, the Manufacturer will answer said questions prior to implementing changes. Once Owner implements the operational changes recommended by Manufacturer and Manufacturer implements any modifications to the System Manufacturer deems necessary, then Manufacturer may resume the Performance Warranty testing by commencing a new Test Period. If Manufacturer fails to meet the Target Values for the Effluent Water

Characteristics after three (3) consecutive Test Periods in which the Target Values for the Influent Water Characteristics have been satisfied and the Owner has otherwise complied with the requirements of this subsection, then Manufacturer shall be deemed to have breached the Effluent Warranty. If, however, at any time Owner fails to comply with Manufacturer's written recommended operational changes, then Manufacturer's obligations under this Warranty Document shall be deemed fully satisfied and Manufacturer shall have no further obligations or liability of any kind to Owner under this Warranty Document.

If Manufacturer is in breach of the Effluent Warranty as described in the preceding subsection the Manufacturer shall, as its sole obligation and as Owner's sole remedy, subject to the limitation on liability set forth in Section H, choose to: (i) pay, in the form of liquidated damages, a lump sum amount of fifty percent 50% of the Equipment Contract price (the "Liquidated Damage Amount") in complete satisfaction of the Performance Warranty; or (ii) provide additional equipment and/or make modifications to the System to enable the System to achieve the Effluent Water Characteristics provided: (i) the Owner agrees in writing that it has the space to accommodate the additional equipment; and (ii) Owner further agrees that any increased operating expenses required by the additional equipment are for the Owner's account. If any such additions or modifications are made, Owner and Manufacture shall then mutually agree on a date to recommence testing to satisfy the Effluent Warranty. Manufacturer shall be permitted a total of three (3) attempts, as set forth herein, to recommend additional equipment or modifications to the System to satisfy the Effluent Warranty. In the event the Manufacturer cannot satisfy the Effluent Warranty after the third and final attempt, then Manufacturer shall pay an amount equal to the difference between the Liquidated Damage Amount, less the amount of costs incurred by Manufacturer in implementing any modifications to the System pursuant to this subsection.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute this Warranty Document with the intention that this Warranty Document will become a part of each Manufacturer's Purchase Agreement connected with the products and the subject matter set forth herein.

City of Ripley
Contract #3 - Proposed 1.2 MGD Wastewater Treatment Plant

Revised per Addendum #1
March 14, 2022
020-01535

Manufacturer: _____

City of Ripley

By: _____

By: _____

Printed Name: _____

Printed Name: _____

Title: _____

Title: _____

Date: _____

Date: _____

APPENDIX I

Warranty Testing

1. Testing Methodology

- a) Unless inconsistent with the specific requirements of the Warranty Document, all sampling and laboratory analysis methods and principles to be used for verification of any of the requirements of the Performance Warranties shall conform to the provisions of the most recent edition of "Standard Methods for the Examination of Water and Wastewater" (the "Standard Methods"). Owner and Manufacturer must mutually agree in writing on any modification to the Standard Methods.
- b) In accordance with Standard Methods, the total suspended solids analysis will use a glass fiber filter disk and the "sample volume shall be sufficient to yield between 2.5 and 200 mg dried residue"; however, the volume shall not be limited to 1 liter. Volumes shall be measured using Class A glassware or determined gravimetrically.
- c) Owner shall provide evidence that its laboratory equipment and analyst capability meet the standards of precision and accuracy as stated in the Standard Methods for each procedure, or the owner may use an independent certified laboratory for the analyses. Certified standard samples may be used to confirm compliance with those standards of precision and accuracy. The Owner, with mutual agreement of Manufacturer, may substitute a third party certified commercial laboratory for analyzing all or part of the samples collected during any Test Period. The Owner may also simultaneously analyze the samples as a backup and/or check against analysis error. A portion of each composite will be supplied to the Manufacturer for its own analysis on request. In the event a conflict of data develops, additional split samples shall be sent to a mutually agreed independent third party certified commercial laboratory for further comparison.
- d) The costs of sampling and laboratory analysis shall be borne by Owner as part of normal plant operation. Any additional analysis beyond normal plant operation shall be borne by the Owner. This may include testing to closely monitor and troubleshoot process performance and is not limited to testing only influent and effluent water characteristics.
- e) Manufacturer shall be permitted to witness and/or participate in the collection and the analysis of any and all samples collected during each Test Period, and to independently collect and analyze additional samples.
- f) Owner shall provide Manufacturer with written notice of the test results promptly after completion of each Test Period.
- g) The Plant and System shall be operated by the Owner at Owner's expense, at all times during the Test Period under the recommendations of the Manufacturer. Manufacturer shall

provide recommendations via telephone during the testing period. However if the process becomes upset or is experiencing problems that cannot be solved with phone calls, the Manufacturer shall provide a trained sequencing batch reactor process representative that can be on-site within a reasonable period of time. The representative shall remain on-site or on call to return until the Owner, Engineer and Manufacturer agree that the process is stabilized.

2. Test Period

- a) Testing to satisfy the Performance Warranty will require the collection and laboratory analysis of samples during sixty (60) continuous days of System operation. Each of the influent and effluent samples shall be analyzed for all characteristics set forth in, and otherwise in accordance with, Parts A and B. Other tests may be performed on the influent or effluent samples if deemed necessary or desirable by the Owner or Manufacturer (if other tests are required by Manufacturer, the Owner will send the invoice for the other tests to the Manufacturer to pay for the other tests).
- b) In the event, based on good faith determination, certain data appear spurious and/or invalid; this data may be rejected by either party. If the rejected data includes an influent or an effluent value for parameters in Parts A and B then all data for the influent and the effluent for that day shall be rejected and that pair shall not be included as part of the Test Period. Days removed during the Test Period due to spurious and/or invalid data will not be reinstated at the end of the Test Period.

3. Sample Collection

- a) Excepting solely for any turbidity, freon-soluble, and sulfate tests (addressed in paragraph 5 below), sampling equipment should be used which assures automatic 24 hour collection, with continuous flow and/or no periods of in line liquid stagnation between flow intervals. Individual samples grabbed by the composite sampler to make up the single 24 hour composite sample shall be no greater than 2 hours between flow intervals. The sampling lines shall be cleaned with bleach solution and thoroughly flushed with potable water before any tests and at not less than seven (7) day intervals during the performance tests.
- b) If automatic sampling equipment is not available or malfunction occurs during testing, a manual program of grab samples at 2 hour intervals may be substituted until the equipment is available or repaired; provided that only suitably trained operators may be used by Contractor or Owner for the manual collection of grab samples.
- c) Owner shall be responsible for ensuring that trained operators are employed to collect and compile samples. Manufacturer may request reasonable assurances and evidence that such operators are appropriately trained and qualified.

4. Sample Preservation

- a) Sample collection containers shall be maintained at a temperature of 4°C to preserve the samples prior to laboratory analysis. Analysis for all parameters must be initiated within approved hold times.

5. Water Analysis

- a) Total BOD, Total Suspended Solids, Ammonia, TKN and TP shall be determined on the freshly mixed composite samples. Sulfate shall be determined in filtrate from the suspended solids determination and/or from filtrate obtained with larger filter pads of the same specifications recommended in Standard Methods for suspended solids. Fat, oil, and grease (freon-soluble) and turbidity shall be determined on separate individual samples obtained manually in glass bottles as specified in Standard Methods. A single grab sample should be taken for each analysis. Sulfide shall be determined on grab samples after fixatives have been added as specified in Standard Methods.
- b) BOD measurement shall be at a fixed temperature. Samples shall be allowed to reach 20 °C before measurement or dilution steps are performed.
- c) pH measurement with a temperature compensation probe is acceptable.

6. Flow and Temperature Measurement

- a) Flow measuring devices and meters installed for full-scale service shall have been electrically calibrated by the meter manufacturer and the accuracy attested in writing to Owner.
- b) Temperature of the influent shall be obtained with a metallic dial thermometer continuously submerged in the liquid. This thermometer shall be calibrated before the Test Period begins against a mercury filled glass thermometer and at weekly intervals during the Test Period.

APPENDIX II
From WPCF Manual of Practice No. 8
1977 Edition, Page 227

**TABLE 14-III. Threshold Concentrations
 of Pollutants Inhibitory to the
 Activated Sludge Process**

Pollutant	Concentration (mg/L)	
	Carbonaceous Removal	Nitrification
Aluminum	15 to 26	--
Ammonia	480	--
Arsenic	0.1	--
Borate (Boron)	0.05 to 100	--
Cadmium	10 to 100	--
Calcium	2500	--
Chromium (hexavalent)	1 to 10	0.25
Chromium (trivalent)	50	--
Copper	1.0	0.005 to 0.5
Cyanide	0.1 to 5	0.34
Iron	1000	--
Lead	0.1	0.5
Manganese	10	--
Magnesium	--*	50
Mercury	0.1 to 5.0	--
Nickel	1.0 to 2.5	0.25
Silver	5	--
Sulfate	--	500
Zinc	0.08 to 10	0.08 to 0.5
Phenols:		
Phenol	200	4 to 10
Cresol	--	4 to 16
2-4 Dinitrophenol	--	150

*Insufficient Data

SECTION 461802 – SLUDGE DEWATERING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. The work included under this section consists of all labor, tools, equipment and services necessary to install a complete sludge dewatering system including one (1) 1.0 meter belt filter press, polymer feed system, lime feed system, sludge conveyor and control panel; as specified and indicated on the Drawings and as required to meet specified performance requirements.
- B. Related Sections
 - 1. Section 463643 – Lime Feed Equipment: The Sludge Dewatering Equipment shall control the lime feed equipment.
- C. Equipment furnished and installed under this section shall be fabricated, assembled, erected and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the engineer.

1.2 COORDINATION

- A. Section 013000: “Administrative Requirements: Requirements for Coordination.”
- B. Coordinate Work of this Section with piping and equipment connections as specified in other Sections and as indicated on Drawings.

1.3 SUBMITTALS

- A. Submittals shall be submitted based on the requirements in Section 013300 - Submittal Procedures. Submittals shall include the following:
 - 1. Product information and drawings for all sludge dewatering equipment components to be furnished and installed as specified herein.
- B. A copy of this specification section and all referenced and applicable sections, with addendum updates included and with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements is required under this section. Check marks (✓) shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The Engineer shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to

the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

1.4 CLOSEOUT SUBMITTALS

- A. Section 017000: "Execution and Closeout Requirements: Requirements for Submittals."
- B. Complete system Operation and Maintenance manuals shall be available in hardcopy and electronic form. The electronic form shall be provided in .pdf format and be fully bookmarked. Manuals shall address:
 - 1. General project information
 - 2. Installation and start-up
 - 3. Process design and operational control description
 - 4. Mechanical, electrical and field instrumentation component descriptions
 - 5. Maintenance and troubleshooting
 - 6. Mechanical and electrical drawings

1.5 WARRANTY

- A. Section 017000 - Execution and Closeout Requirements: Requirements for warranties.
- B. All equipment provided under this Section shall be furnished with one (1) year warranty on materials and workmanship from the **date of Substantial Completion**. The Owner will return any equipment found defective to the manufacturer for inspection and validation of the defect. Defective equipment will be repaired or replaced at manufacturer's discretion and shipped back to Owner at no charge.

1.6 WORKMANSHIP AND DESIGN

- A. All components of the sludge dewatering equipment shall be engineered for long, continuous, and uninterrupted service. Provisions shall be made for easy lubrication, adjustment, or replacement of all parts. Corresponding parts of multiple units shall be interchangeable.

1.7 SYSTEM DESCRIPTION

- A. The sludge dewatering system shall consist of one (1) belt filter press, polymer feed system, lime feed system, sludge conveyor and all appurtenances. Each belt filter press shall be a complete prefabricated unit consisting of at least a sludge conditioning system, a gravity drainage section, a pressure section, a belt tensioning system and a belt washing system. Only units having a measured belt width of 1.2 meters, 1.0 meters effective shall be considered acceptable under this specification. The unit shall be the Klampress® 1.0 meters with Extended Gravity and Wedge zones Belt Filter Press as manufactured by Alfa Laval Ashbrook Simon-Hartley, Houston, Texas, or equal.
- B. The overall height, width, and length of each belt filter press shall be as follows: 95.75" inches high (centerline of feed inlet), 244.75 inches long and 94.75 inches wide.

- C. The minimum clearance requirements specified herein shall not relieve the contractor from allowing additional clearances for the proper installation, operation, and maintenance of the units. Should equipment other than that specified be proposed, the contractor shall be responsible for any redesign based on the requirements contained herein.

1.8 QUALITY ASSURANCE

- A. Perform Work according to specified standards.
- B. Maintain one (1) copy of each standard affecting Work of this Section on Site.
- C. Basis of Design: The Drawings and Specifications have been developed based on SBR equipment manufactured by Alfa Laval, Inc. Ashbrook Simon-Hartley of Houston, Texas. Any costs resulting from changes made necessary by the approval of other SBR equipment shall be borne by the Contractor. This shall include all design work and drawing and specification revisions by the Engineer. Also, the Contractor shall submit drawings to the Engineer for approval showing all changes made necessary by the other equipment.
- D. Single Source Responsibility: To ensure that all equipment required for the installation of the screening equipment and controls is properly coordinated and will function as a unit in accordance with the intent of these specifications, the Contractor shall obtain all the equipment specified under this Section, from a single supplier in whom the responsibility for the proper function of all the equipment, regardless of manufacturer, as an integrated and coordinated system shall be vested. The intent of this paragraph is to establish unit responsibility for all the equipment with the screening equipment supplier. The use of the work "responsibility" relating to the equipment supplier is in no way intended to relieve the Contractor's ultimate responsibility for equipment coordination, installation, operation, and guarantee.
- E. Consideration will be given only to products of manufacturers who can demonstrate that their equipment fully complies with all requirements of the specifications and contract documents. The equipment shall be supplied by a firm which has been regularly engaged in the design, fabrication, assembly, testing, start-up and service of full scale belt filter presses, of the same model and size as proposed, operating in the U.S., with similar sludges, for a period of not less than ten (10) years prior to the bid date of this contract. To insure that the highest standards are met each bidder shall be certified to ISO 9001 quality standards as a belt press manufacturer in the United States. The bidder shall submit data to substantiate the manufacturers experience in accordance with the contract documents. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- F. If a bidding belt press manufacturer does not have a formal quality system in place, or documentation to prove so, a performance/maintenance bond in the amount of 100% of the installed price (including equipment, labor, piping, and wiring associated with the system covered under this specification) shall be included in the bid proposal. The bond should be made out to the owner for 100% of the amount bid, and shall be in force for a minimum of five (5) years from the date of first beneficial use of the equipment. The five (5) year minimum is to cover all warranties listed under this specification.
- G. Store materials according to manufacturer instructions.
- H. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Protect piping and appurtenances by storing off ground.
3. Provide additional protection according to manufacturer instructions.

1.9 PATENTS

- A. The manufacturer warrants that the use of this system and its equipment, in the process for which the system has been expressly designed, will not infringe any U.S. or foreign patents or patents pending. In the event of any claim of infringement the manufacturer shall defend and indemnify the owner free from any liabilities associated with the use of the patented equipment or process.
- B. The manufacturer hereby grants to the owner, in perpetuity, a paid up license to use any inventions covered by patent or patents pending, owned, or controlled by the manufacturer in the operation of the facility being constructed in conjunction with the equipment supplied under this contract, but without the right to grant sublicenses.

1.10 CONDITIONS OF SERVICE AND PERFORMANCE REQUIREMENTS

- A. The sludge dewatering equipment shall be designed to adequately condition and dewater the sludge so that a dewatered sludge cake is produced that easily discharges from the dewatering unit without blinding and that may be handled by the pump or conveying equipment.
- B. Each unit shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required dewatering operations without spillage of water or sludge beyond the nominal machine envelope.
- C. The description of the sludge to be fed to the belt filter press is as follows:
 1. Type of sludge:
 - WAS from a Sequencing Batch Reactor (SBR) plant which is raw, aerobically digested.
 - Feed Solids, percent d.w.s. 1% to 2%
- D. Each belt filter press shall be capable of meeting the following minimum performance criteria provided the above Conditions of Service are furnished:
 - Sludge throughput (lbs. d.w.s./hour) 650 – 750
 - Hydraulic capacity (GPM) 65-75
 - Cake solids, percent d.w.s 16 – 18%
 - Solids capture, percent 93-95%
 - Lbs/ton of active polymer in feed, d.ws. 12 - 15

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include:
1. Alfa Laval, Inc.
 2. Komline-Sanderson

2.2 MATERIALS AND COATINGS

- A. All materials used in the construction of the sludge dewatering equipment shall be of the best quality and entirely suitable in every respect for the service required. All structural steel shall conform to the ASTM Standard Specification for Structural Steel, Designation A36/A36M. All iron castings shall conform to the ASTM Standard Specifications for Gray Iron Castings, Designation A48, and shall be of a class suitable for the purpose intended. Other materials shall conform to the ASTM Specifications where such specifications exist and the use of such materials shall be based on continuous and successful use under similar conditions of service.
- B. All electrical components shall be U.L. listed where such listing exists and all electrical control panels shall be assembled in U.L. approved facilities.
- C. All structural carbon steel plates and shapes shall have a minimum thickness of 1/4 inch and shall be hot dip galvanized in accordance with ASTM A-123.
- D. The following materials and coatings shall be provided for the belt filter press and related components unless specified otherwise herein:

Bearing housings	Painted, cast iron
Horizontal gravity, wedge, and pressure zone grids:	Carbon steel hot dipped galvanized, fitted with U.H.M.W. Polyethylene wiper bars
Wash box	C.S. Galvanized, fitted with U.H.M.W. Polyethylene wiper bars.
Belt wash spray tube and nozzles	Stainless steel.
Belt wash piping	Schedule 80 PVC, 1 1/2 inch.
Chicanes	Galvanized steel support rods, galvanized cast iron holders and U.H.M.W. polyethylene blades.
Discharge Chute	Stainless steel.
Doctor blades	U.H.M.W. polyethylene.
Drain trays	Stainless steel, 14 gauge.

Drain tray piping	Schedule 40 PVC.
Frame	A36 steel, hot dip galvanized, ASTM A123, coating grade 100
Hardware, fasteners, springs, clips, etc.	316 stainless steel.
Hydraulic cylinders	Painted carbon steel
Miscellaneous	Carbon steel surfaces to be hot dip galvanized, ASTM A123 4 mils. min.
Polymer mixer housing	Aluminum
Counterweight	Cast iron, galvanized
Injection ring	UHMW polyethylene
Splitter Manifold	UHMW polyethylene
Roller shaft & body	Carbon steel. Drive roller coated with Buna N rubber, 1/4 inch, other rollers coated with thermoplastic nylon, 25 mils.
Sludge containment barriers	Stainless steel, 14 gauge.

E. All hot dip galvanizing shall be applied in accordance with ASTM-A123. Zinc flame spray shall not be considered an acceptable substitute to this specification.

F. The heat setting thermoplastic nylon coating, specified herein, shall have the following properties:

<u>Coating Properties</u>	<u>Test Method</u>	<u>Value</u>
Hardness, Shore D	ASTM D-2240	77 durometer
Specific Gravity	ASTM D-792	1.06-1.20
Impact, RT & 45 F	ASTM D-2794	160 in-lbs
Direct Pass		
Tensile Strength	ASTM D-638	6000 PSI
Elongation	ASTM D-638	15%
Melting Point	ASTM D-789	3700F
Abrasion Resistance	ASTM D-4060	8-18 mg. Wt. loss

G. Buna N rubber coating shall have the following properties:

Tensile strength, ASTM D-412	2500 psi
Tear strength, die C, ASTM D-624	250 psi
Elongation at break, ASTM D-412	160%
Hardness, Shore A, ASTM D -676	90

H. Other types of protective coatings shall not be acceptable.

2.3 SLUDGE CONDITIONING SYSTEM

- A. Each belt filter press shall be provided with a sludge conditioning system, designed to efficiently mix polymer with the sludge and to adequately flocculate the sludge, for optimum dewatering.
- B. The sludge conditioning system shall be mounted upstream of the press and shall consist of a flow splitting manifold, a four port vortex polymer injection ring and an in line, non-clog, variable orifice mixer. Polymer addition systems which utilize tanks with mixers or inject polymer directly into the sludge line are not an acceptable equal to the system specified due to the excess amounts of polymer required by these inefficient systems.
- C. The belt filter press manufacturer shall be required to provide, to the engineer, a recommended layout for the sludge conditioning system that includes the recommended locations for the system.
- D. The sludge conditioning system shall be capable of providing the following performance:
 - 1. The polymer and sludge must be instantly mixed (less than 1.0 second at 60 GPM).
 - 2. Mixing energy must be independently adjustable during operation.
 - 3. Flocculation time must be independently adjustable, by the displacement of flanged pipe sections, with the mixer, at a minimum of three locations in the sludge feed piping. The three locations shall be 15, 30, and 45 seconds upstream from the belt filter press as calculated using the sludge feed design flow rate and velocity.
- E. The manufacturer shall be required to demonstrate, during the start up and calibration phase, that one man can adjust flocculation time within sixty minutes. The sludge conditioning system shall meet the following mechanical specifications:
 - 1. The in line mixer shall have a flanged, cast housing, an adjustable orifice plate, with shaft and o ring seal, connected to an externally mounted lever and counterweight and a removable side plate for inspection and cleaning.
 - 2. The inlet to the flow splitting manifold shall be fitted with a 3/4-inch male hose fitting connection. The four manifold outlets and polymer injection ring inlets shall be fitted with 1/2-inch male hose fittings that provide for the interconnection of clear flexible tubing. The Manufacturer shall provide four feet of 3/4 inch clear flexible tubing, sixteen feet of 1/2 inch clear flexible tubing and all necessary hose clamps with the sludge conditioning system.
 - 3. The open throat area of the mixer shall be fully adjustable downward and shall open automatically to prevent clogging.
 - 4. The position of the counterweight on the externally mounted orifice plate lever shall be fully adjustable, within a 360 degree circle, to allow for adjustment of the mixing energy, regardless of the mounting angle, while the unit is in operation.
- F. The polymer mixer shall be designed specifically for it's intended use. The use of modified check valves, static mixers, or mixers requiring a tank and motor driven propeller shall not be acceptable to this specification.

2.4 STRUCTURAL MAIN FRAME

- A. The structural main frame shall be fabricated of steel plate conforming to ASTM Standard Specifications for Structural Steel, into a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection.
- B. Maximum load on the frame, rollers and bearings shall be based on the summation of forces applied to the frame from roller mass forces, weight of the rollers including the sludge and belts and static belt tension of 30 pli per belt plus the tension produced by the driving torque of the motor. The frame shall have a minimum design safety factor greater than 5, and frame deflection shall not exceed 0.030 inches under the above specified loading forces.
- C. The framework shall be of welded and/or bolted construction. All welding shall conform to the American Welding Society Structural Welding Code.
- D. The structure shall be designed for installation on a prepared concrete foundation and secured with anchor bolts. The entire system shall be enclosed and protected by removable 14 gauge stainless steel safety shields. The construction of the belt press with the shields removed shall allow easy access and visual inspection of all internal components.
- E. The manufacturer shall warrant the frame and the coating for a period of three years from the date of start up, not to exceed three and a half years from the date of delivery. The frame shall not require preventive maintenance during the warranty period. Any defects or corrosion occurring within the warranty period shall be repaired or replaced at no additional cost to the owner.

