Re-advertisement Request for Qualifications

Piedmont Triad Regional Water Authority
John Franklin Kime Water Treatment Plant Expansion & Reverse Osmosis Treatment System Installation
Progressive Design-Build Services
Nov 21, 2023

Statement of Qualifications Due by:
November 28th, 2023
3:00 pm

Piedmont Triad Regional Water Authority
Physical Address: 7297 Adams Farm Road
Randleman, NC 27317

Request for Qualifications

Note: This document was prepared using elements of DBIA Document Nos. 405 and 410.

This **REQUEST FOR QUALIFICATIONS** ("RFQ") from the Owner named below invites the submittal of a Statement of Qualifications ("SOQ") from firms interested in providing design-build services for the Project described below. By submitting an SOQ, the Proposer represents that it has carefully read the terms and conditions of this RFQ and all Attachments, and/or Addenda thereto and agrees to be bound by them. This RFQ is not an offer to enter into a contract, but merely a solicitation of persons interested in submitting an SOQ to the Owner for the Project.

OWNER:
Piedmont Triad Regional Water Authority ("PTRWA" or "Owner")

PROJECT:
John Franklin Kime Water Treatment Plant ("JFK-WTP") Expansion & Reverse Osmosis Treatment System Installation – Progressive Design-Build Services

PROJECT ADDRESS*:*
7297 Adams Farm Road
Randleman, NC 27317

In accordance with PTRWA guidelines, submittals for the services specified will be received by the PTRWA at the specified location listed in this RFQ document, until the time and date cited. Submittals received by the correct time shall be considered. Submittals received after the due date and time will not be considered.

PROCUREMENT WEBSITE
To view or download the RFQ for this project go to either website listed below.
Piedmont Triad Regional Water Authority website: http://www.ptrwa.org
State of North Carolina IPS: https://www.ips.state.nc.us/IPS/Default.aspx

SOQ DUE DATE AND TIME
Proposer's SOQ shall be submitted no later than: **November 28, 2023, 3:00 PM**

Electronically mail submission packets to:
Piedmont Triad Regional Water Authority
Attention: Rebecca Brown (rbrown@ptrwa.org.)
Subject: "JFK-WTP Expansion & RO Project – Progressive Design-Build Services SOQ"

Proposers must submit one (1) electronic copy to the person and address stated above.

All SOQs must be submitted pursuant to the instructions below. It is the Proposer's sole responsibility to ensure that the SOQ is delivered in the manner required by this RFQ by the due date and time. Owner has the right to reject any SOQs not properly delivered.

Deadline for Questions: November 24, 2023, by 3:00 pm, EST. Submit all questions regarding this Request for Qualifications (RFQ) to Rebecca Brown at rbrown@ptrwa.org. List in the email subject line: "JFK-WTP Expansion & RO – Progressive Design-Build Services Questions".

SECTION 1: OWNER DESCRIPTION

1.1 General

The Piedmont Triad Regional Water Authority ('PTRWA') is a wholesale drinking water supplier located in the northern most portion of Randolph County, North Carolina. PTRWA provides potable water to its member governments at entry point meters to their distribution systems in accordance with a 50-year contractual agreement. The member governments who are currently allocated water from PTRWA's John Franklin Kime Water Treatment Plant ('JFK-WTP') are the Cities of Archdale, Greensboro, High Point and Randleman as well as the Town of Jamestown and Randolph County. The entire Piedmont Triad region is experiencing significant economic growth with large scale manufacturing development throughout the region, the infrastructure demands associated with these facilities and the expected residential growth are necessitating an expansion of the JFK-WTP. The facility is currently