2.5 GRAVITY DRAINAGE SECTION

- A. Each belt filter press shall be furnished with a gravity drainage section to accept sludge from the sludge conditioning system. The gravity drainage section shall be furnished with a sludge feed baffle to evenly distribute conditioned sludge over the effective width of the moving filter belt.
- B. The conditioned sludge shall be contained on the belt with adjustable containment barriers equipped with replaceable rubber seals to prevent leakage. The rubber seals shall be designed for attachment to the containment barriers by friction fit, to allow for easy replacement without the use of tools.
- C. The gravity drainage section shall have an effective dewatering area of 46 square feet, which is defined as the effective width of the belt press times the length of the gravity deck.
- D. A carbon steel hot dipped galvanized grid fitted with high-density polyethylene wiper bars shall support the filter belt while in the gravity drainage section. The wiper bars shall be spaced at a maximum of two and one half inches and shall have a nominal wear thickness of one half inch, to minimize the frequency of replacement. The belt support grid shall be a minimum of 2 inches wider than the belt on each side and so designed to reduce belt wear. Wiper bars constructed of fiberglass, other high friction materials, or table rollers that require extra maintenance due to coatings and additional bearings shall not be considered an acceptable substitute to this specification.

- E. The gravity drainage section shall be furnished with chicanes (plows) to adequately furrow the conditioned sludge to facilitate drainage. Each row of chicanes shall be provided with a single lifting handle, designed to remove the entire row of chicanes at least 6 inches from the belt, out of the sludge flow, to facilitate cleaning. Chicanes shall be designed to be individually adjustable laterally and shall pivot to allow them to pass over obstructions on the belt. A minimum of 5 rows, for a total of 13 chicanes shall be supplied in the gravity section.
- F. The manufacturer shall be required to demonstrate that each individual chicane shall be capable of allowing a one-inch vertical obstruction on the belt to pass under them without damage to the equipment.
- G. Vacuum assisted, inclined gravity drainage sections that are subject to flooding, or independent gravity drainage sections that require a separate belt drive motor and tensioning device will not be considered an acceptable substitute to this specification.

2.6 PRESSURE SECTION

- A. Each belt filter press shall be furnished with a pressure section following the gravity drainage section. The pressure section shall consist of two stages.
- B. The first stage of the pressure section shall be the increasing pressure (wedge) zone, where the upper and lower belts gradually converge with the sludge between the belts. In the wedge zone the sludge cake is prepared for the shear pressure zone by generating continuously increasing pressure on the sludge as it travels through the zone.
- C. For process flexibility, the amount of pressure exerted on the sludge and the rate at which the increasing pressure is applied shall be independently adjustable while the machine is in operation utilizing an adjustable steel wedge plate located between the belts, pressing down on the sludge. These adjustments shall be capable of being performed without causing undue wear on the belts or other components and without causing the belts to be moved from their normal path between rollers. The sludge inlet height at the entrance to the wedge plate shall be adjustable between one and three inches.
- D. The minimum effective dewatering area in the increasing pressure shall be 29 square feet. The belt in the increasing pressure zone shall be supported in the same manner as supported in the gravity drainage section.
- E. The second stage of the pressure section shall be the shear pressure zone consisting of a 12" radius curved grid and a minimum of 8 pressure rollers arranged to provide a serpentine pattern of belt travel.
- F. The curved grid shall further enhance dewatering by causing the pressure on the sludge between the belts to increase and press out free water. The horizontal wiper bars shall give a wiping action to the bottom of the belt in the wedge zone that will quickly remove water from the belt allowing faster drainage. The belt-supporting grid in the wedge zone shall be horizontal and blend into a gradual downward curve that shall be tangent to a radius pressure grid.
- G. The first roller in the increasing pressure zone shall be a 16" perforated roller. Rollers shall be constructed as specified under "Rollers". The rollers shall be supported by bearings mounted on the end shafts as specified under "Bearings".

- H. The minimum effective dewatering area in the shear pressure zone shall be 66 square feet. The effective dewatering area in the shear pressure zone shall be defined as the area of curved grid and rollers in contact with the belts, meaning full width of the belt.

2.7 ROLLERS

- A. All Solid Rollers shall be constructed using one-piece forge shafts and end plates. The forged stub shaft unit shall eliminate all welding of the roller shafts in the region of highest stress where the shafts join with the end plates. Welded up constructions of round bar and flat plates that create built in stresses and stress concentrations will not be considered equal to this specification. The forged stub shaft unit shall be welded to the roller shell with a machine-applied weld using the submerged arc process. The weld depth shall be equal to the wall thickness of the roller shell. The roller shall be machined so that the total indicated run out of the shell relative to the journals is 0.010 inch maximum. Total surface machining is required to provide a smooth surface for the coating of thermoplastic nylon or to prepare the roller for cladding.
- B. The perforated roller, which is the first roller in the pressure section, is designed to allow water to escape out both ends. It shall be constructed with a solid through shaft and at least five (5) radial vanes to support the perforated shell.
- C. The forged stub shaft unit shall be made of ASTM A572 Grade 50 Type 2 or equal. The roller shells may be ASTM A53 or equal. The perforated roller shall have a solid shaft of cold drawn carbon steel, AISC 8620 and the shell and radial vanes shall be ASTM A36 or equal, or stainless steels may be substituted on special order.
- D. Drive rollers shall be coated up to the point of insertion into the bearings by a 1/4-inch minimum thickness of Buna-N rubber. Solid and perforated rollers shall be coated with a 30-mil minimum thickness of thermoplastic nylon. See detail spec for these coatings in Section 2.2.
- E. Solid rollers may also be clad with 304 or 316 stainless steel. The cladding will be welded to the fully machined roller entirely covering the roller up to the point of insertion into the bearings. Welded stainless steel shafts in lieu of the forging are not acceptable for this application due to the lower strength and higher stress.
- F. All solid roller shells shall have a mill spec minimum wall thickness of 1/2 inch. Heavier walls shall be used where required to meet the maximum stress and deflection limits. The roller bearing journals shall be turned to 75 mm to accept direct mounted 75 mm bore bearings. The minimum thickness of the forged flange that forms the end plates shall be one (1) inch.
- G. The perforated roller shall have punched holes of 1 1/4 inch diameter minimum to prevent bridging of solid material. The punched shell shall be rolled with the smooth side out. The shell shall be a minimum 1/4-inch thick.
- H. The rollers shall be analyzed using finite element stress analyses. Certified calculations, showing the maximum stress to be less than 1/5 the yield strength of the material and the maximum deflection at mid span to be less than 0.050 inch shall be submitted as set forth in the contract documents. The standard load case for the pressure rollers shall be a distributed load in the belt contact area equivalent to 50-pli belt tension, weight loading and drive torque. The

standard load case for the other rollers shall be a distributed load in the belt contact area equivalent to 50-pli belt tension and weight loading.

2.8 BEARINGS

- A. All rollers shall be supported by greaseable type, high capacity design roller bearings, in sealed, splash proof, horizontal split case pillow block housings. The bearings shall be direct mounted on the shaft with a shrink fit backed by a retaining snap ring.
- B. Bearings supporting the steering rollers shall be non self aligning cylindrical roller bearings in pivot mounted pillow block housings.
- C. All other rollers shall be supported by self-aligning Type "E" spherical roller bearings with metallic cages, (plastic cages in spherical roller bearings are not acceptable) mounted in fixed pillow block housings.
- D. Bearings supporting all the rollers except the steering rollers shall be 75mm bore double row spherical bearings (type E construction) AFBMA size number 22215 with a dynamic radial capacity of 41,500 lb.. Bearings supporting the steering rollers shall be 75mm bore single row cylindrical roller bearings AFBMA size number 2215 with a dynamic radial capacity of 36,500 lb.
- E. Bearing housings shall be cast iron with two mounting bolts and four cap bolts. The outer side of the housing shall be solid, without end caps or filler plugs. The housings shall be designed with an integrally cast water trough which, when shrouded by a shaft mounted water flinger, shall divert water from the bearing seal area. The housings shall be cleaned, iron phosphate, and coated with nylon to a thickness of 8-12 mil.
- F. The bearing seal in the pillow block housing shall be of nonmetallic construction with a carrier/flinger, which rotates with the roller shaft. A static sealing arrangement between the carrier/flinger and the shaft shall be a triple rubber seal, constructed in a manner that prevents relative rotation between the seal and the shaft. A dynamic sealing arrangement between the carrier/flinger and the bearing housing shall consist of a primary dynamic contact seal of ozone resistant rubber which shall seal by rotational contact with a machined housing surface. A secondary dynamic seal shall be a labyrinth seal between the carrier/flinger and the bearing housing which utilizes a nonmetallic retaining ring to hold the seal assembly in position within the housing.
- G. Bearing lubrication shall be performed through stainless steel grease fitting mounted on the bearing housing. All bearings shall be outboard (externally mounted) and shall be greaseable while the unit is in operation. Lubrication shall not be required more often than once every six months.
- H. The manufacturer of the belt filter press shall warrant the complete bearing assembly, as specified herein, for a period of one year from the date of start-up, or acceptance of the equipment, whichever occurs first. The warranty is void if the bearings are not lubricated sufficiently to prevent rusting of the rolling elements.

2.9 BELT WASH SYSTEM

- A. Each belt filter press shall be equipped with individual belt wash stations for both the upper and lower belts. Each station shall consist of a spray pipe, fitted with spray nozzles, contained within a fabricated housing which encapsulates a section of each belt. The spray tube assembly shall be readily removable.
- B. Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another at the belt surface. Individual spray nozzles shall be replaceable.
- C. The housing shall be sealed against the belt with rubber seals. The spacing between the upper and lower housing shall be adjustable to insure continuous contact between the seals and belt. The seals shall be replaceable without disassembly of the wash station.
- D. Each belt wash station shall be furnished with a drain valve having an external handwheel to which is mounted a stainless steel cleaning brush located inside the spray pipe. One full turn of the handwheel shall cause the brush bristles to enter each spray nozzle, and dislodge any solid particles which have accumulated, open the valve and allow the solids particles to be flushed into the drainage system.
- E. Belt wash stations shall be the type manufactured by Appleton Manufacturing, Menasha Corporation, Menasha, Wisconsin or equal.
- F. Each belt wash station shall be positioned such that the washing is performed after the cake has been discharged from the belt. The belt wash station shall extend over the full width of the filter belt by a minimum of two (2) inches. The belt shall be cleaned by the belt wash with no blinding. The belt wash system shall be suitable for use with plant effluent water supplied at a minimum pressure of 85 psig and shall be designed to operate at a flow of 40 gpm.
- G. Washwater pressure shall be supplied to each washwater pump (one required per belt press) at 40 psig, and the belt press manufacturer shall furnish a separately mounted in line booster pump rated at sufficient capacity and discharge head to meet the process requirements. All controls and equipment necessary to provide a complete and operating system shall be provided for the pumps by the belt press manufacturer, including the controls from the machine control panel as specified hereinafter.
- H. Each belt filter press shall be provided with a 1 1/2 inch female pvc connection for belt wash water.

2.10 BELT ALIGNMENT SYSTEM

- A. Each belt shall be provided with an alignment system. Belt alignment shall be accomplished using a self-contained system that does not require an external power source, except for electrical power.
- B. The belt alignment system shall be provided with sensing devices designed with a counter-weighted arm fitted with a ceramic plate, which rides on the edge of the belts to detect their position. The arm shall operate a pilot valve, which in turn affects the position of a hydraulic actuator connected to a pivoted belt alignment roller. The pivoting action of the belt alignment

roller shall cause this roller to skew from its transverse position to guide the belts centrally along their path.

- C. The alignment systems shall function as a continuous automatic belt guidance system and shall be an integral part of the press. The alignment system shall operate with smooth and slow motions resulting in a minimum of belt travel from side to side. The use of electrical servos or systems which utilize devices that maintain alignment by a large snap action type alternating movement of the alignment roller shall not be considered acceptable to this specification.
- D. Rollers for the belt aligning system shall be constructed as specified under "Rollers". Support bearings for these rollers shall be as specified under "Bearings".
- E. Backup limit switches for the belt alignment system shall be provided on the machine with sufficient contacts to de energize all drives and sound an alarm in case of belt over travel.
- F. A hydraulic unit shall be provided, as specified under "Hydraulic Power Unit".

2.11 BELT TENSIONING SYSTEM

- A. Each belt shall be provided with a belt tensioning system. The belt tensioning system shall be hydraulically actuated. The design of the tensioning system shall be such that adjustments in tension shall result in immediate changes in dewatering pressure.
- B. The belt tensioning system shall be furnished with a control station located on the press so that shutoff of belt tension is possible. Actual belt tension, shall be maintained automatically despite process changes or belt stretching and not require additional adjustment by the operator to maintain the setpoint.
- C. The belt tensioning system shall be designed to accommodate maximum belt stretching during the useful life of the belt.
- D. The tensioning system shall have two hydraulic cylinders for each belt, directly connected to a rigid tensioning yoke, to provide absolute parallel tension across the entire width of the belt. The tension force shall be constant over the full range of the cylinder.
- E. Manual tensioning systems or pneumatic bellows systems, which do not automatically maintain a pre-set pressure on the sludge despite process changes, are not acceptable. Furthermore, air bladders change diameter and, as a result, force as they extend.
- F. Sensing devices shall be furnished for each belt with sufficient electrical contacts to de energize all drives and sound an alarm in the event of failure of the belt or the tensioning system.
- G. Rollers for the belt tensioning system shall be constructed as specified under "Rollers". The roller shaft bearings shall be as specified under "Bearings".

2.12 HYDRAULIC POWER UNIT

- A. Each belt filter press system shall be provided with a dedicated hydraulic power system to provide pressurized oil for the tensioning. The unit shall consist of a one-gallon reservoir,

variable-displacement pressure compensated hydraulic oil pump and drive motor, hydraulic oil filter, pressure gauge, piping, and cylinders to make a complete operational system.

- B. The pump, motor, reservoir, and oil filter shall be mounted directly to the belt press frame to eliminate excess piping runs, extra fittings and hoses. All hydraulic lines shall be properly sized for the pressure and flow of the unit. Pressurized hydraulic lines shall be 316ss tubing or high-pressure hose, and shall be supported on the structural frame of the press. Flexible lines to cylinders, low-pressure connections to the reservoir, etc. shall be hose of the material and construction appropriate to the application. The hydraulic reservoir shall be made of high-density polyethylene (HDPE) and shall be translucent to allow visual inspection of the oil level.
- C. The pump motor shall be a 1 hp and shall not exceed a noise level of 70 DbA. The motor shall be a cast iron TEFC 1,200 rpm, NEMA B design with a "C" face mounting for the hydraulic pump adapter.
- D. Maximum system pressure shall be set equal to the highest pressure required to obtain the desired operating belt tension. The maximum system operating pressure is 1,000 psi.
- E. Hydraulic system controls shall be grouped for easy access and ease of operation. There shall be means provided to retract the belt tension cylinders for service. The valves, fittings, manifold and associated parts shall be of non-corroding materials such as FRP, glass filled Nylon and stainless steel.
- F. The oil pressure gauge(s), one for each pair of belt tension cylinders (upper & lower belt) shall indicate oil pressure in PSI. Low-pressure switch (es) shall be provided to sense the absence of belt tension pressure.
- G. Hydraulic cylinders shall have a non-corrosive body and 316 stainless hardware and cylinder rod. The cylinder rod shall be solid stainless with a hardened polished seal contact surface. Chrome or nickel-plated rods are not acceptable.

2.13 BELT DRIVE

- A. Input power to the drive roller shaft shall be supplied through a variable speed drive unit. The drive roller speed reduction is obtained through a helical-bevel mounted gear reducer.

Drive Motor Data:

Quantity per Machine	1
Maximum Horsepower	1.5 hp
Power Requirements	460 v.a.c., 3 phase, 60 cycle.
Rated Speed	1740 r.p.m.
Nema Design	B
Insulation Class	F
Enclosure	TEFC
Service Factor	1.15
Lubrication	grease filled
Special Features	severe duty rating

- B. The variable input power shall be transmitted through a gear reducer mounted on the drive roller shaft. The drive roller shall be constructed as specified under "Rollers" and shall be surfaced with a Buna-N rubber coating to permit slip free transmission of driving torque to the belt.

2.14 DEWATERING BELTS

- A. Each belt filter press shall incorporate the use of two dewatering belts. Belts shall be fabricated of monofilament polyester and shall have 316 Stainless Steel seams. The mesh design shall be selected for optimum dewatering of the sludge to be processed and provide for maximum belt life when operated in accordance with the manufacturer's instructions.
- B. Belt selection shall be based on the manufacturer's experience obtained from testing the sludge during start up of the belt filter press (es) and at other installations dewatering similar sludges with similar polyelectrolyte conditioning chemicals.
- C. Each belt and connecting seam shall be designed for a minimum tensile strength equal to five times the normal maximum dynamic tension to which the belt shall be subjected. The seam shall be designed to fail before the belt.
- D. Belts shall be designed for ease of replacement with a minimum of belt filter down time. Belt replacement shall be such that disassembly of the equipment is not required.

2.15 DISCHARGE BLADES

- A. Discharge blades shall be provided to scrape dewatered sludge from the belt at the final discharge rollers. The blades shall be of ultra-high molecular weight polyethylene (UHMW) construction and shall be readily removable.

2.16 DRAINAGE PANS

- A. Drainage pans shall be provided as necessary to contain filtrate from all dewatering areas within the belt filter press without splashing and to prevent rewetting of downstream cake. All drainage piping shall be furnished, adequately sized for the intended service, and rigidly attached to the press frame. Drainage piping shall terminate inside the structural frame at the bottom of the press. Drain connection shall be self-venting to prevent overflow. Drainage pans shall be located so that the moving belts do not come into contact with the pans, nor does the filtrate come back into contact with the belt, under any condition.

2.17 SHAFTLESS SCREW CONVEYOR EQUIPMENT

- A. Furnish three (3) shaftless screw conveyors for the conveyance of dewatered wastewater sludge from a belt filter press or other.
- B. Screw conveyors shall be fabricated and assembled in full conformity with this specification and as shown in the contract drawings. Each conveyor shall be furnished complete with all supports; all mechanical equipment required for proper operation, including complete drive

Supports	AISI 304, ASTM A167, 18-8
Hoppers	AISI 304, ASTM A167, 18-8
Spiral Flighting	old formed, High Strength Micro Alloy Carbon Steel with a minimum hardness of 220 Brinell
Wear Liner	Ultrahigh molecular polyethelene (4.02.04A)
Bolts, Nuts, and Washers For Conveyor Supports	AISI 316, ASTM A167, 18-8
For Conveyor Trough,	AISI 304, ASTM A167, 18-8

E. General

1. Power supply: Power supply to the equipment will be 480volts, 60 Hz, 3 phase. Power supply for control shall be 120 volts, 60 Hz, single phase.
2. Electrical Equipment
 - a. All electrical equipment shall conform to applicable standard of the National Electrical Manufactures Association (NEMA) and the National Electrical Code (NEC). Both power and control equipment shall be insulated for not less than 600 volts even though operating voltages may be lower. Controls for conveyors supplied by others.
 - b. All motors shall be totally enclosed, fan cooled (TEFC). Control panels shall be NEMA 4X, stainless steel.
3. Fabrication: All welds shall be continuous unless otherwise specified. Facing surfaces of bolted joints shall be shop primed. Facing surfaces of field welded components shall be beveled and match marked.
4. Edge Grinding: Sharp corners of all cut and sheared edges shall be made smooth by a power grinder.
5. Fasteners: All bolts, nuts, washers, and other fasteners shall be AISI 316 stainless steel.
6. Surface Preparation: All iron and mild steel surfaces to be painted shall be dry abrasive grit blasted to "near white metal" in accordance with SSPC-SP6 or SSPC-SP10, and in accordance with the painting section of these specifications. Grit blasted surfaces shall be painted within 24 hours to prevent rusting and surface discoloration.
7. Painting: After surface preparation, metal surfaces except for the spiral flighting shall receive a minimum of one coat of Tnemec "66-1211 Epoxoline primer" or equal, and one coat of "46H-413 Hi-Build Tnemec-tar" coal tar epoxy or equal, to provide a total minimum dry film thickness of 15 mils prior to shipment to jobsite. Stainless steel components shall be furnished unpainted.

F. Shaftless Screw Conveyor Construction

1. Spiral Flighting

- a. Spiral flighting for the shaftless screw conveyors shall be designed to convey material without a center shaft. The minimum overall spiral weight and surface pressure shall be as specified herein. The conveyor will include an inner flight to increase axial strength and capacity of the conveyor. The minimum spiral weight shall be specified herein.
- b. Spiral flights shall be cold-formed high strength micro alloy steel with a minimum hardness of 220 Brinell. The spiral flights shall be designed with the stability to prevent distortion and jumping in the trough. The torsional rating of the auger flighting shall be reached at 30% of the Fy value in the extreme fiber of the flight material. Supplier shall demonstrate that, at 250% of the motor nameplate horsepower, the drive unit cannot produce more torque than the torsional rating of the flighting, and that the "spring effect" of the spiral shall not exceed + 0.8 mm per meter of length at maximum load conditions.
- c. Spiral flight material, fabrication technique, strength, hardness, and overall quality are critical to the proper operation of the conveying system as herein designed. Spiral flights that do not meet the characteristics or herein specified are specifically not acceptable. Supplier shall provide certified written documentation that the spiral flights conform to the following:

Material: Micro Alloy Steel
Hardness: 220 Brinell Minimum
Concentricity: 2.0 mm +/-

- d. Supplier shall maintain a certified factory quality control program which shall include certification of spiral flighting as described herein
- e. The spiral flighting shall be formed in sections from one continuous flat bar and shall be concentric to within 2mm +/- . Sectional flighting formed from plate shall not be permitted.
- f. Spiral flighting shall have full penetration welds at all splice connections. The flights shall be aligned to assure true alignment when assembled in the field and shall be made in accordance with the supplier's requirements. The spiral flights shall be coupled to the end shaft by a flanged, bolted connection.
- g. The connection of the spiral to the drive system shall be through a flanged connection plate that is welded to the spiral forming a smooth and continuous transformation from the flange plate to the spiral. The drive shaft shall have a mating flange and shall be bolted to the spiral connection plate.

2. Horizontal and Inclined Troughs

- a. Troughs shall be similar to the dimensional standards of CEMA 300 and enclosure classification IIE. Each conveyor trough shall be U-shaped, fabricated from a minimum 1/8 inch stainless steel plate.

- b. Stiffeners shall be placed across the top of the trough and fastened to both sides of the trough to maintain trough shape and act as a face seal for the covers; apply a continuous gasket, one half inch width, to the entire top face of the trough top flange and stiffeners.
 - c. Each trough shall be equipped with filling and/or discharge openings as required by the contract drawings. If required, each filling and discharge opening shall be flanged suitable for interconnection to other devices. Any interconnecting devices such as chutes and hoppers shall be fabricated from the same material as the troughs.
 - d. A flanged covered drain outlet shall be provided with each conveyor to facilitate cleaning.
 - e. The portion of each trough that is not covered by the filling chute shall be covered by a bolted cover of a material identical to the trough. The covers shall be manufactured in maximum four foot length section to allow for access to the conveyors. To prevent unsafe access to the conveyors, quick opening covers will not be allowed.
3. Wear Liner (Anti-Wear UHMW)
- a. The wear liner for each conveyor shall be fabricated of ultra high molecular weight polyethylene sintered with an anti-wear filler to reduce wear and synthetic lubricant to reduce friction. The wear liner shall be furnished in maximum four foot sections, 3/8" minimum thickness, to provide ease of replacement. The liner shall be held in place with clips; no fasteners will be allowed.
4. Inlet and Discharge Chutes
- a. Inlet and discharge chutes shall be provided by the conveyor supplier as shown on the drawings. All chutes shall be fabricated from the same material as the conveyor trough.
5. Conveyor Supports
- a. Each conveyor shall be furnished complete with supports suitable for mounting as shown on the contract drawings and as required by the supplier's design. The supports shall be shop fabricated from structural steel shapes and plates, and shall be assembled and fitted to the conveyor prior to its delivery to the jobsite. Supports and conveyor segments shall be match marked and shipped to the jobsite for assembly by the contractor. At a minimum, each conveyor shall be provided with supports at the inlet and discharge end, with intermediate supports as required. Supports shall be fabricated of AISI 304 stainless steel or equal.
 - b. All shop welding shall conform to the latest standards of the American Welding Society (AWS). The supports shall be designed to avoid interference with other equipment or equipment supports.
6. Structural Design

- a. All structural supporting members shall be designed such that the ratio of the unbraced length to least radius of gyration (slenderness ratio) shall not exceed 120 for any compression member and shall not exceed 240 for any tension member (of angles about Z-Z axis). In addition, all structural members and connections shall be designed so that the unit stresses will not exceed the American Institute of Steel Construction allowable stresses by more than 1/3 when subject to loading of twice the maximum design operating torque of the spiral conveyor drive motors.

7. Drive Units

- a. Each spiral conveyor shall be driven by a constant-speed integral gear reducer/motor drive unit mounted to an adapter flange mounted to the end plate of the conveyor. The adapter flange shall allow the leakage of any material from the conveyor trough to atmosphere rather than into the gear reducer/ motor drive unit. Direct coupling of the gear reducer/motor drive unit to the end flange of the conveyor will not be acceptable.
- b. The drive unit shall be rigidly supported so there is no visible "wobble" movement under any operating condition. In the event of a prolonged power failure or emergency system shutdown the drive system shall be designed, at a minimum, to start the conveyor from a dead stop with the trough filled throughout its entire cross sectional area and length with partially dried and hardened dewatered material.
- c. Each motor shall be 460 volt, 60 Hz, 3 phase conforming to the General Equipment specifications, except as modified herein. Each motor shall be high efficiency, 40C ambient rated, 1.15 service factor and shall have Class F insulation. Motor shall have a TEFC enclosure with Design B speed/torque characteristics.

8. Gear Reducers

- a. All gears shall be AGMA Class II, single or double reduction, helical gear units with high capacity roller bearings. Bearings shall be designed for the thrust loads from the fully loaded startup condition and shall have a AFBMA B10 life of 30,000 hours. The reducer will be the standard air cooled unit with no auxiliary cooling. The gear reducer shall be sized with a torque service factor of 1.5 times the absorbed power or 1.1 times the motor nameplate, at the driven shaft speed, whichever is greater.
- b. An adjustable greased gland packing ring consisting of two Teflon coated packing rings shall seal the drive shaft at its penetration through the end plate.

9. Zero Speed Switch

- a. Each conveyor drive unit shall be equipped with a motion failure alarm unit. The location and mounting details shall be as recommended by the conveyor manufacturer. Motion sensors shall be the non contacting type using a probe with a pre-amplifier and main electronic assembly. The main electronic unit shall operate on 120 volt, single phase, 60 Hz power supply, and shall be housed in a NEMA 4X enclosure. A 0 to 60 second time delay shall be provided for startup of the conveyor.

10. Emergency Shutdown

- a. Each conveyor shall be furnished with an emergency trip cord and safety switch. The cord shall run the full length of each conveyor. The trip switch shall immediately stop all conveyors when the switch is actuated.

11. Quality Assurance

- a. Conveyors shall be inspected and operated in the shop with the actual drive unit for this project in its entire length. Conveyor longer than the required shipping lengths will have the screws tack welded together and tested in their entire length. Conveyors should be operated for a minimum of 15 minutes and observed for alignment and abnormal operation. Conveyors shall be corrected as necessary. Prior to shipment the tack welds will be broken apart and conveyors suitably prepared for shipment. A video of the test should be supplied on disk to the contractor to be forwarded on to the engineer for record purposes. Video must be received to get paid.

2.18 POLYMER DOSING SYSTEM FOR LIQUID POLYMER

- A. System shall be designed for the preparation, dosing of up to 3 GPH of polymer solution having an active polymer concentration between 0.05 and 0.25 %. The actual size of the polymer system depends on the specified type of sludge, maximum capacity and polymer consumption. The polymer system shall be a Veloblend VM-P.
- B. The polymer station shall be self-contained with pumps, piping, fittings, and accessories, and shall be factory assembled and tested to eliminate field assembly work and therefore to minimize installation and start up time. The frame shall be 304 stainless steel and the piping SCH.80 PVC.
- C. A polymer mixing chamber shall be provided. A high energy, multi zoned, hydro-mechanical mixing device shall be provided. The mixing chamber shall have a translucent front cover.
- D. The hydro mechanical impeller shall be designed to produce variable intensity, back flow mixing action to optimize polymer performance without damaging polymer molecular structure.
- E. The motors shall be 0.5hp, 1750rpm, 90 V, 60Hz, wash down duty with keyless shaft and left hand impeller mounting screw.
- F. Materials: Impeller - stainless steel; body of mixing device – stainless steel; cover – clear lexan; fastener – 316 SS; seals – viton; pressure rating – maximum 100 PSI.
- G. Contractor shall provide a drinking water connection for the dilution of the polymer in the polymer tank. The water piping to the polymer blend system shall include a minimum 1 in inlet (NPT female), an UL listed solenoid valve (rated IP65), and a flow meter with a rate adjusting valve and low pressure alarm switch. The dilution water flow range is 1 to 10 GPM.
- H. A neat polymer metering pump with hose connector shall be provided and connected through a 1/2 in barbed hose to the polymer mixing device. The neat polymer pump shall be a Seepex progressive cavity type pump.
- I. Control Panel: NEMA 4X FRP enclosure, 120 VAC, 60 Hz, 1 PH service.

1. Operator interface – discrete selector switch (system ON/OFF/REMOTE); mechanical mixer speed adjust potentiometer; ten-turn potentiometer – progressive cavity metering pump control
 2. Status / Alarm indicators: system running indication; LCD display of metering pump rate; low pressure switch alarm; low polymer flow alarm
 3. Inputs: remote start / stop (discrete dry contact); pacing signal from main control panel (4-20mA)
 4. Outputs: system running (discrete dry contact); remote mode (discrete dry contact); low pressure alarm (discrete dry contact)
- J. The pressure side of the polymer system shall be connected through a minimum 1 in diameter PVC pipeline and a magnetic inductive flow meter to the polymer injection ring described above.

2.19 LIME FEED SYSTEM

- A. Refer to Section 463643.

2.20 CONTROL SYSTEM

- A. Each belt filter press shall be provided with a manual control panel that will contain the necessary control devices and equipment for controlling the dewatering process as described herein.
- B. General Considerations
1. The control panel shall accept a 460 VAC, 60 hertz, 3-phase power input. A main disconnect circuit breaker and operator mechanism shall be included. When the disconnect is in the open position, all power shall be removed from the control system. An IEC rated motor starter shall be provided for the hydraulic unit, the sludge pump, the wash water booster pump, two (2) 2 HP sludge conveyor drives, one (1) 1.0 HP sludge conveyor drive and a remotely mounted VFD included for the belt drive. Short circuit protection for the hydraulic pump motor shall be accomplished utilizing thermal magnetic circuit breakers, while the VFD will use an in line fuse to protect the belt drive motor. Individual thermal overload protection shall be provided. A control power transformer shall be included that will provide 120 VAC control power to the system.
 2. Located on the front of the control panel shall be a CONTROL POWER ON/OFF switch. When in the ON position, the CONTROL POWER ON pilot light will be illuminated and control power shall be distributed to the control system. When in the OFF position, the control system shall be held de energized. Also located on the control panel shall be an EMERGENCY STOP pushbutton. It shall be a mushroom head style push/pull operator that when depressed shall immediately de energize all moving equipment in the system.
- C. System Operation
1. As a minimum, the following control pilot devices shall be located on the front of the control panel:

CONTROL POWER on/off
PRESS READY indicator
WASHWATER PUMP START pushbutton
WASHWATER PUMP STOP pushbutton
WASHWATER PUMP RUNNING indicator
HYDRAULIC PUMP START pushbutton
HYDRAULIC PUMP STOP pushbutton
HYDRAULIC PUMP RUNNING indicator
BELT DRIVE REMOTE VFD keypad with controls
SLUDGE PUMP START pushbutton
SLUDGE PUMP STOP pushbutton
SLUDGE PUMP RUNNING indicator
POLYMER SYSTEM START pushbutton
POLYMER SYSTEM STOP pushbutton
POLYMER SYSTEM RUNNING indicator
CONVEYOR START pushbuttons
CONVEYOR STOP pushbuttons
CONVEYOR RUNNING indicators
LIME FEED SYSTEM START pushbutton
LIME FEED SYSTEM STOP pushbutton
LIME FEED SYSTEM RUNNING indicator
EMERGENCY STOP push/pull operator

D. Sequence of Operation (Manual Mode)

1. To operate the press, the operator will start the washwater pump by pressing the WASHWATER PUMP START pushbutton, then start the hydraulic pump by pressing the HYDRAULIC PUMP START pushbutton.
2. The operator must not proceed until the belts are fully tensioned. No interlock is provided to prevent the operator from starting the belt drive before the belts are tight. Pressing the BELT DRIVE START button on the remote keypad will energize the belt drive.
3. The conveyor should be started by pressing the CONVEYOR START pushbutton and then the sludge pump, polymer system and lime feed system started by pushing their respective pushbuttons.
4. Pressing the respective STOP pushbuttons in the reverse order stated above will stop the system.

E. Enclosure

1. Control panel enclosures shall be fabricated of fiberglass, and shall be suitable for NEMA 4X service.

F. Wiring

1. All power and control wiring shall be 600 volt, type THHN/THWN insulation stranded copper and shall be sized for the required load, 12 AWG for power, 14 AWG for control, and 18AWG for instrumentation.

G. Circuit Breakers

1. Circuit breakers for the main disconnect shall be thermal magnetic molded case units. Circuit breakers shall be Square D, Class 650, Type FAL, or equal.

H. Motor Starters

1. Motor starters shall be full voltage, non-reversing, IEC GV2 style across the line units. Coils shall be 120 VAC.

I. Variable Frequency Drives

1. The VFD shall be UL listed and shall be a Yaskawa V1000 wash down duty NEMA 4X.

J. Selector Switches

1. All selector switches shall be heavy duty, oil tight/watertight, and corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Selector switches shall be Square D, Type SK or equal.

K. Pushbuttons

1. All pushbuttons shall be heavy duty, oil tight/watertight, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10-ampere continuous service. Pushbuttons shall be Square D, Type SK or equal.

L. Pilot Lights

1. Pilot lights shall be heavy duty, oil tight/watertight, corrosion resistant units rated for NEMA 4X service. Units shall be 120 VAC transformer type press to test. Pilot lights shall be Type ZB or equal.

M. Terminal Blocks

1. Terminal blocks shall be high density, solderless box lug style, with 600-volt rating. Terminal blocks shall be Wago spring cage clamp type or equal.

2.21 SPARE PARTS

A. The following spare parts shall be furnished with the Belt Filter Press

1. One (1) set of filter belts.
2. Two (2) sets of doctor blades.
3. One (1) set of rubber seals for the gravity zone, wedge zone and washbox.
4. One (1) set of bearings of each sized used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 017000: "Execution and Closeout Requirements: Requirements for Installation Examination."
- B. Verify that field dimensions are as indicated on Drawings.

3.2 PREPARATION

- A. Section 017000: "Execution and Closeout Requirements: Requirements for Installation Preparation."

3.3 INSTALLATION

- A. The installation of the equipment furnished by the manufacturer shall be installed by certified technicians from the equipment manufacturer with assistance from the Contractor.

3.4 START-UP AND OPERATOR TRAINING

- A. Services of the manufacturer's factory trained representative, who is specifically knowledgeable in the type of equipment specified herein, shall be provided during the equipment installation period. Upon complete installation of equipment by installing contractor, including placement of equipment, setting and leveling the equipment, piping and electrical connections to all the equipment specified herein, the manufacturer's service representative will approve the installation and begin start up and training.
- B. Upon approval of the installation, the services of the manufacturer's factory trained representative shall be provided at the project site for equipment start up and calibration. During the startup and calibration phase the manufacturer's representative shall inspect all system components for proper connection and alignment and assist the installation contractor in placing the equipment in a proper operating condition.
- C. Upon satisfactory completion of the startup and calibration, a representative of the manufacturer shall be provided to instruct Owner's personnel in the proper operation and maintenance of the equipment. The manufacturer's representative who will be providing the instruction shall have prior operation, maintenance and instructing experience acceptable to the Engineer.
- D. The manufacturer's representative shall complete all of the above sessions in one trip to the jobsite. The equipment manufacturer will request in writing that all installation prior to arriving at the jobsite be completed by the contractor. If the equipment manufacturer arrives at the jobsite and equipment installation is not complete, the equipment manufacturer shall bill the contractor for the installation time, which is not covered under this contract.

Period

Number of 8-hour days

Inspection / Start Up and Calibration	2
Operator Training	1

3.5 FIELD QUALITY CONTROL

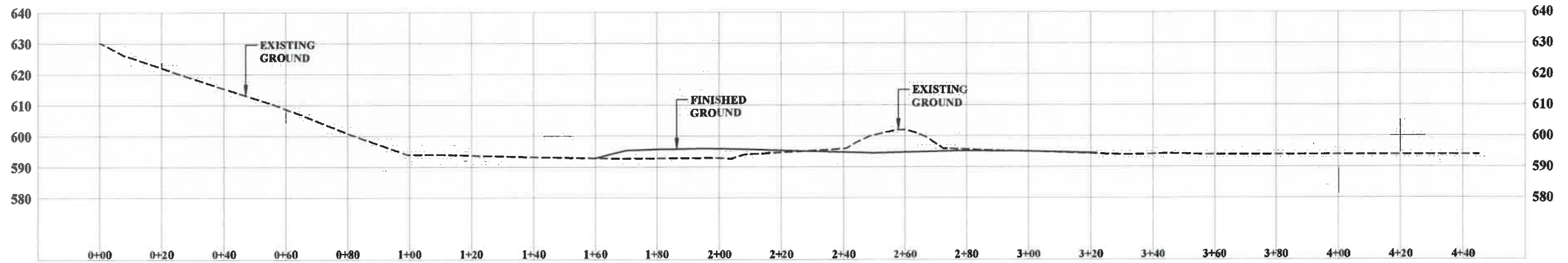
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B. Inspection:

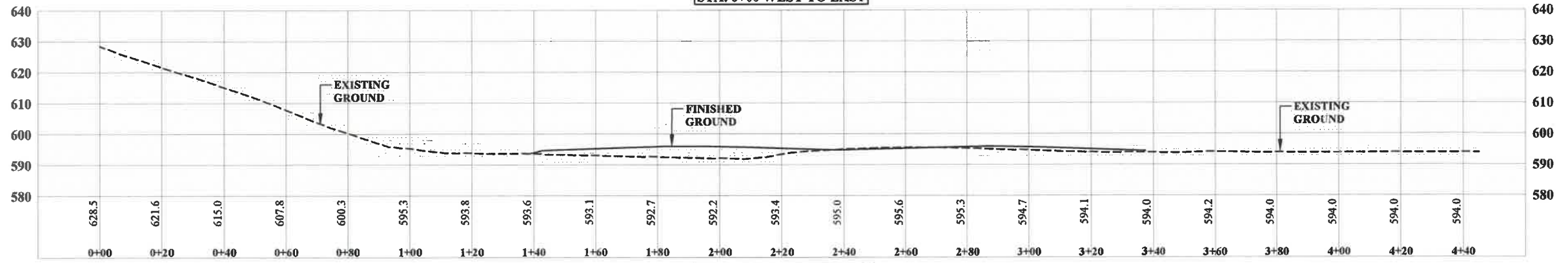
1. Inspect for equipment for damage and for other defects that may be detrimental as determined by Engineer.
2. Repair or replace damaged equipment.
3. After installation, inspect for proper installation.

END OF SECTION 461802

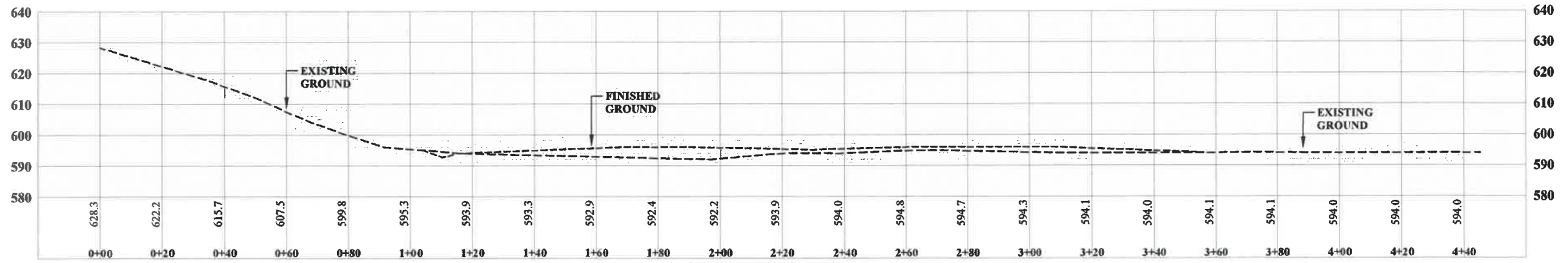
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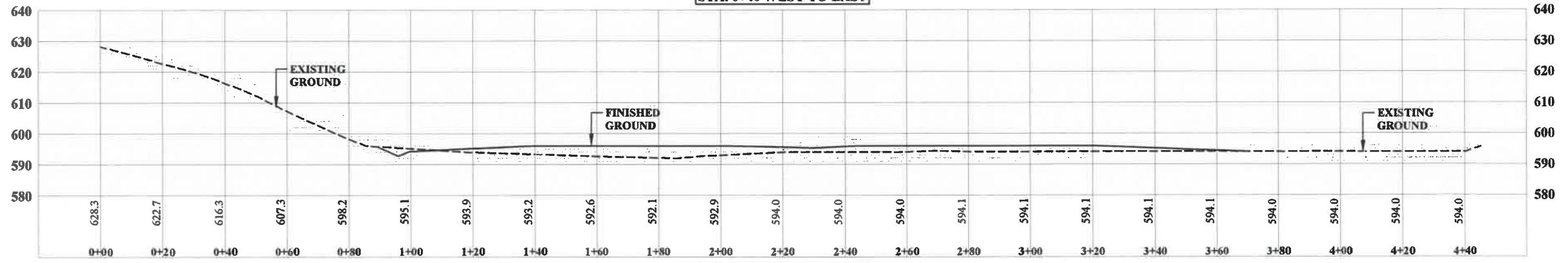
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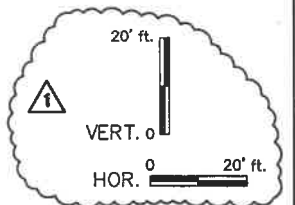
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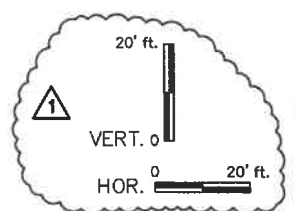
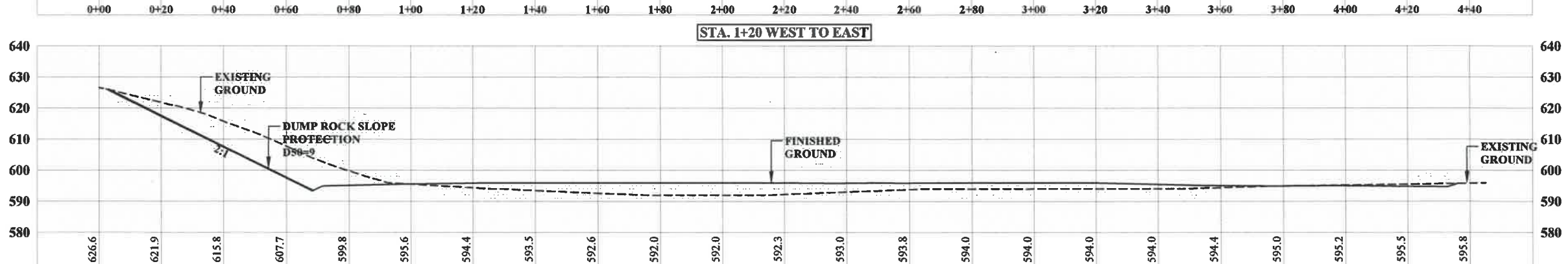
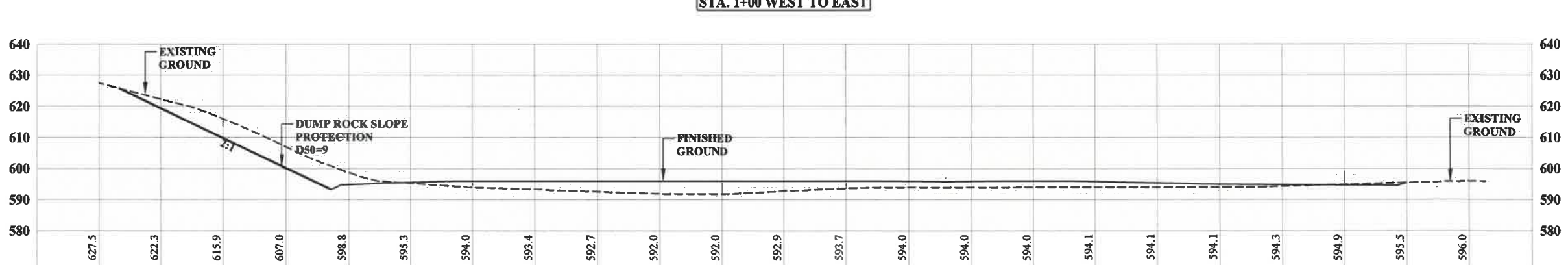
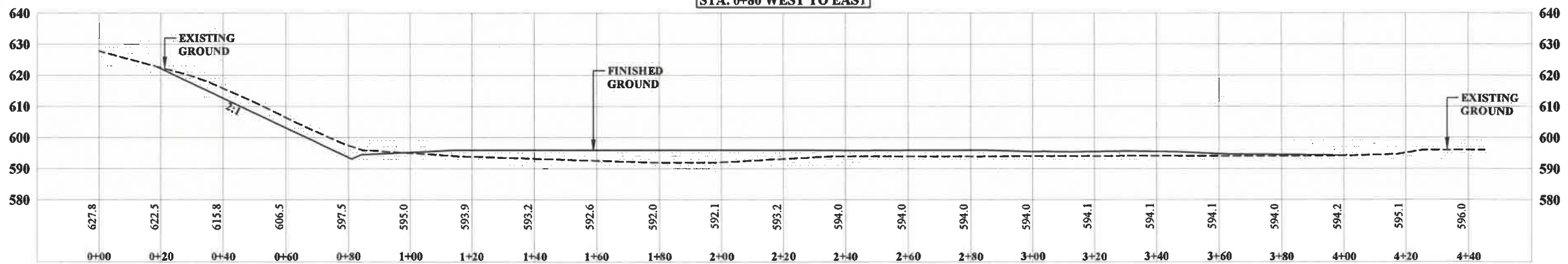
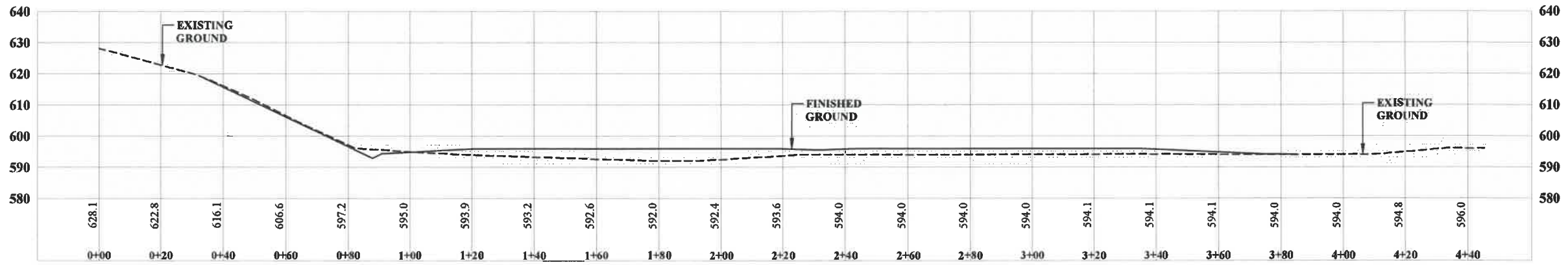
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 PROJECT No.
 101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED WEST SIDE SITE
 CROSS SECTIONS 0+00 TO 0+60

SHEET No.
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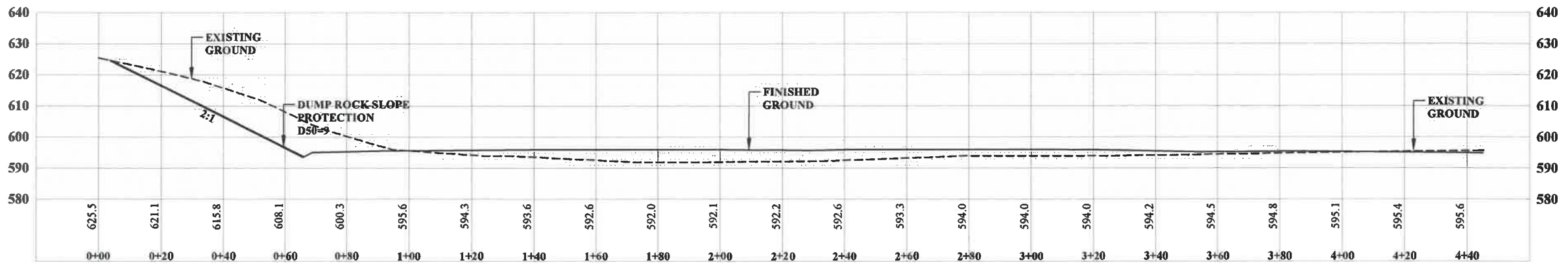
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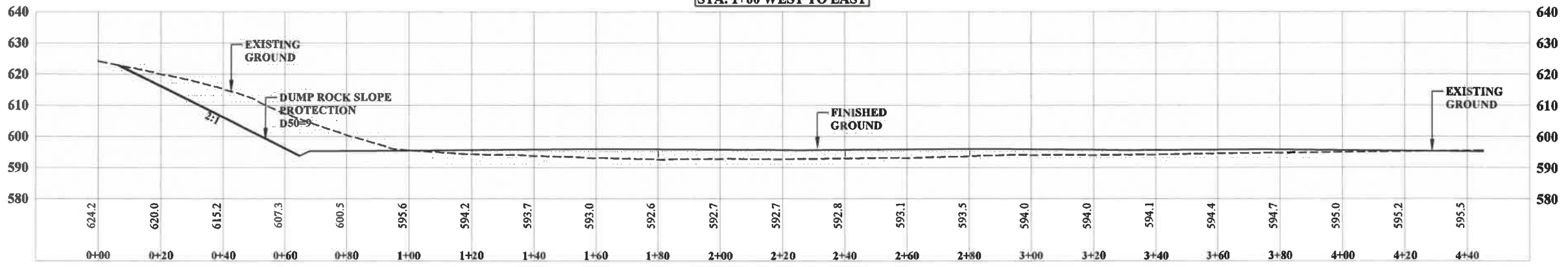
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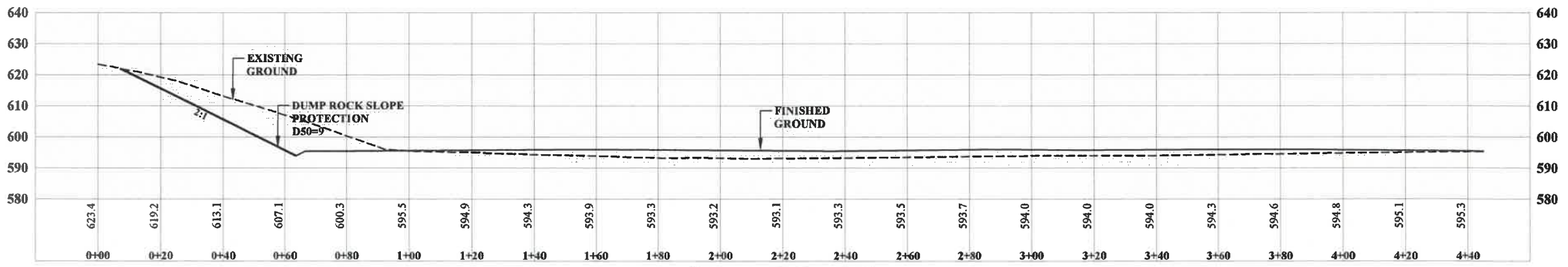
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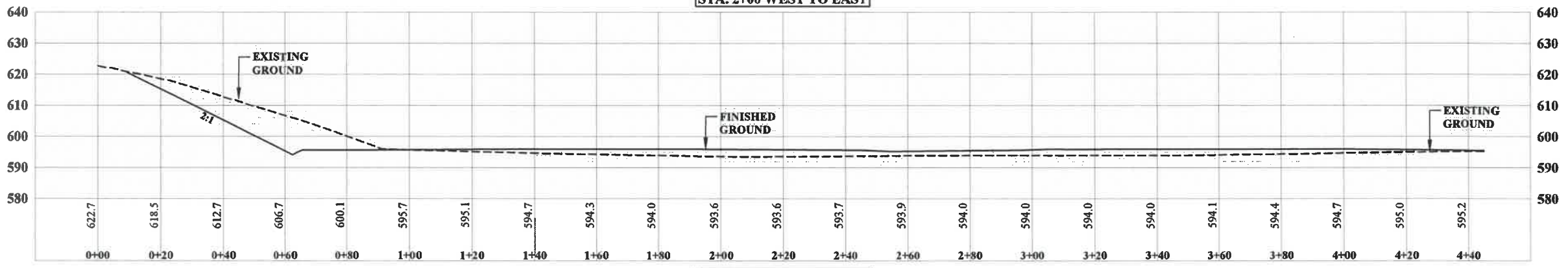
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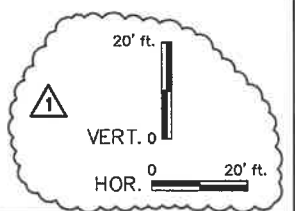
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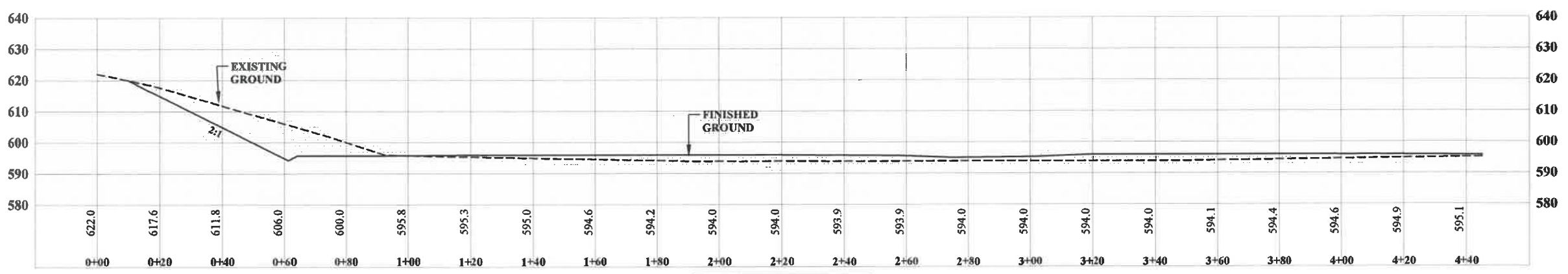
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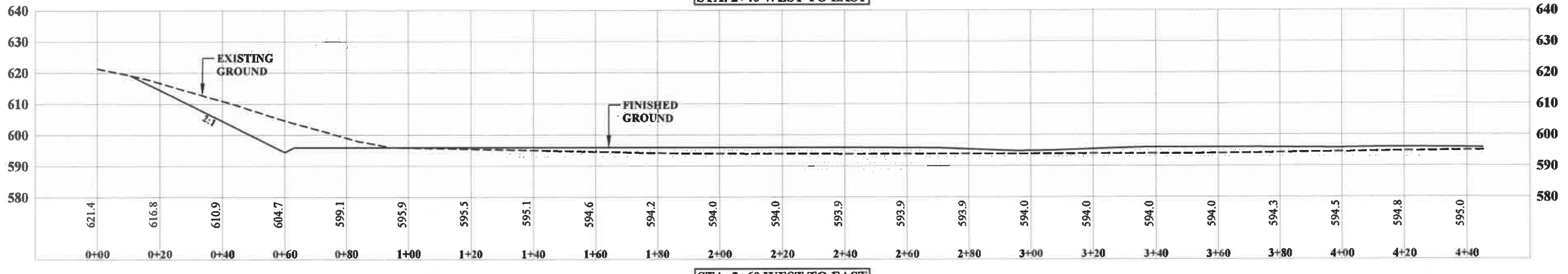
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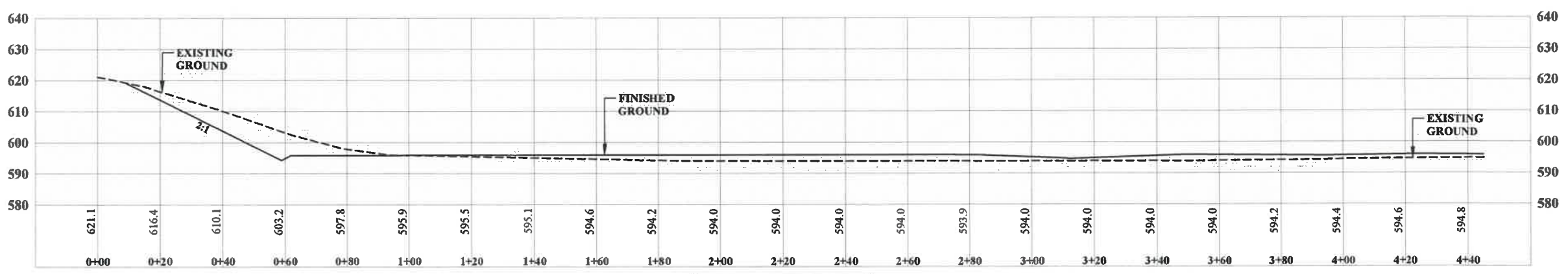
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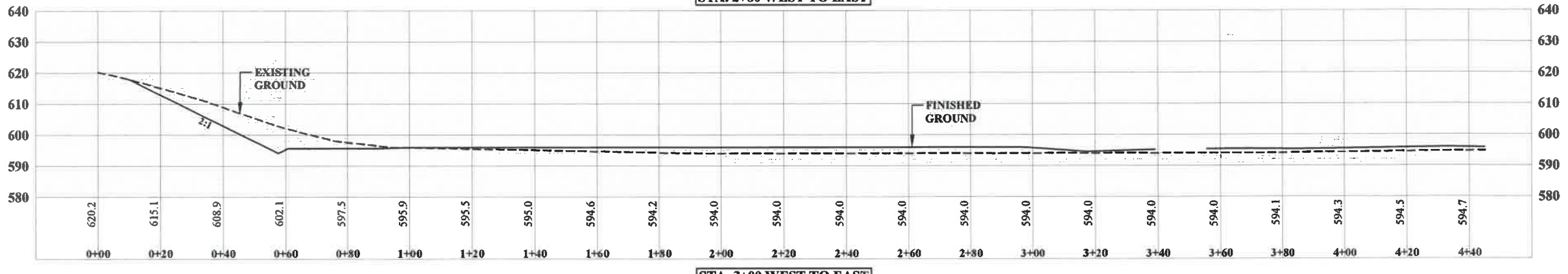
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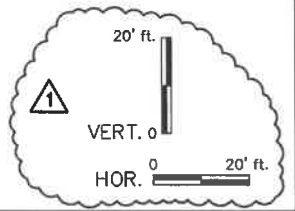
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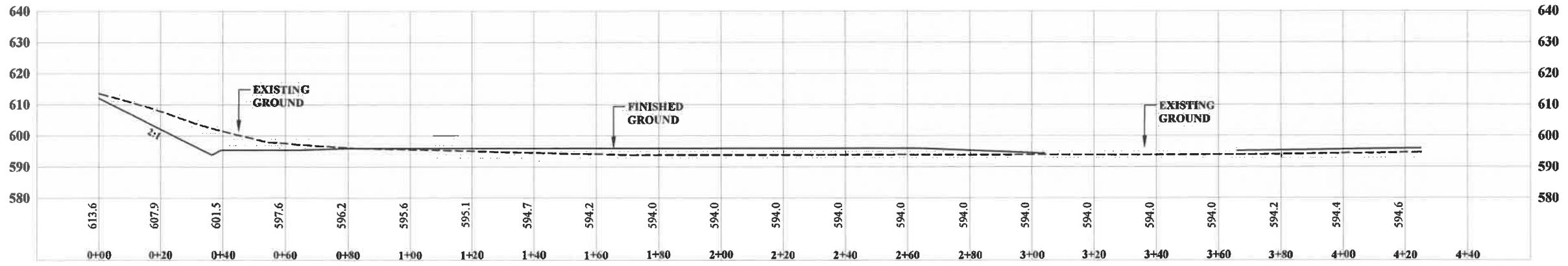
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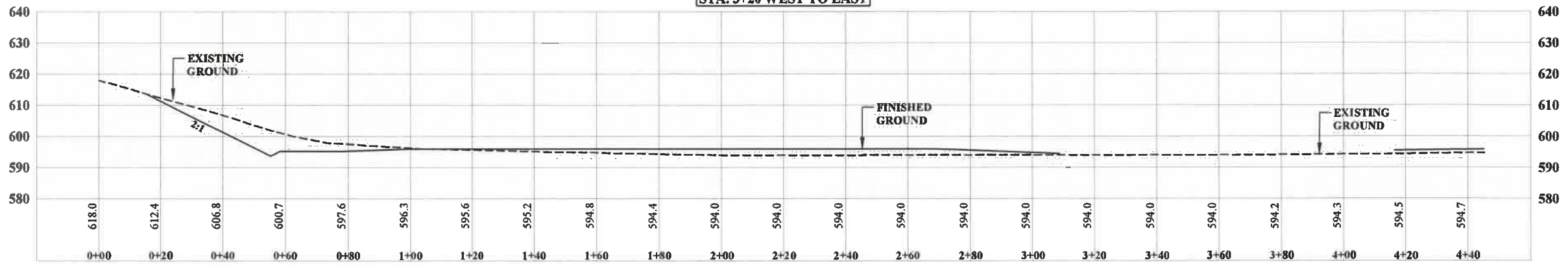
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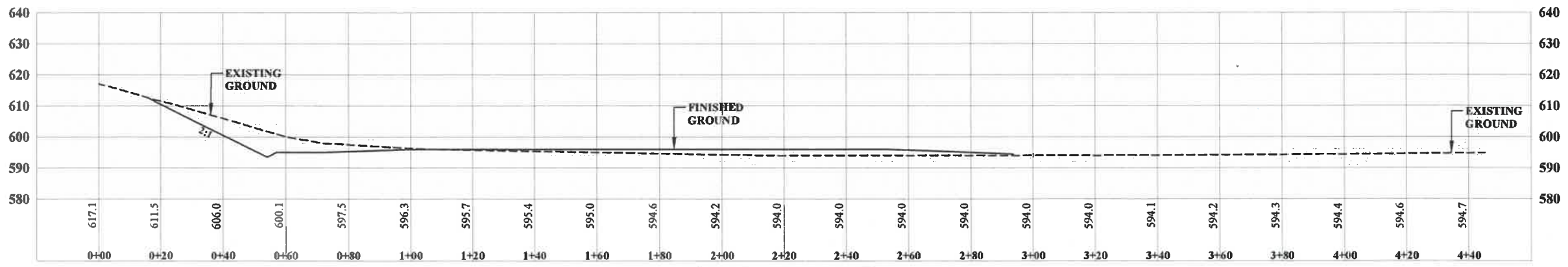
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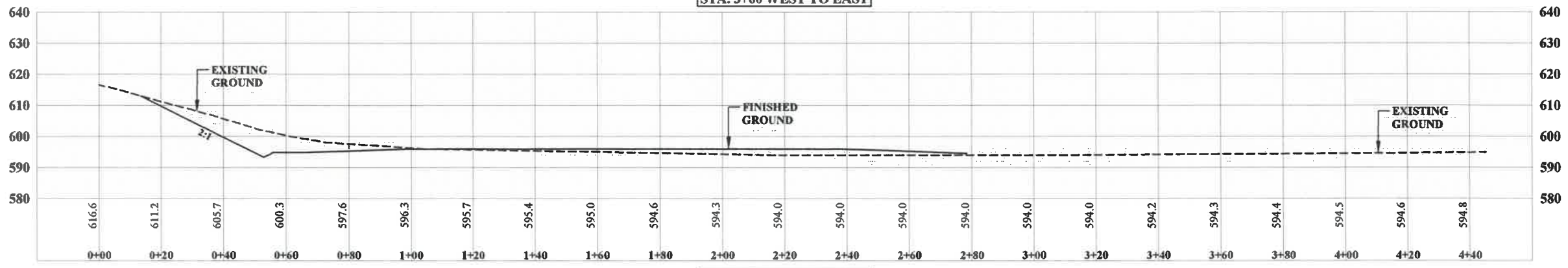
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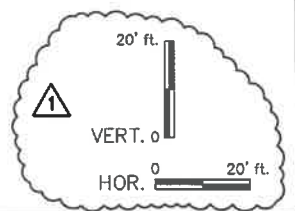
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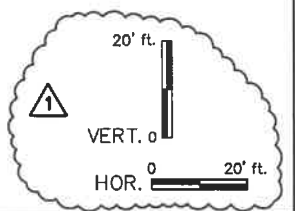
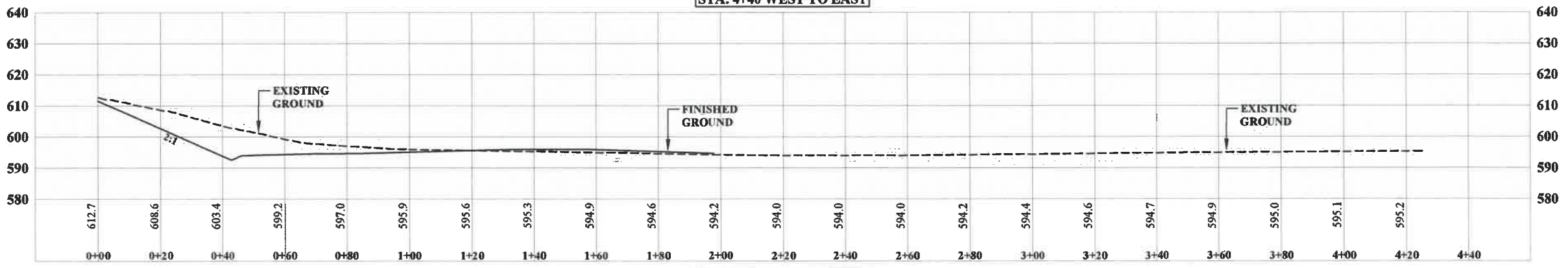
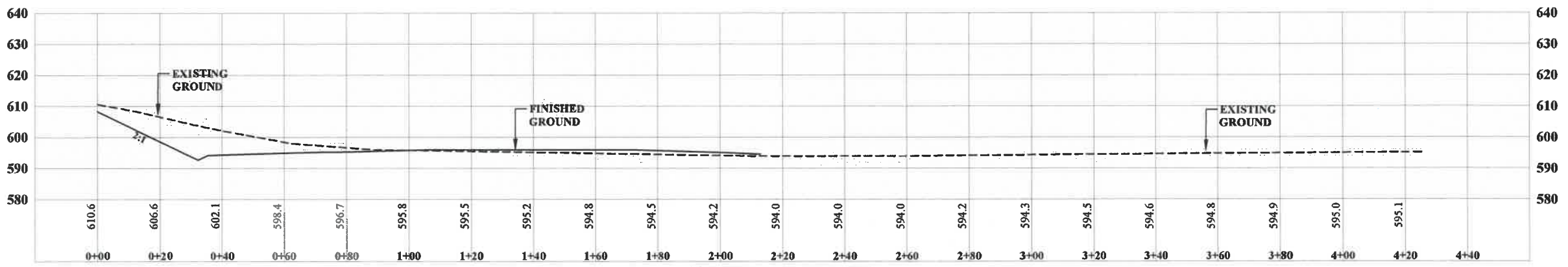
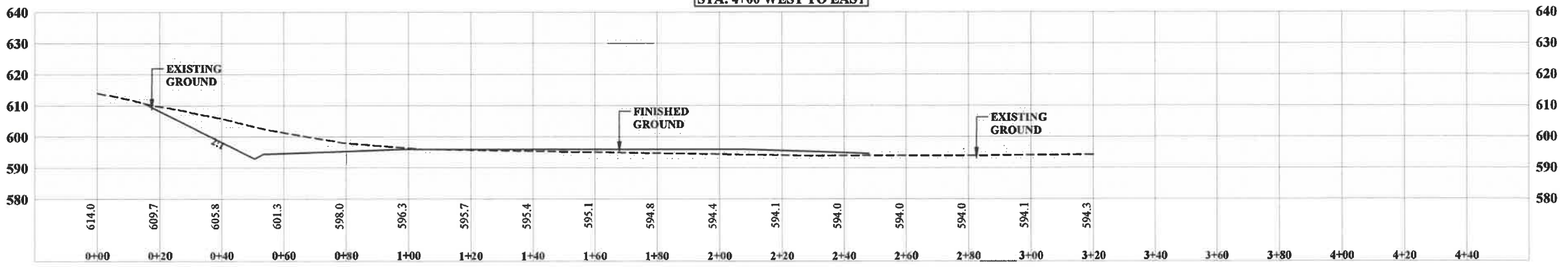
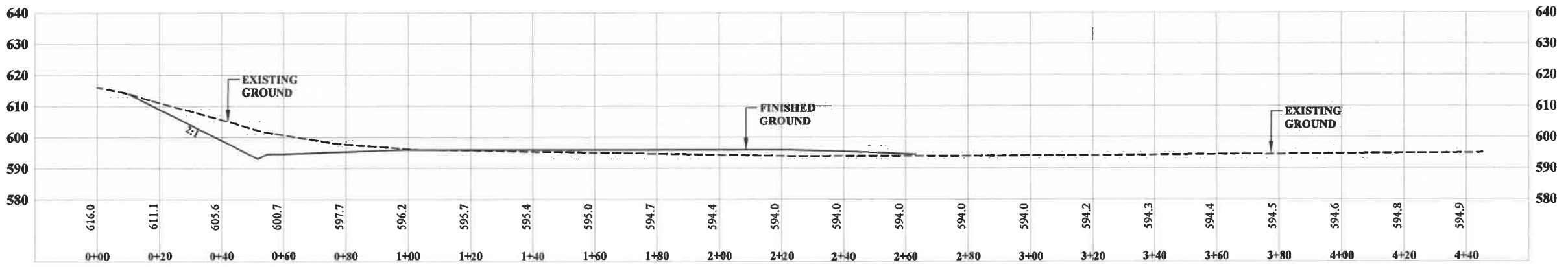
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PHASE No.
 CONTRACT No. 3
 PROJECT No. 101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED WEST SIDE SITE
 CROSS SECTIONS 3+20 TO 3+80

SHEET No. 12

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 USER: philip lantz



NO.	BY	DATE	DESCRIPTION
1	PL	3/8/22	ADDENDUM No.1



SCALE: 1"=20'
 DRAWN: P.LANTZ DATE: 9/2021
 CHECKED: R. HUDKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
 FIELD BOOK No.:

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PHASE No.
 CONTRACT No. **3**
 PROJECT No.
101-020-1535

CITY OF RIPLEY
**PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED WEST SIDE SITE
 CROSS SECTIONS 4+00 TO 4+60**

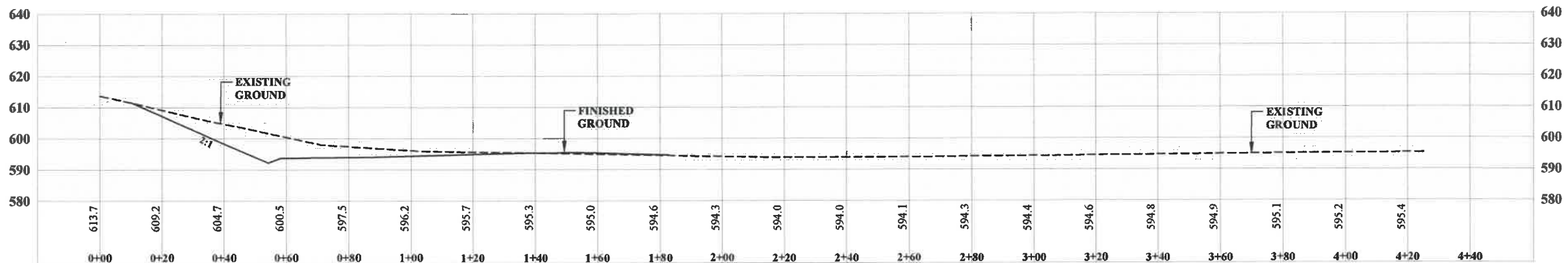
SHEET No.
13

USER: philip lantz

LAYOUT: Sheet-14

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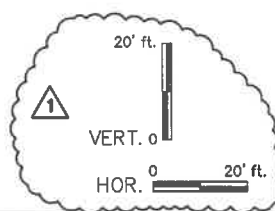
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STA. 4+80 WEST TO EAST



STA. 5+00 WEST TO EAST



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1	PL	3/9/22	ADDENDUM No.1



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 DRAWN: P.LANTZ DATE: 9/2021
 CHECKED: R. HUCKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
 FIELD BOOK No.:



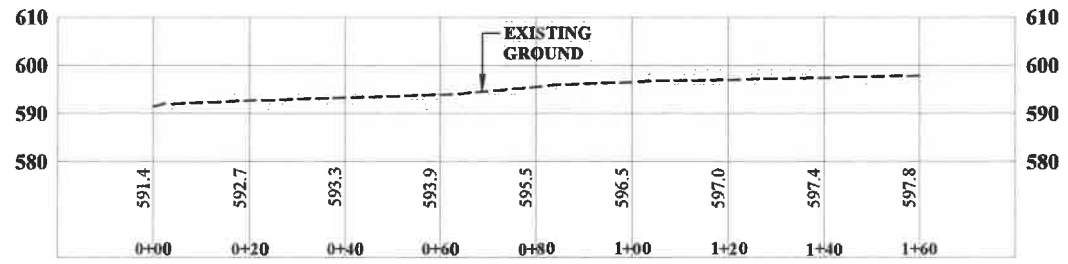
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 CONTRACT No. 3
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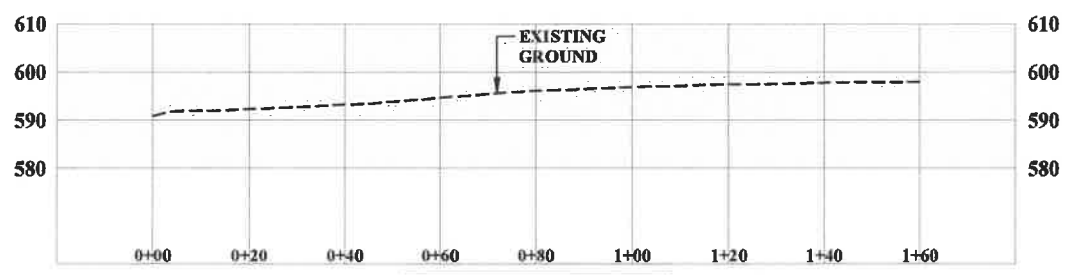
CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY WASTEWATER TREATMENT PLANT
 PROPOSED WEST SIDE SITE
 CROSS SECTIONS 4+80 TO 5+00

SHEET No. 14

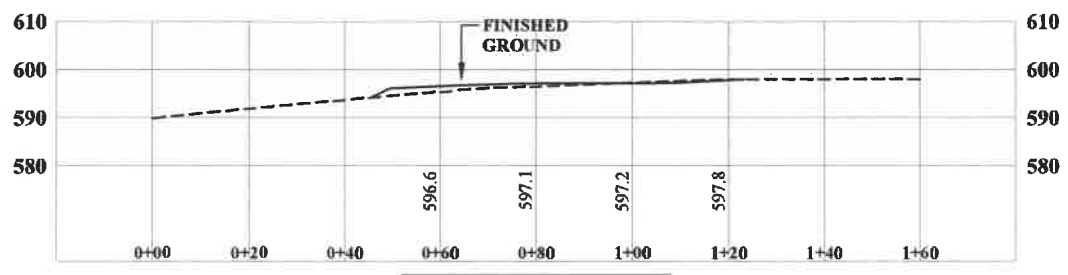
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 USER: philip.lantz



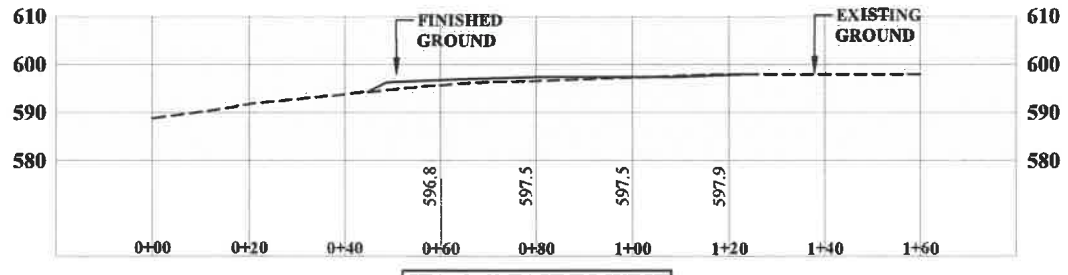
STA. 6+00 EAST TO WEST



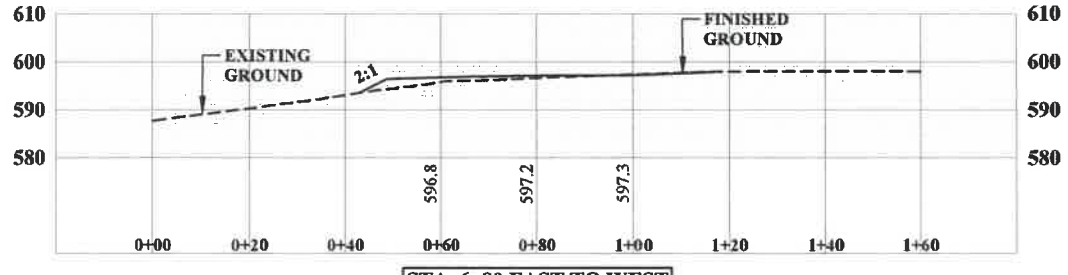
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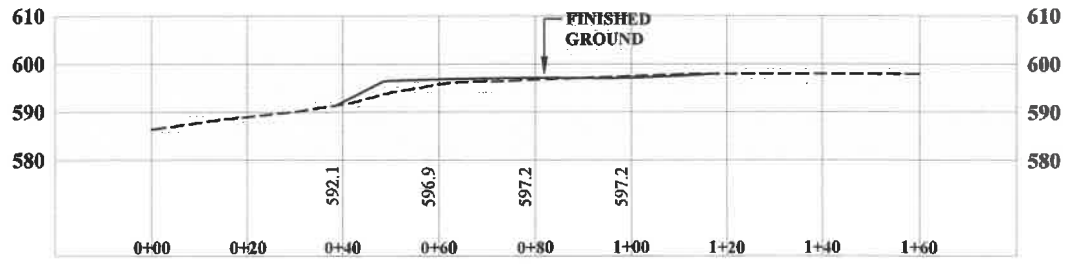
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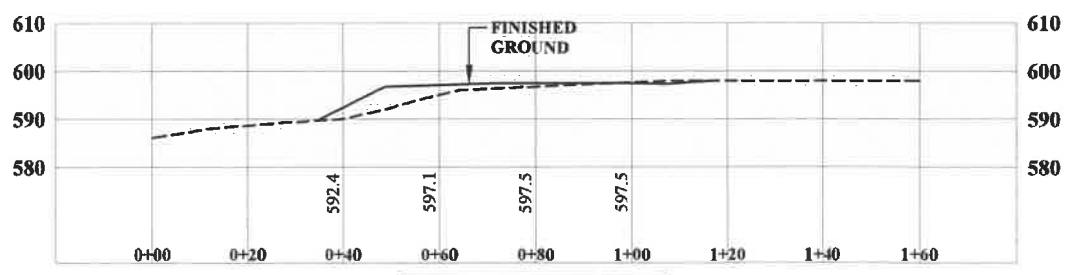
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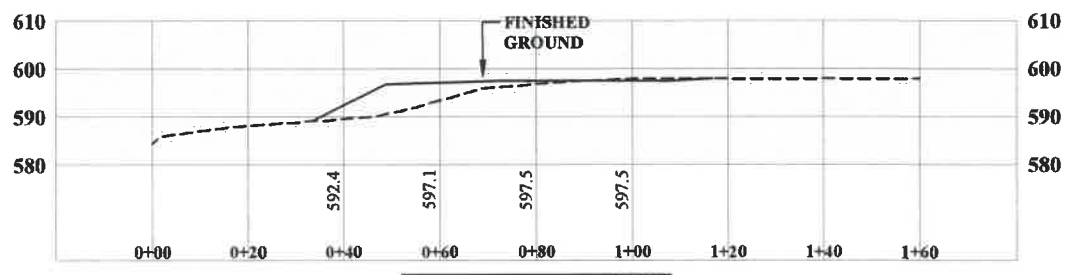
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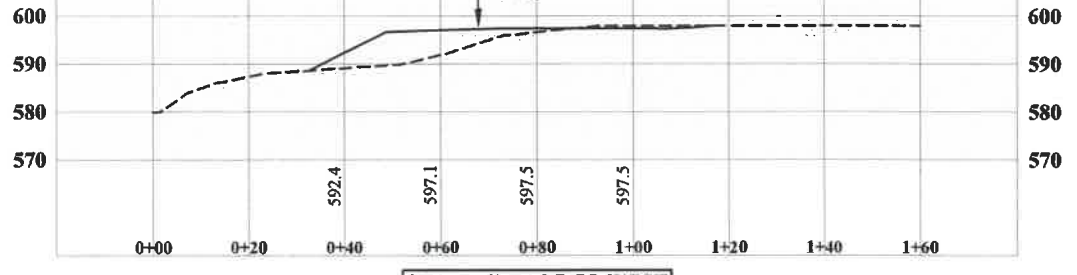
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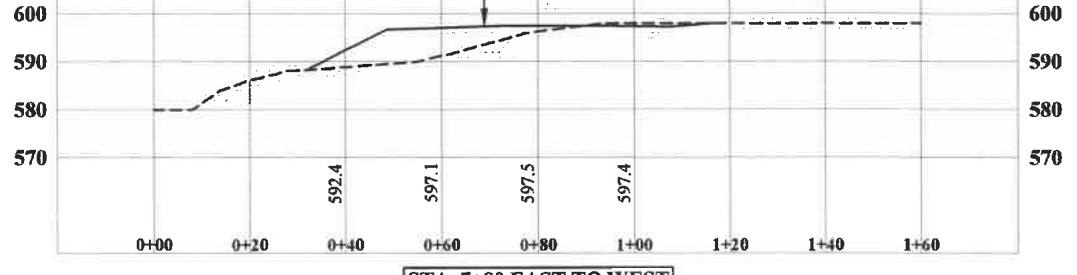
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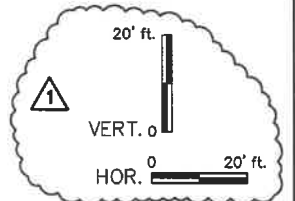
STA. 7+40 EAST TO WEST



STA. 7+60 EAST TO WEST



STA. 7+80 EAST TO WEST



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 SURVEY DATE:
 SURVEY BY:
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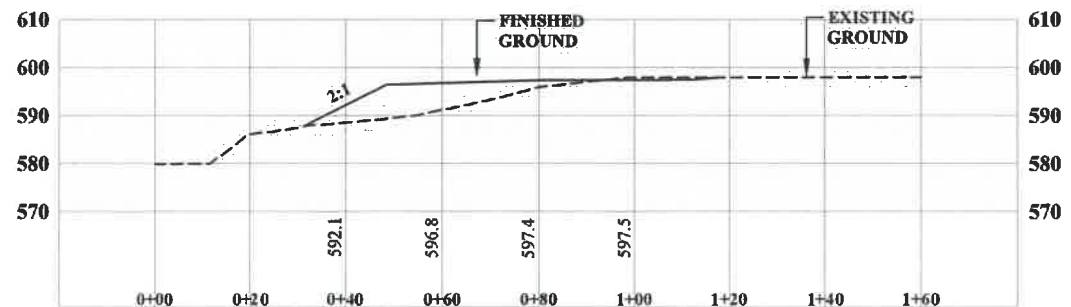
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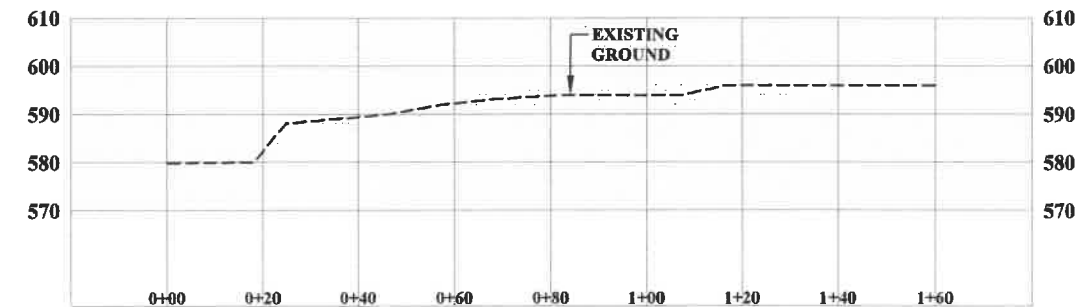
CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED EAST SIDE SITE
 CROSS SECTIONS 6+00 TO 7+80

SHEET No.
16

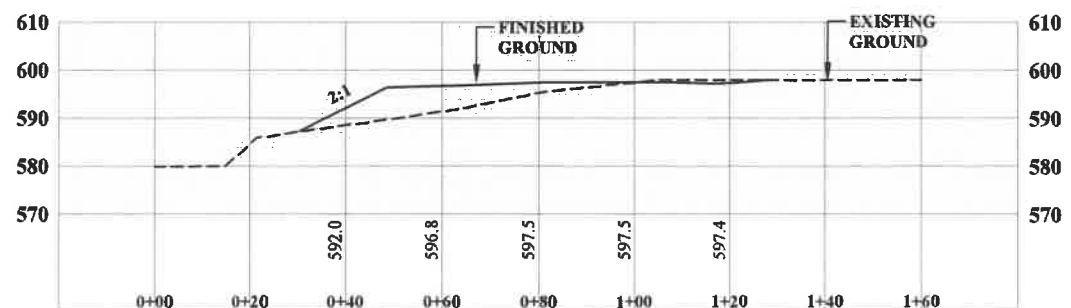
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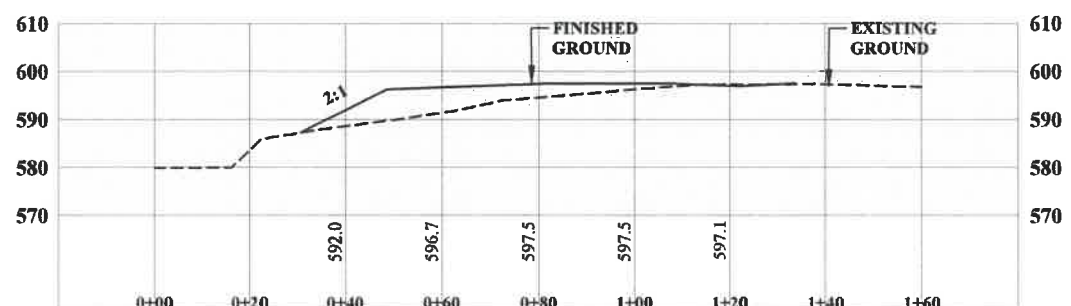
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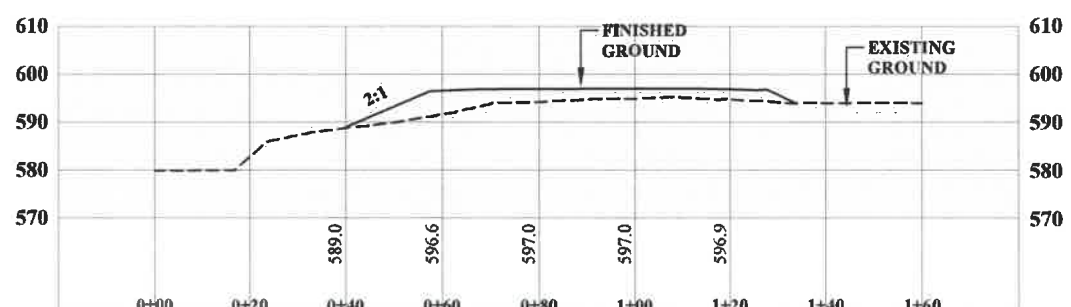
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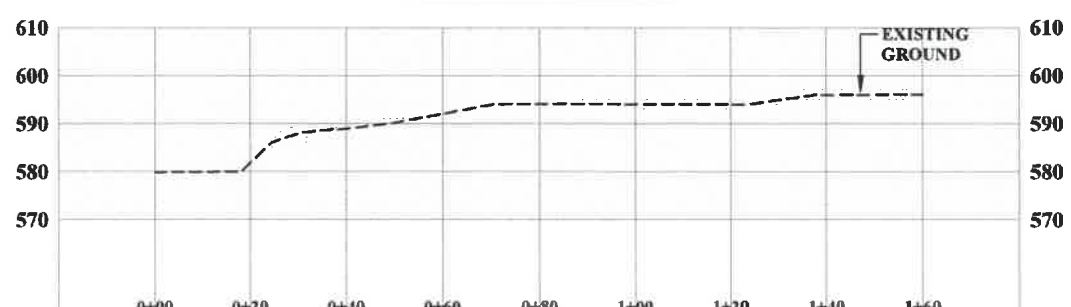
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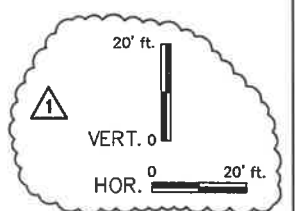
STA. 8+40 EAST TO WEST



STA. 8+60 EAST TO WEST



STA. 8+80 EAST TO WEST



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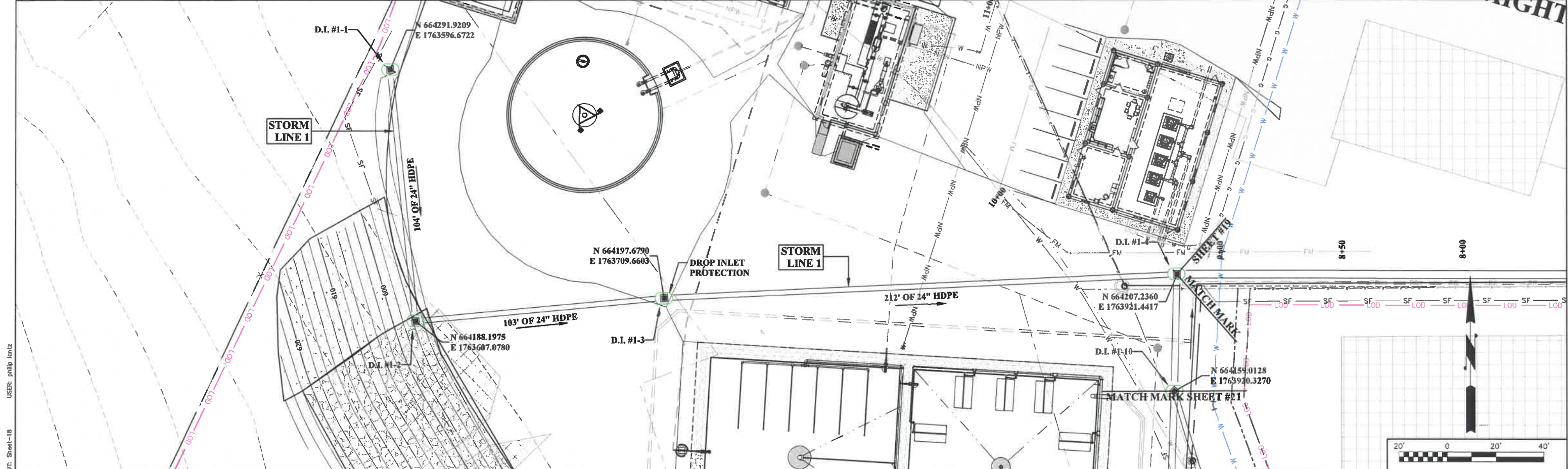


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CHECKED: R. HUDKINS	DATE: 2/2022
APPROVED: D. FERRELL	DATE: 2/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

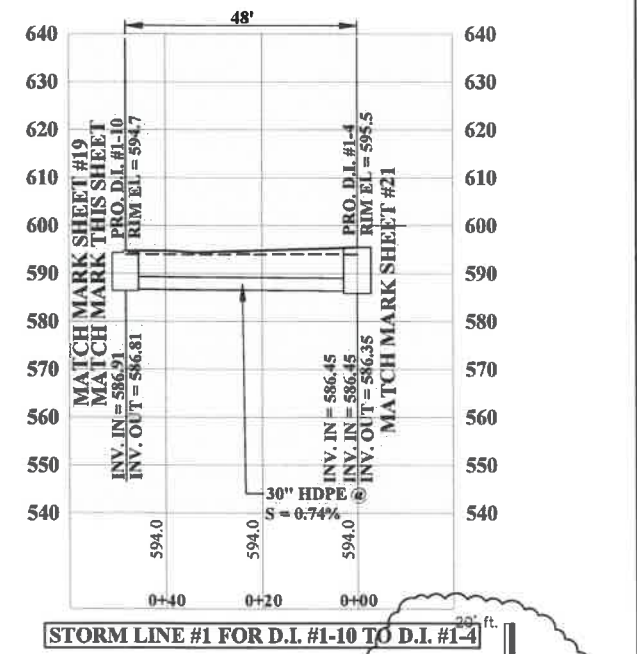
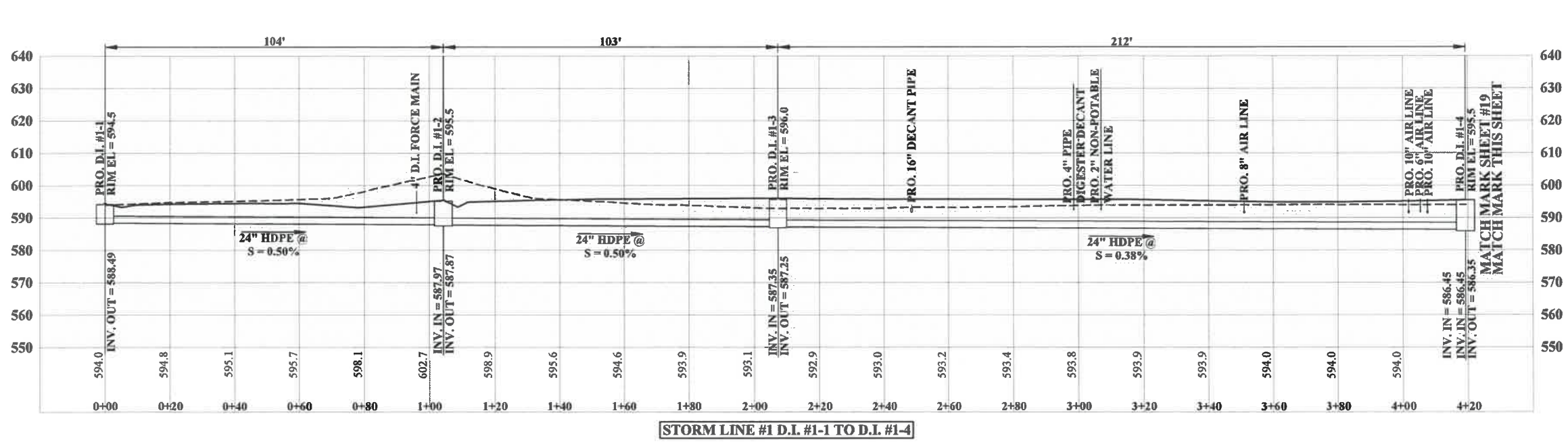
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PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED EAST SIDE SITE
 CROSS SECTIONS 8+00 TO 9+00



CAD FILE: R:\020\020-1535-WWP-BRILEY-Drawing\Contract #13\Drawings\C3-002-Ex. Site Plan.dwg
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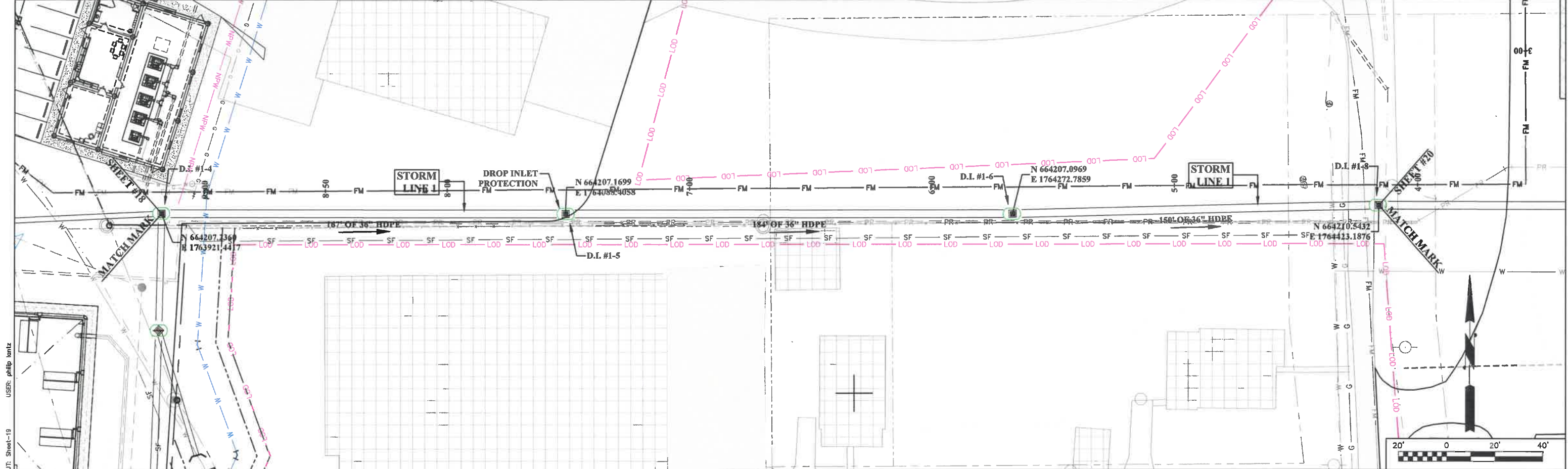
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 SURVEY BY:
 FIELD BOOK No.:



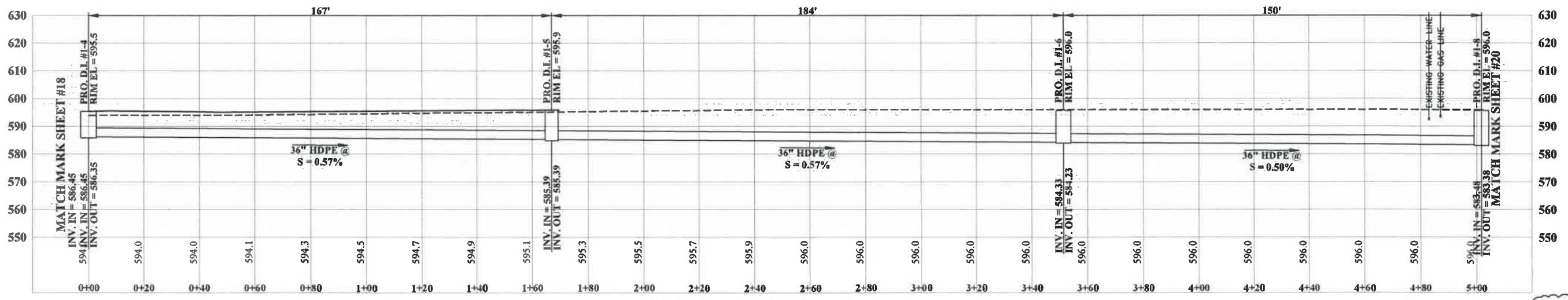
PHASE No.
 CONTRACT No. 3
 PROJECT No.
 101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED STORM SEWER
 PLAN AND PROFILE

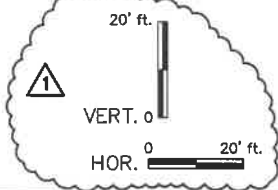
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18



USER: philip lantz
 LAYOUT: Sheet-19
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STORM LINE #1 FROM D.I. #1-4 TO D.I. #1-8



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SCALE: 1"=20'
 DRAWN: P.LANTZ DATE: 9/2021
 CHECKED: R. HUDKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
 FIELD BOOK No.:



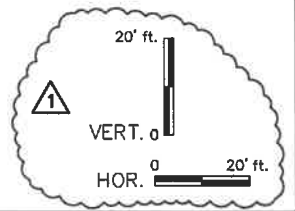
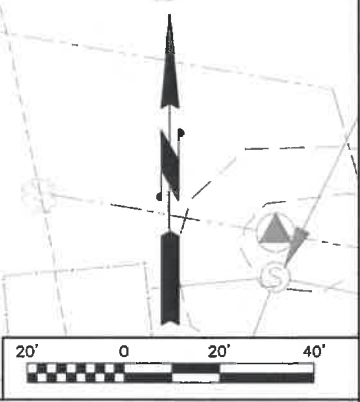
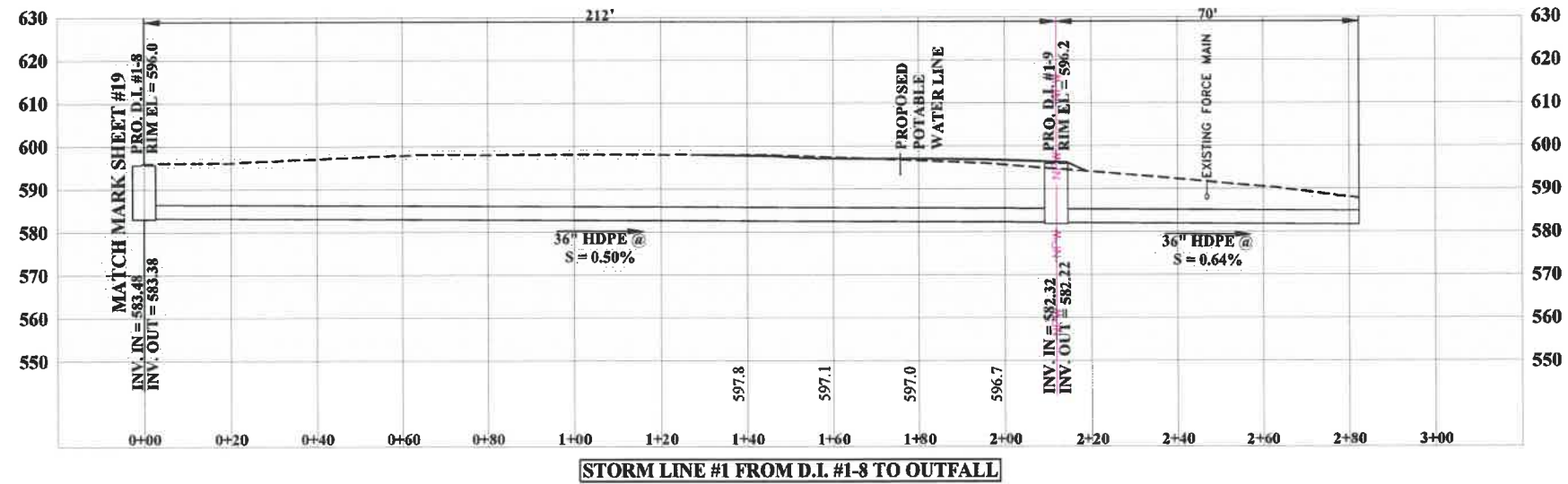
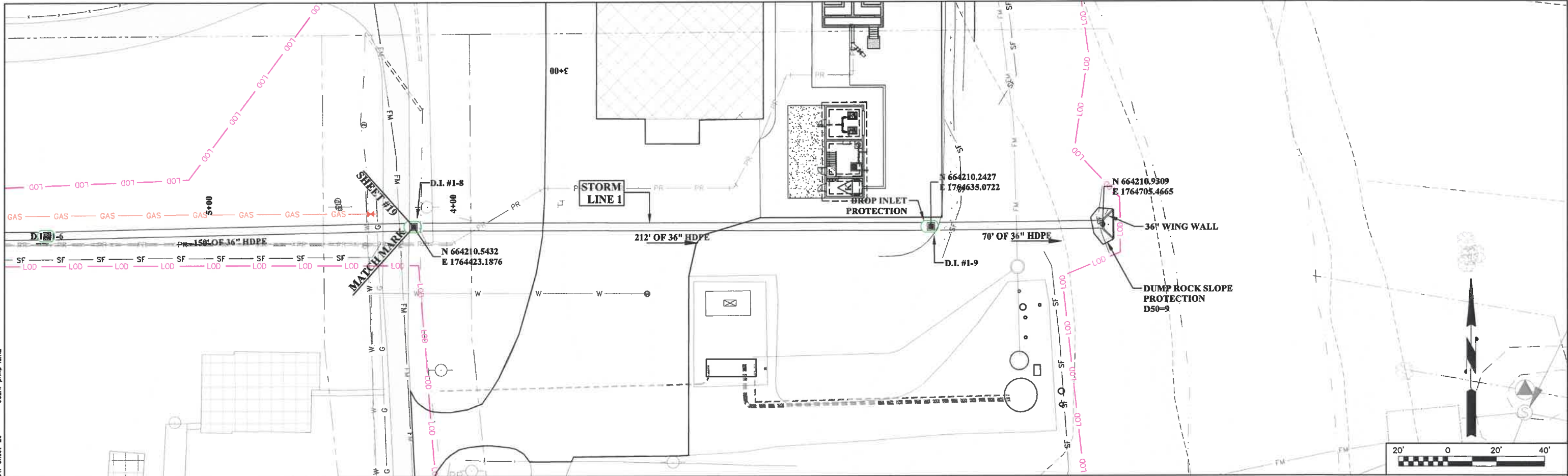
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PROJECT No.
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 WASTEWATER TREATMENT PLANT
 PROPOSED STORM SEWER
 PLAN AND PROFILE

SHEET No.
19

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 LAYOUT: Sheet-20
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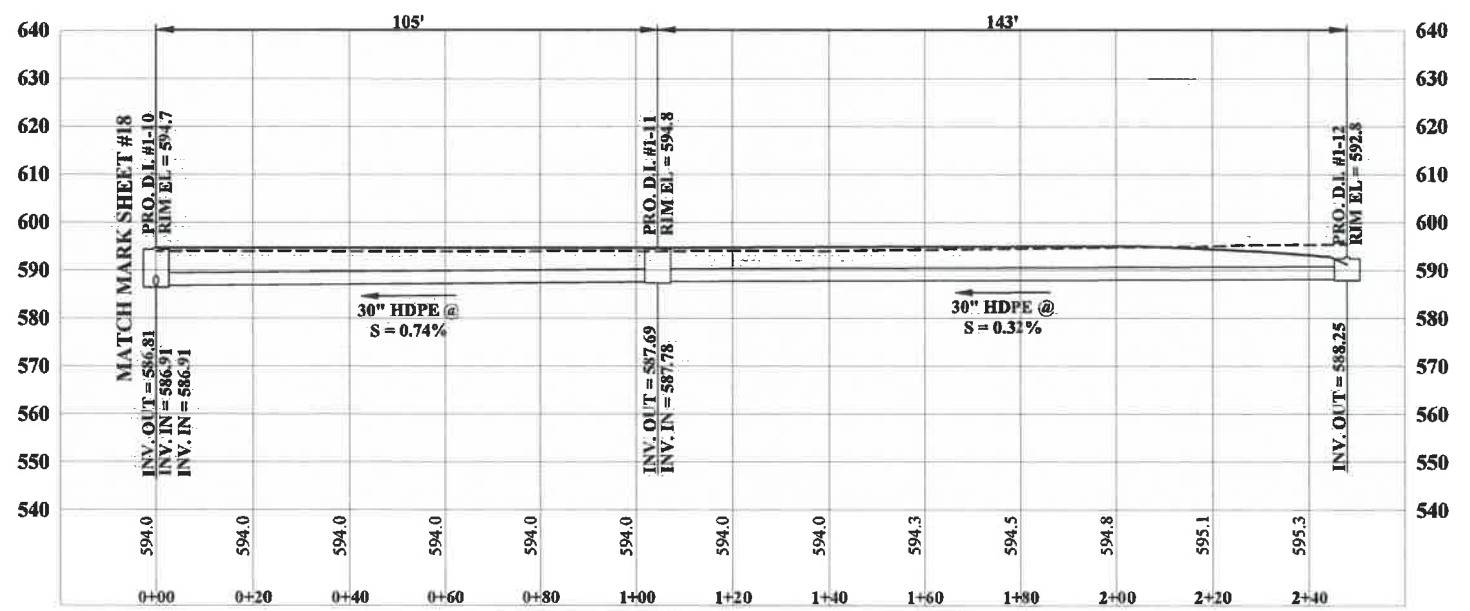
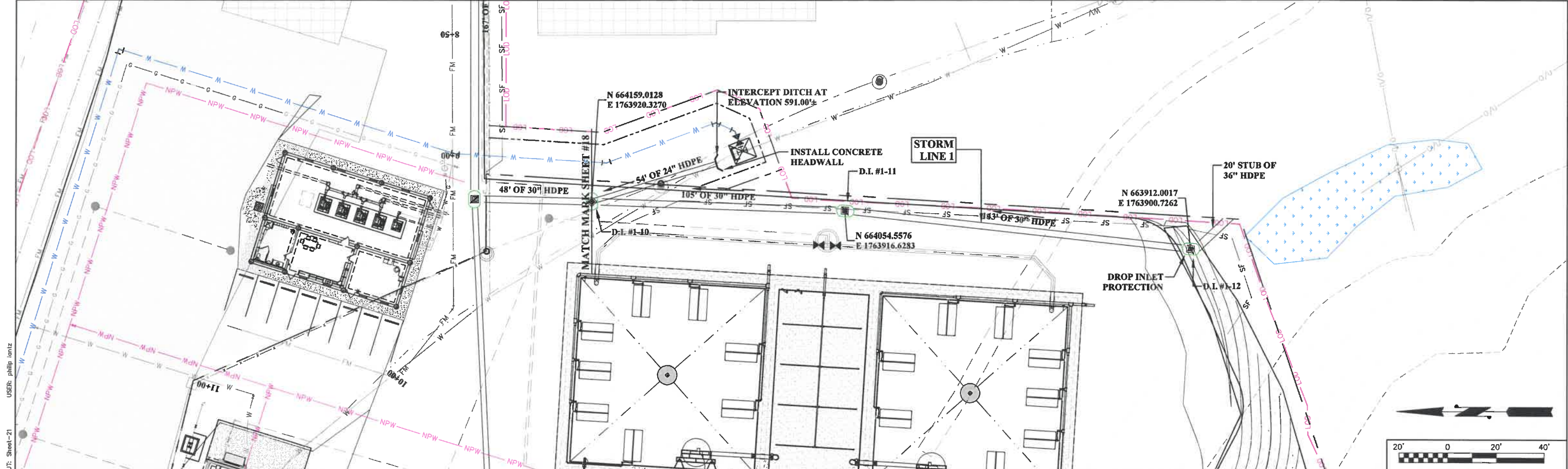
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 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
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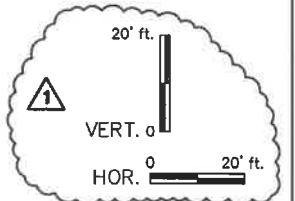
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CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED STORM SEWER
 PLAN AND PROFILE

SHEET No.
20



STORM LINE #1 FROM D.I. #1-10 TO D.I. #1-12



CAD FILE: R:\020\020-1535-WWTP-RIPLEY-Drawing\Contract_#3\Drawings\C3-002-Ex_Site Plan.dwg
 PLOT DATE/TIME: 3/8/2022 9:35 AM
 LAYOUT: Sheet-21
 USER: philip_lantz

1	PL	3/8/22	ADDENDUM No.1
NO.	BY	DATE	DESCRIPTION



SCALE: 1" = 20'
 DRAWN: P.LANTZ DATE: 9/2021
 CHECKED: R. HUDKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
 FIELD BOOK No.:



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 CONTRACT No. 3
 PROJECT No. 101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED STORM SEWER
 PLAN AND PROFILE

SHEET No. 21

EQUIPMENT LEGEND NOTES

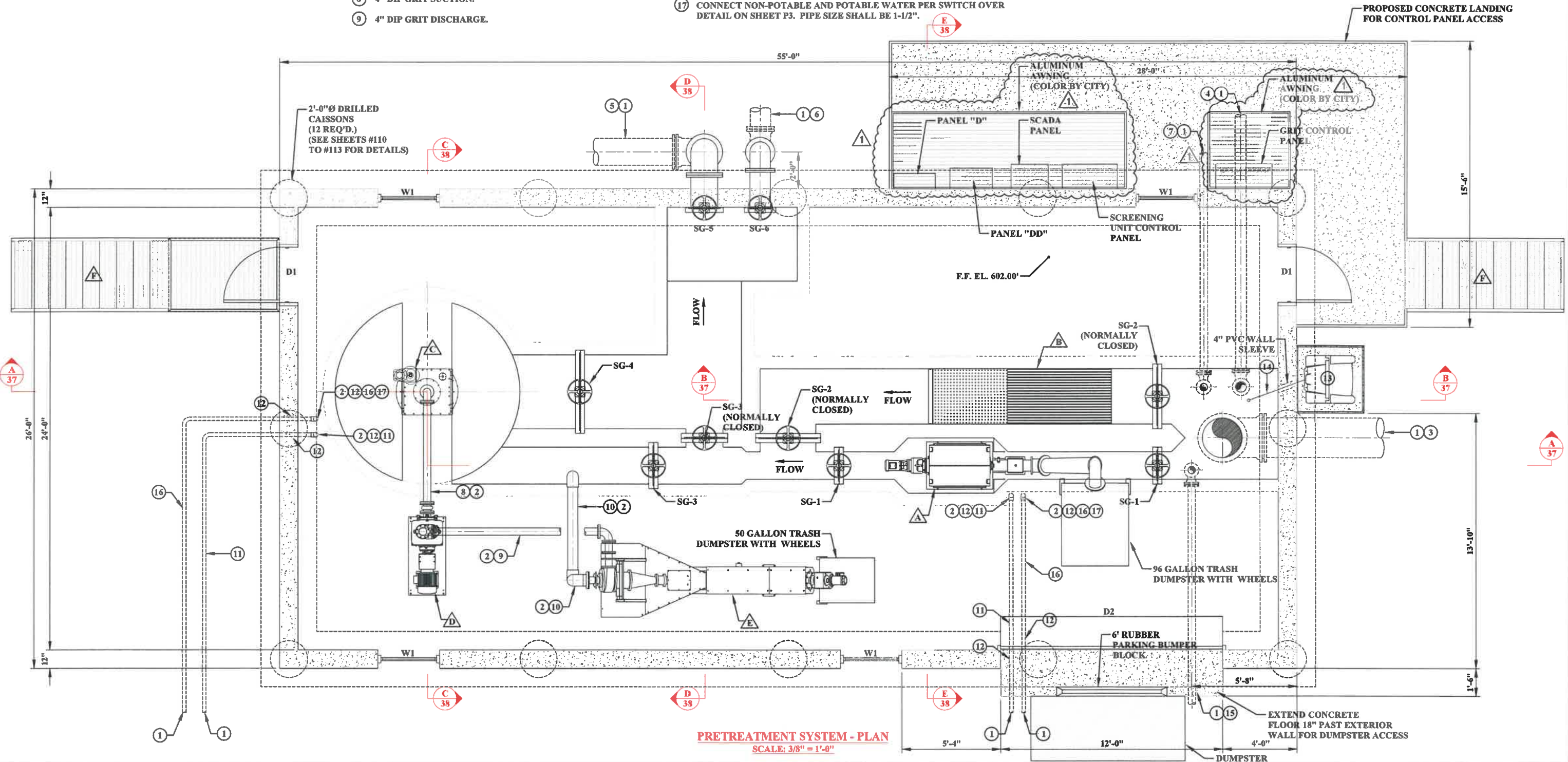
- A** PRE-SCREENING UNIT.
- B** MANUAL BAR SCREEN AND DRAIN PLATE.
- C** GRIT DRIVE MOTOR AND UNIT ASSEMBLY. (10'-0" DIAMETER GRIT HOPPER)
- D** GRIT PUMP.
- E** GRIT CLASSIFIER.
- F** GALVANIZED ACCESS STAIRS.

PIPING LEGEND NOTES

- 1** REFER TO SHEET No. 24 FOR CONTINUATION.
- 2** INSULATE ALL EXPOSED PIPE PER SPECIFICATION SECTION 404213.
- 3** 24" DIP INFLUENT.
- 4** 6" DIP FROM PRE-EQ BASIN.
- 5** 16" DIP TO SBR TREATMENT BASINS.
- 6** 12" DIP TO PRE-EQ BASIN.
- 7** 4" DIP FROM PLANT PUMP STATION.
- 8** 4" DIP GRIT SUCTION.
- 9** 4" DIP GRIT DISCHARGE.
- 10** 6" SCH. 80 PVC DRAIN.
- 11** 2" PE WATERLINE AND TRANSITION TO SCH. 80 PVC 6" A.F.F. INSTALL 2" BALL VALVE IN RISER 2'-0" A.F.F. AND REDUCE TO 1-1/2" SCH. 80 PVC AT CONNECTIONS TO SCREEN.
- 12** 4" SCH. 80 PVC ENCASED THRU WALL AND FLOOR.
- 13** ALL WEATHER AUTO-SAMPLER (REFER TO SPEC. SECTION 469000).
- 14** SAMPLER TUBING (INSULATE PER SPEC. SECTION 404213).
- 15** 4" DIP DIGESTER DECANT.
- 16** 2" PE NON-POTABLE WATER AND TRANSITION TO SCH. 80 PVC 6" A.F.F. INSTALL 2" BALL VALVE IN RISER 2'-0" A.F.F. AND REDUCE TO 1-1/2" SCH. 80 PVC AT CONNECTIONS TO SCREEN.
- 17** CONNECT NON-POTABLE AND POTABLE WATER PER SWITCH OVER DETAIL ON SHEET P3. PIPE SIZE SHALL BE 1-1/2".

NOTE

1. REFER TO SHEET #110-#113 FOR STRUCTURAL DRAWINGS.
2. REFER TO SHEET #142 FOR PLUMBING DRAWINGS.
3. REFER TO SHEET #143 FOR MECHANICAL DRAWINGS.
4. REFER TO SHEET #159-#160A FOR ELECTRICAL DRAWINGS.
5. HEADWORKS BUILDING TO BE CLASS I DIV. I AREA



USER: philip lantz

LAYOUT: SHEET 36

PLOT DATE/TIME: 3/9/2022 9:47 AM

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NO.	BY	DATE	DESCRIPTION
1	PLACENDUM N. 1		



SCALE: 3/8"=1'-0"	DATE: 9/2021
DRAWN: PLANTZ	DATE: 1/2022
CHECKED: R. HUDKINS	DATE: 2/2022
APPROVED: D. FERRELL	
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

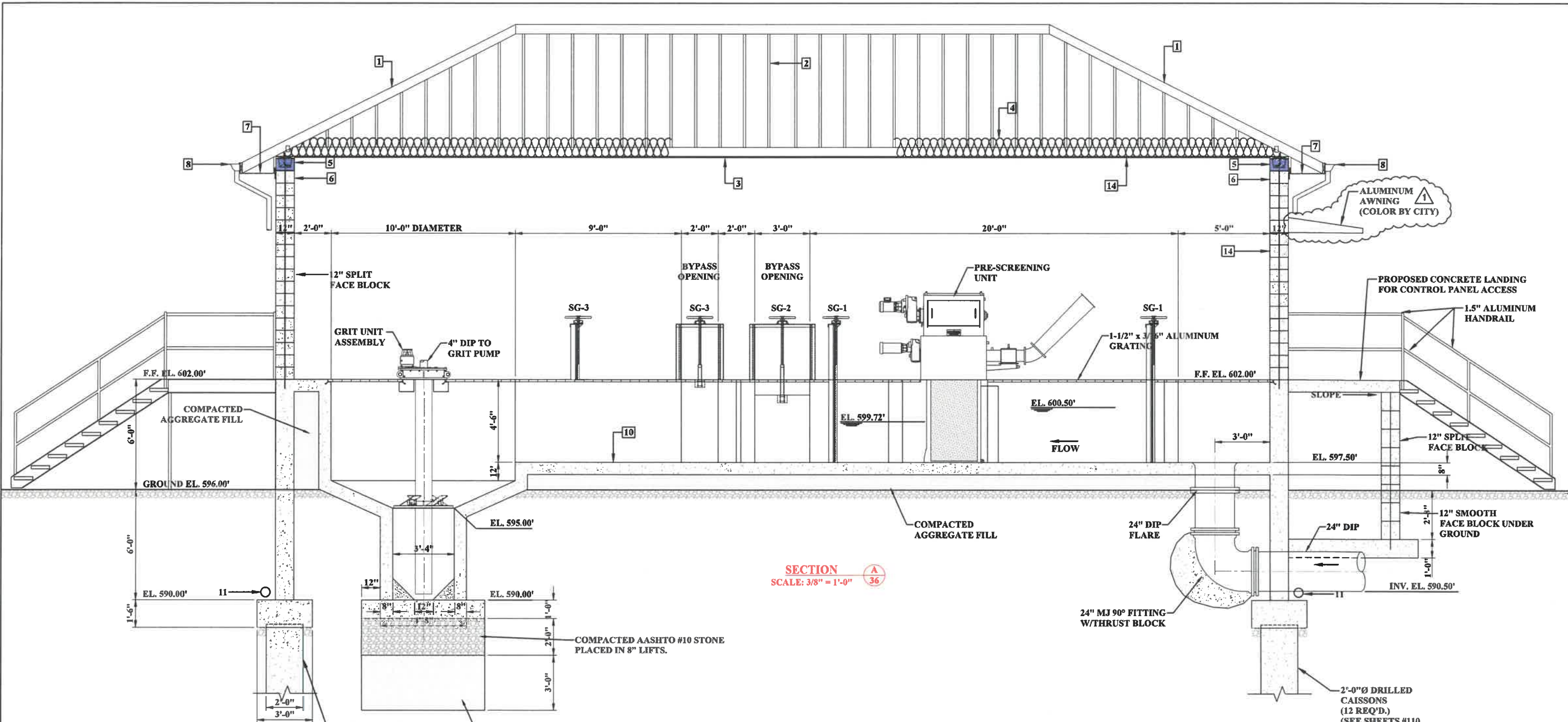
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CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
PROPOSED PRETREATMENT
SYSTEM PLAN VIEW

SHEET No.
36

CAD FILE: R:\020\020-1535-WWTP-RIPLEY-Drawing\Contract 03-010-PreTreatment.dwg
 PLOT DATE/TIME: 3/8/2022 9:47 AM
 LAYOUT: SHEET 37
 USER: philip lantz



SECTION A-36
SCALE: 3/8" = 1'-0"

LEGEND NOTES

- 1 STANDING SEAM METAL ROOF OVER SYNTHETIC ROOF UNDER LAMENT, 3/4" PLYWOOD.
- 2 PRE-ENGINEERED ROOF TRUSSES AT 16" O.C.
- 3 5/8" MARINE GRADE PLYWOOD (PAINTED), AND CAULK ALL SEAMS.
- 4 12" FIBERGLASS INSULATION WITH KRAFT PAPER BACKING.
- 5 12" SMOOTH FACE CMU BOND BEAM W/ 2-#5 BARS CONTINUOUS.
- 6 12" SMOOTH FACE BLOCK TO ACCEPT THE RETURN OF THE SOFFIT.
- 7 VINYL SOFFIT (VENTED), 6" FASCIA PANEL, ALUMINUM DRIP EDGE.
- 8 6" ALUMINUM GUTTER WITH 5"x6" ALUMINUM DOWNSPOUT AND PRECAST CONCRETE SPLASH PAD.
- 9 FOUNDATION INSULATION BOARD.
- 10 8" CONCRETE SLAB OVER 10 MIL. VAPOR BARRIER.
- 11 6" PERF. PVC FOUNDATION DRAIN IN STONE TRENCH WRAPPED WITH FILTER FABRIC.
- 12 NOT USED
- 13 COMPACTED AGGREGATE BASE.
- 14 CEILING AND WALLS TO BE PAINTED, WALLS TO HAVE SPRAY FOAM INSULATION

NO.	BY	DATE	DESCRIPTION
1	PL	3/8/22	ADDENDUM No. 1



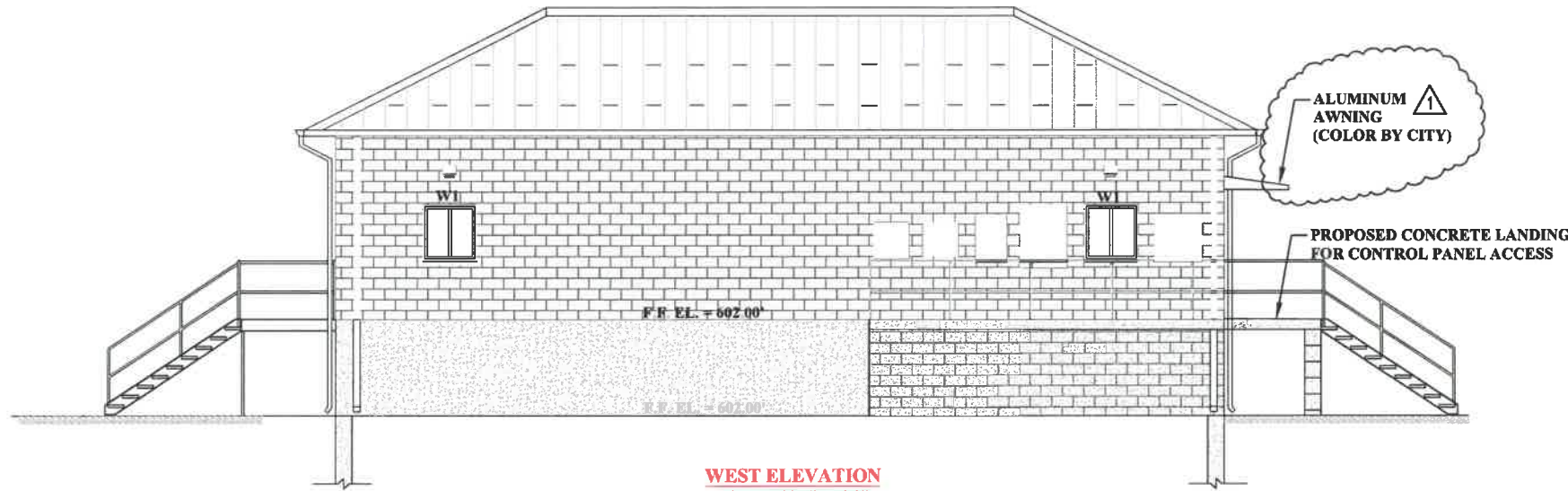
SCALE: 3/8"=1'-0"	DRAWN: P.LANTZ	DATE: 9/2021
CHECKED: R. HUDKINS	DATE: 1/2022	
APPROVED: D. FERRELL	DATE: 2/2022	
SURVEY DATE:		
SURVEY BY:		
FIELD BOOK No.:		

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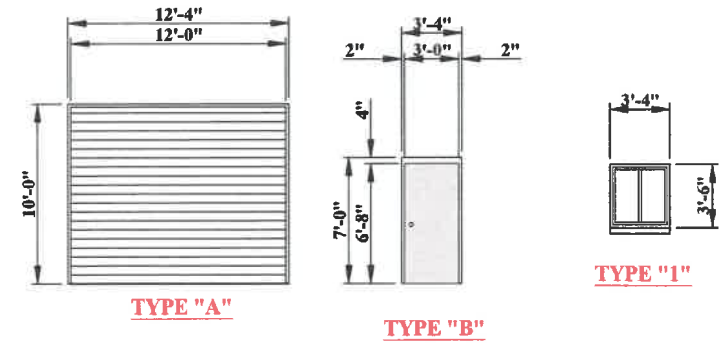
PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED PRETREATMENT
 SYSTEM SECTION VIEWS A AND B

CAD FILE: R:\020\020-1535-WTP-RIPLET-V\Drawing\Contract #3\Drawings\C3-010-Pretreatment.dwg
 PLOT DATE/TIME: 3/8/2022 9:47 AM
 LAYOUT: SHEET 41
 USER: philip_lantz



WEST ELEVATION
SCALE: 3/16" = 1'-0"

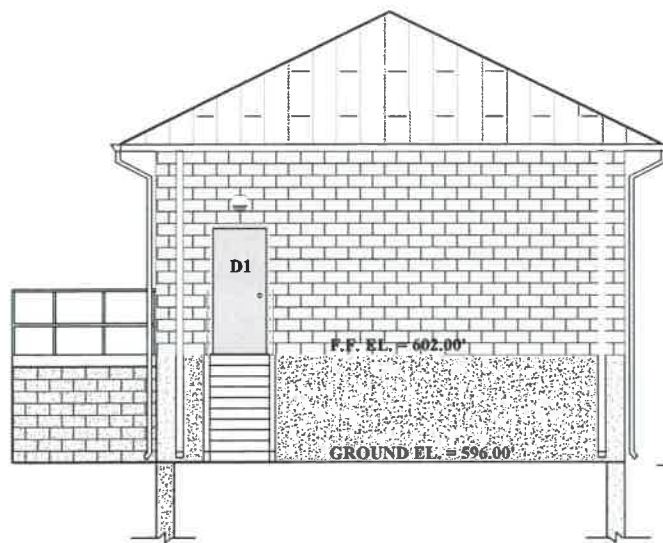


DOOR SCHEDULE							
DOOR NUMBER	WIDTH	HEIGHT	THICKNESS	MATERIAL	DOOR TYPE	HARDWARE SET	REMARKS/LABEL
D1	3'-0"	6'-8"	1 3/4"	ALUMINUM	B	1	ALUMINUM THRESHOLD
D2	12'-0"	10'-0"	1 3/4"	ALUMINUM	A	6	

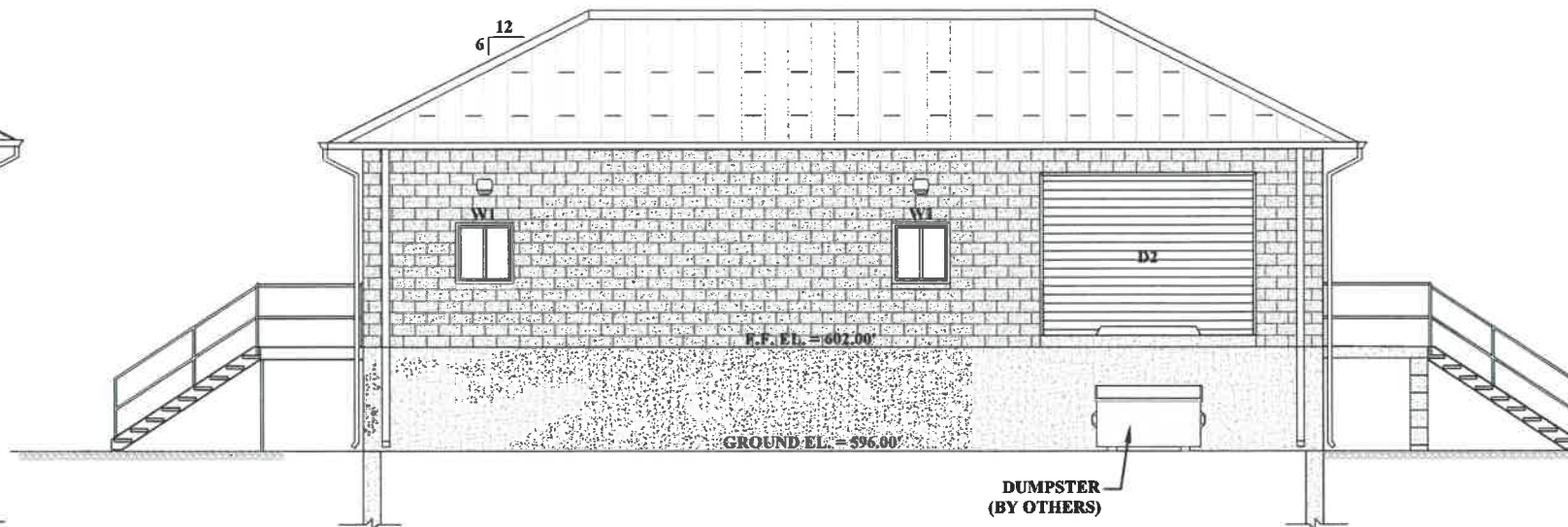
DOOR NOTES:
1. REFER TO SPECIFICATION SECTION 087100 FOR HARDWARE SCHEDULE.

WINDOW SCHEDULE				
WINDOW NUMBER	WIDTH	HEIGHT	WINDOW TYPE	REMARKS/LABEL
W1	3'-4"	4'-0"	1	1, 2, 3 & 4

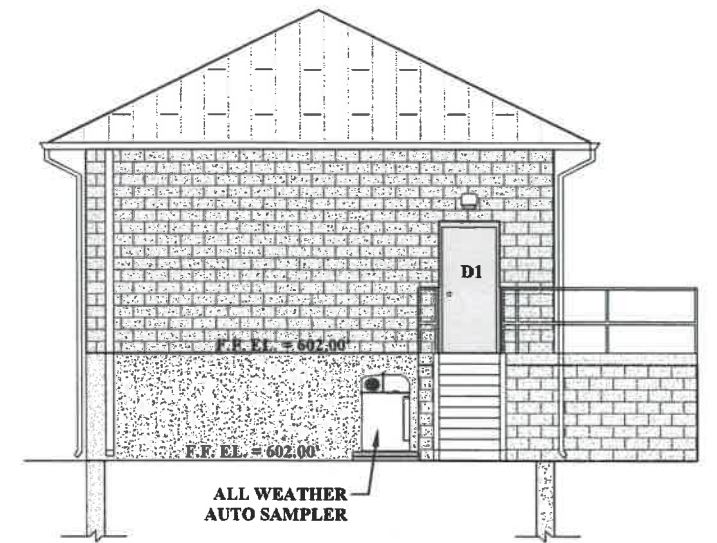
- WINDOW NOTES:**
1. ALL WINDOWS REQUIRE INTERIOR AND EXTERIOR TRIM.
 2. WINDOW MUST BE SIZED TO FIT OPENINGS USING MANUFACTURER'S RECOMMENDATIONS.
 3. ALL EXTERIOR WINDOWS SHALL BE OPERABLE AND SUPPLIED WITH SCREENS.
 4. WINDOWS SHALL HAVE INTERIOR AND EXTERIOR STONE SILLS.
 5. WINDOWS SHALL BE FIXED, TEMPERED GLAZING CLEAR.



SOUTH ELEVATION
SCALE: 3/16" = 1'-0"



EAST ELEVATION
SCALE: 3/16" = 1'-0"



NORTH ELEVATION
SCALE: 3/16" = 1'-0"

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NO.	BY	DATE	DESCRIPTION
1	PL	3/8/22	ADDENDUM No. 1



SCALE: 1/4"=1'-0"
 DRAWN: P.LANTZ DATE: 9/2021
 CHECKED: R. HUDKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY BY:
 SURVEY DATE:
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PHASE No.
 CONTRACT No. 3
 PROJECT No.
 101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED PRETREATMENT
 SYSTEM BUILDING ELEVATIONS

SHEET No.
41

ROOM FINISH SCHEDULE					
ROOM NUMBER	FLOOR	WALL	CEILING	CEILING HEIGHT	REMARKS/LABEL
101	SEALED CONC.	PAINTED MASONRY	SUSP. ACOUSTIC TILE	8'-0"	N/A
102	SEALED CONC.	PAINTED MASONRY	SUSP. ACOUSTIC TILE	8'-0"	N/A
103	SEALED CONC.	PAINTED MASONRY	SUSP. ACOUSTIC TILE	8'-0"	N/A
104	SEALED CONC.	PAINTED MASONRY	PAINTED PLYWOOD	10'-0"	N/A

WINDOW SCHEDULE				
WINDOW NUMBER	WIDTH	HEIGHT	WINDOW TYPE	REMARKS/LABEL
W1	3'-4"	4'-0"	1	1, 2, 3 & 4
W2	3'-4"	4'-0"	2	1, 2, 3 & 4
W3	3'-4"	3'-6"	1	1, 2, 3 & 4
W4	3'-4"	4'-0"	1	1, 2, 3 & 4
W5	NOT USED			
W6	3'-4"	4'-0"	1	1, 2, 3 & 4
W7	3'-4"	4'-0"	1	1, 2, 3 & 4
W8	3'-4"	4'-0"	1	1, 2, 3 & 4
W9	3'-4"	4'-0"	1	1, 2, 3 & 4
W10	3'-4"	4'-0"	1	1, 2, 3 & 4
W11	3'-4"	4'-0"	1	1, 2, 3 & 4

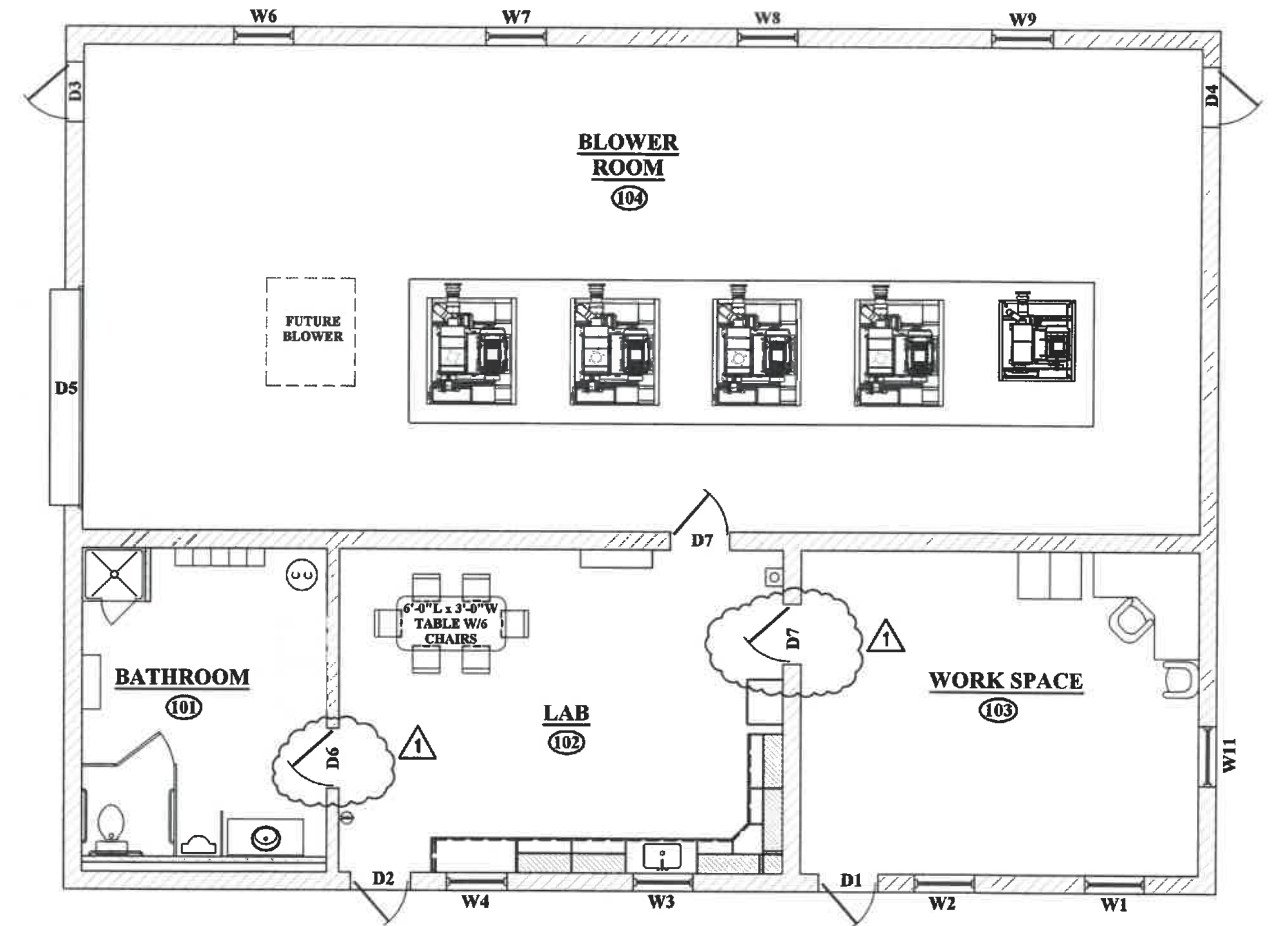
- WINDOW NOTES:**
- ALL WINDOWS REQUIRE INTERIOR AND EXTERIOR TRIM.
 - WINDOW MUST BE SIZED TO FIT OPENINGS USING MANUFACTURER'S RECOMMENDATIONS.
 - ALL EXTERIOR WINDOWS SHALL BE OPERABLE AND SUPPLIED WITH SCREENS.
 - WINDOWS SHALL HAVE INTERIOR AND EXTERIOR STONE SILLS.
 - WINDOWS SHALL BE FIXED, TEMPERED GLAZING CLEAR.

DOOR SCHEDULE							
DOOR NUMBER	WIDTH	HEIGHT	THICKNESS	MATERIAL	DOOR TYPE	HARDWARE SET	REMARKS/LABEL
D1	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	A	1	ALUMINUM THRESHOLD
D2	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	A	1	ALUMINUM THRESHOLD
D3	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	D	3	ALUMINUM THRESHOLD
D4	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	D	3	ALUMINUM THRESHOLD
D5	12'-0"	8'-0"	—	—	—	—	FIBERGLASS GARAGE DOOR
D6	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	B	5	ALUMINUM THRESHOLD
D7	3'-0"	6'-8"	1 3/4"	HOLLOW METAL	C	4	ALUMINUM THRESHOLD

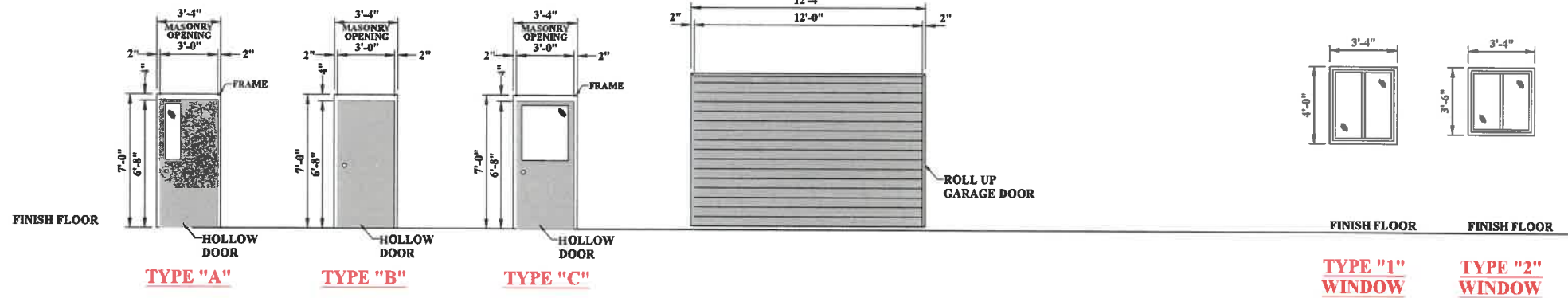
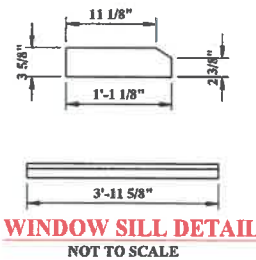
- DOOR NOTES:**
- REFER TO SPECIFICATION SECTION 087100 FOR HARDWARE SCHEDULE.

PIPING PAINTING SCHEDULE				
PIPE TYPE / PROCESS	PAINT / COATING SYSTEM	COLOR	LABEL / LETTERING	REMARKS/LABEL
AIR PIPING	REFER TO SPEC 099010	REFER TO SPEC 099010	"AIR"	1
GAS PIPING	REFER TO SPEC 099010	REFER TO SPEC 099010	"GAS"	1
POTABLE WATER	REFER TO SPEC 099010	REFER TO SPEC 099010	"POTABLE WATER"	1

- PAINTING NOTES:**
- ALL EXPOSED PIPING SHALL BE PAINTED AND LABELED.



CONTROL & PROCESS BLOWER BUILDING - FLOOR PLAN
SCALE 3/16" = 1'-0"



CAD FILE: R:\020\020-1535-WWP-RIPLEY-Drawing\Contract #3\Drawings\C3-016-Control And Blower Bldg.dwg PLOT DATE/TIME: 3/8/2022 9:52 AM LAYOUT: SHEET B2 USER: philip lantz

1	PL	3/8/22	ADDENDUM No. 1
NO.	BY	DATE	DESCRIPTION



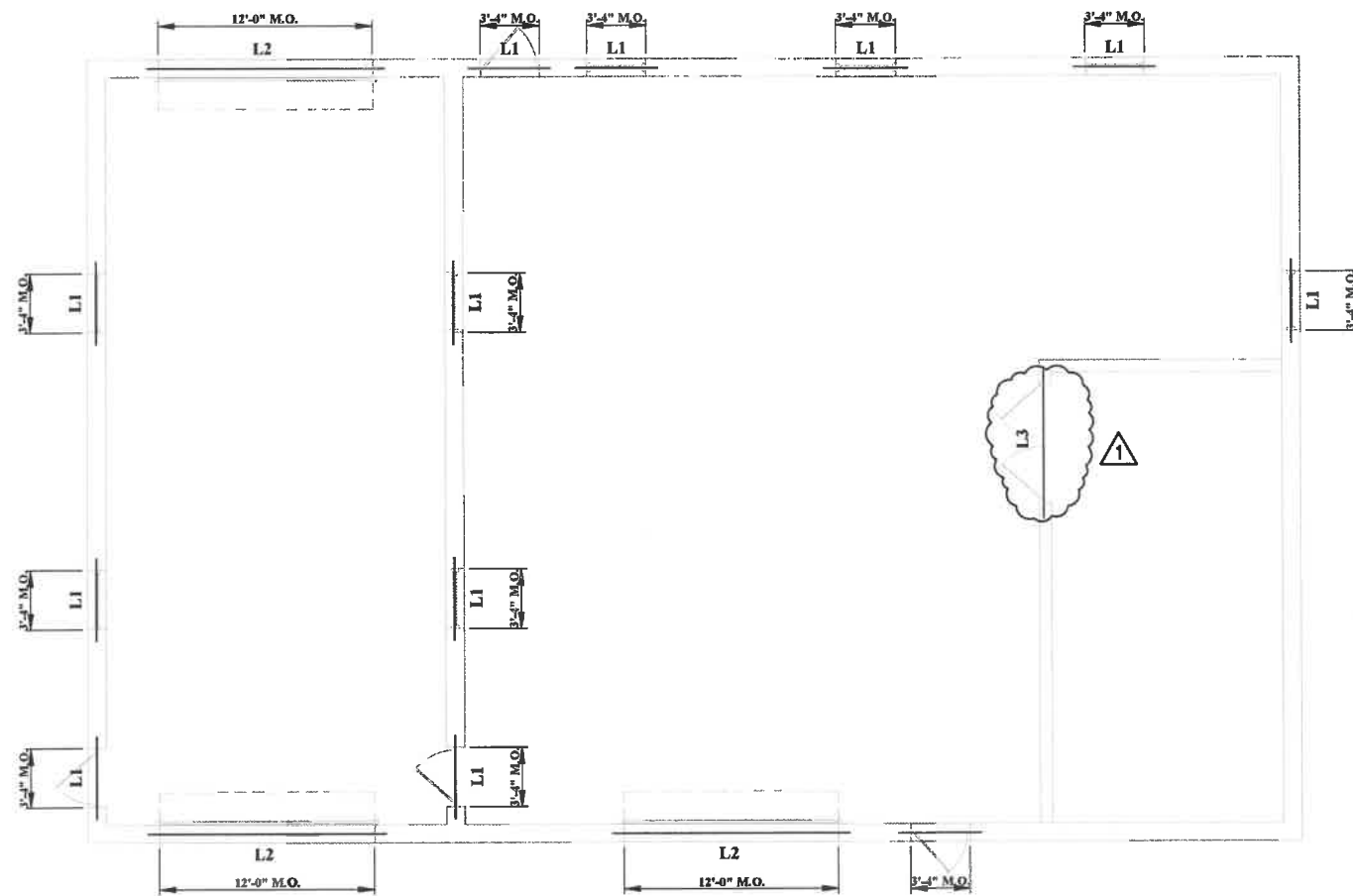
SCALE: 3/16"=1'-10"
DRAWN: P.LANTZ DATE: 9/2021
CHECKED: R. HUDKINS DATE: 1/2022
APPROVED: D. FERRELL DATE: 2/2022
SURVEY DATE:
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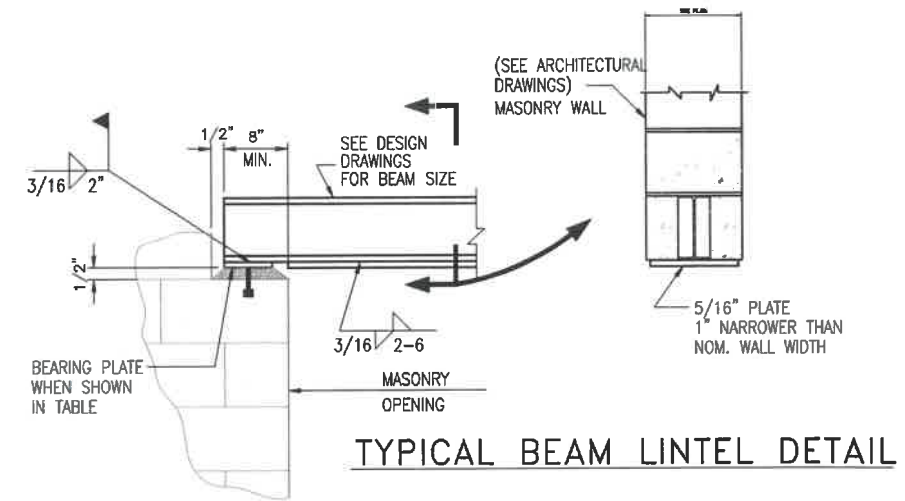
PHASE No.
CONTRACT No.
3
PROJECT No.
101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
CONTROL & PROCESS BLOWER BUILDING
PROPOSED BUILDING SCHEDULES

SHEET No.
82



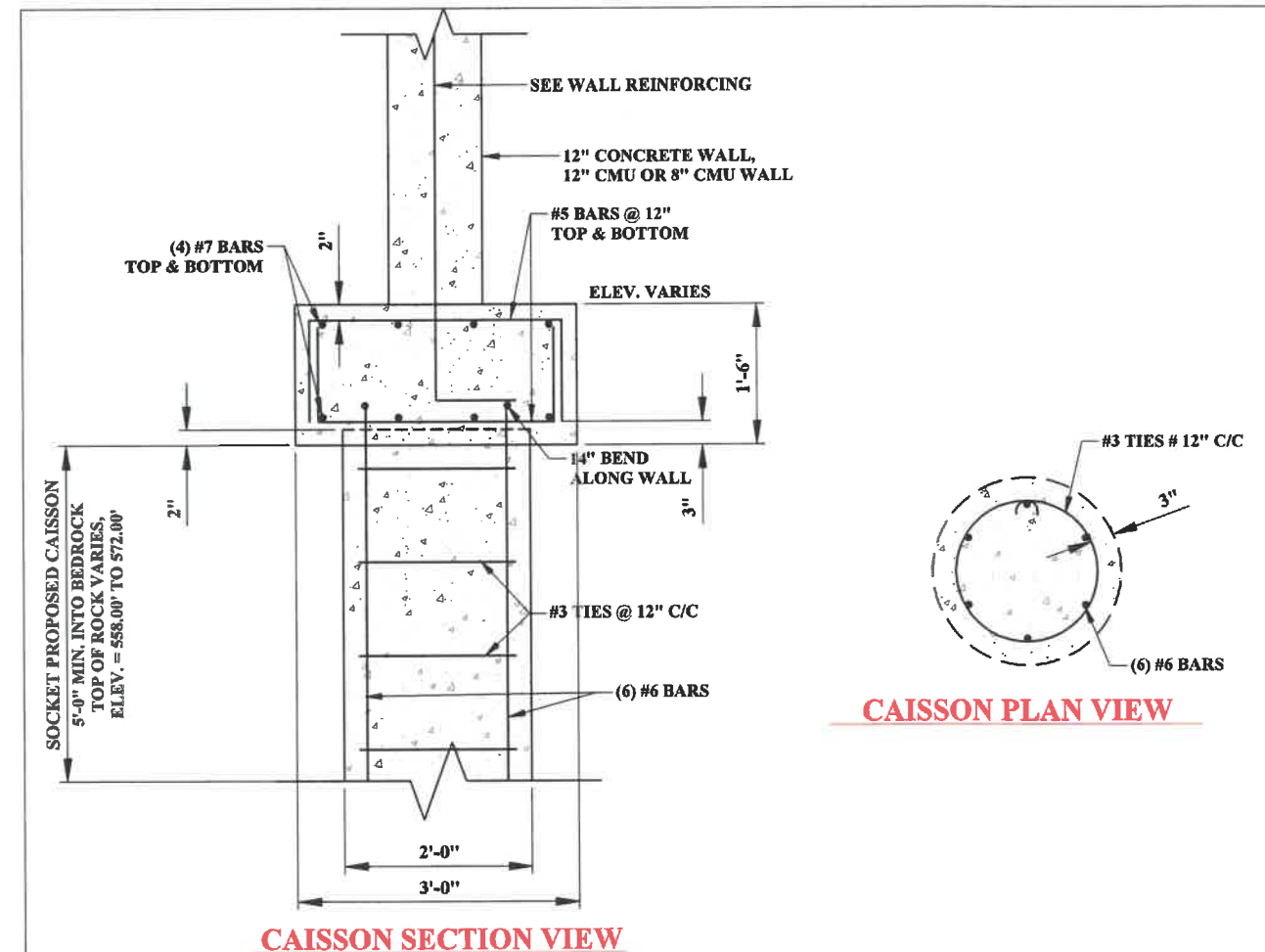
SLUDGE DEWATERING BUILDING - LINTEL PLAN
SCALE: 1/4" = 1'-0"



TYPICAL BEAM LINTEL DETAIL

LINTEL SCHEDULE

LINTEL NUMBER	MEMBER SIZE	MASONRY OPENING	BEARING EACH END	BEARING PLATE SIZE	BOT. OF STL. ELEV.	REMARKS
L1	(3) L-4"x3 1/2"x1/4"	3'-4"	8"	NONE		HOT DIP GALV.
L2	W8x15 W/ 5/16" BOT. PLATE x 11" WIDE	12'-0"	8"	PLATE 1/2x8"x0'-8" W/ (2) 1/2"x4" LG. HEADED STUDS		HOT DIP GALV.
L3	(1) L-4"x3 1/2"x1/4"					



CAISSON SECTION VIEW

CAISSON PLAN VIEW

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1	PL	3/8/22	ADDENDUM No. 1



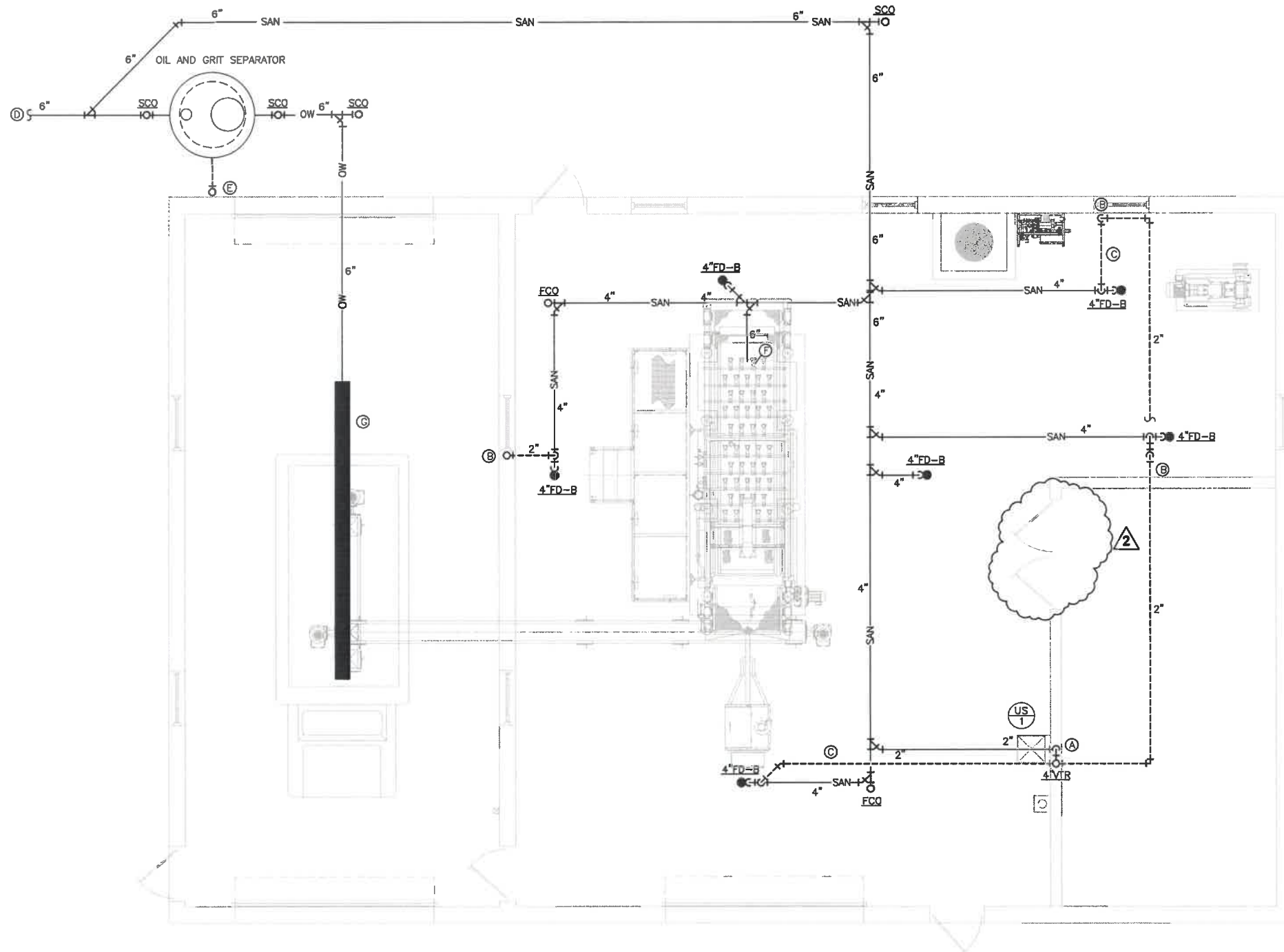
SCALE: AS NOTED
 DRAWN: PLANTZ DATE: 9/2021
 CHECKED: R. HUDKINS DATE: 1/2022
 APPROVED: D. FERRELL DATE: 2/2022
 SURVEY DATE:
 SURVEY BY:
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PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED SLUDGE DEWATERING BUILDING
 LINTEL SCHEDULE & CAISSON DETAIL

SHEET No.
126



PLAN NOTES:

- Ⓐ 2" SANITARY SEWER DOWN AND 1 1/2" VENT UP.
- Ⓑ 2" VENT UP.
- Ⓒ VENT LINE BELOW FLOOR.
- Ⓓ SEE SHEET 24, 24A, AND 24B FOR CONTINUATION.
- Ⓔ 2" VENT UP WITH GOOSENECK.
- Ⓕ TRENCH DRAIN BY GENERAL CONTRACTOR.
- Ⓖ 18'-0" LONG TRENCH DRAIN. MULTIDRAIN ECONODRAIN SERIES #8 PT-2 WITH BOLT-IN-PLACE RAIL SPACER BAR, GALVANIZED HOT DIPPED FRAME RAIL, GRATE #J.

SLUDGE DEWATERING BUILDING - SANITARY AND VENT PLAN

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1	PL	9/16/2021	PER WWD/EP COMMENTS
2	PL	3/8/22	ADDENDUM No. 1
NO.	BY	DATE	DESCRIPTION



SCALE:	
DRAWN: PLANTZ	DATE: 9/2021
CHECKED: R. HUDKINS	DATE: 1/2022
APPROVED: D. FERRELL	DATE: 2/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	



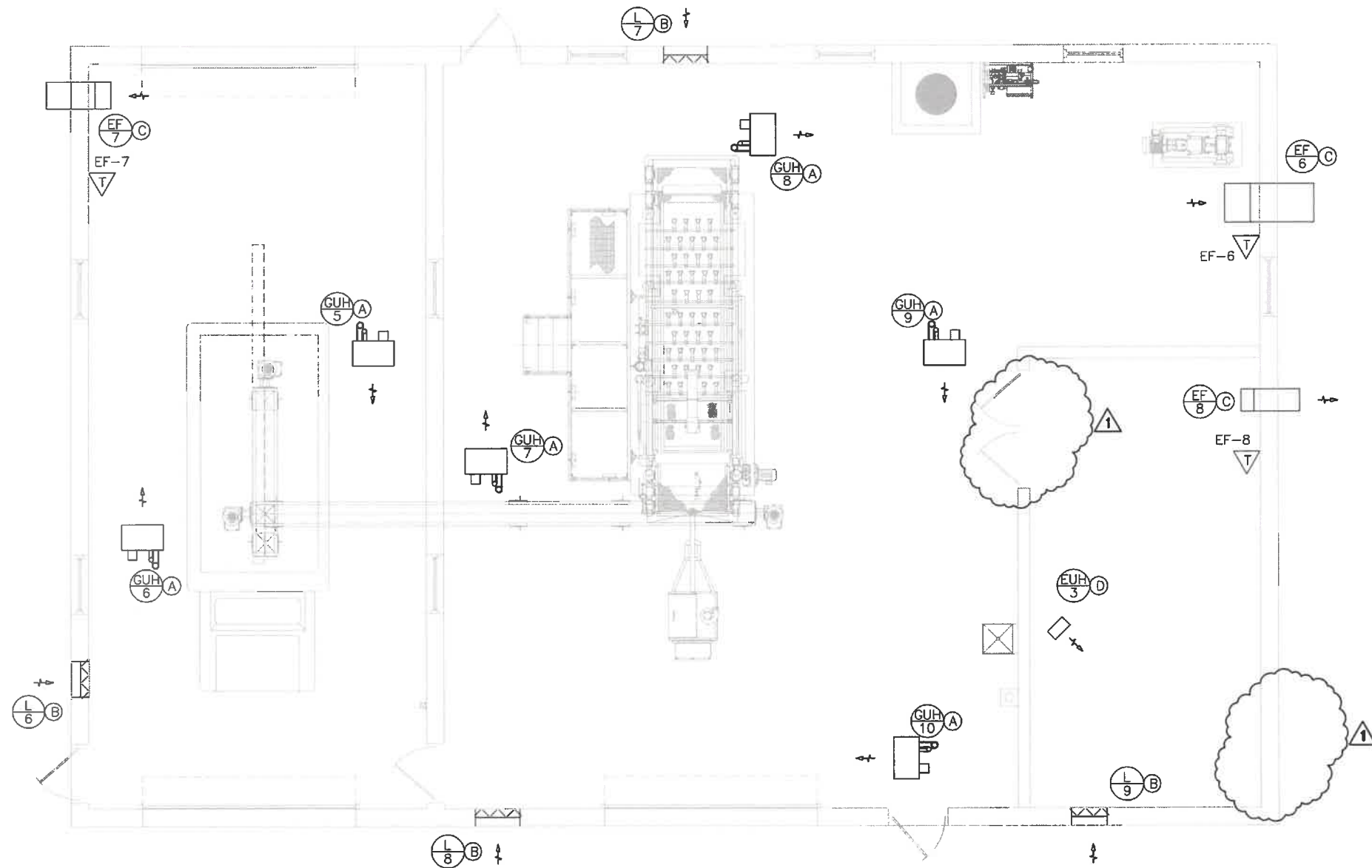
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PHASE No.	
CONTRACT No.	3
PROJECT No.	101-020-1535

CITY OF RIPLEY
PROPOSED 1.2 MILLION GALLONS PER DAY
WASTEWATER TREATMENT PLANT
PROPOSED SLUDGE DEWATERING BUILDING
SANITARY AND VENT PLAN

SHEET No.
140

CAD FILE: R:\020\020-1535-WWTP-RIPLEY-Drawing\Contract 83\Drawings\C3-035-Mechanical.dwg
 PLOT DATE/TIME: 3/9/2022 10:19 AM
 LAYOUT: SHEET 147
 USER: philip lantz



PLAN NOTES:

- (A) MOUNT BOTTOM OF GAS UNIT HEATER AT ±9'-0" A.F.F.
- (B) MOUNT TOP OF LOUVER AT ±12" BELOW FINISHED CEILING.
- (C) MOUNT TOP OF EXHAUST FAN AT ±12" BELOW FINISHED CEILING.
- (D) MOUNT HEATER AT ±9'-0" A.F.F.

SLUDGE DEWATERING BUILDING - HVAC PLAN

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1	PL	3/8/22	ADDENDUM No. 1
NO.	BY	DATE	DESCRIPTION



SCALE:	DATE: 9/2021
DRAWN: P. LANTZ	CHECKED: R. HUDKINS
APPROVED: D. FERRELL	DATE: 2/2022
SURVEY DATE:	
SURVEY BY:	
FIELD BOOK No.:	

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PHASE No.	
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PROJECT No.	101-020-1535

CITY OF RIPLEY
 PROPOSED 1.2 MILLION GALLONS PER DAY
 WASTEWATER TREATMENT PLANT
 PROPOSED SLUDGE DEWATERING BUILDING
 HVAC PLAN

SHEET No.
147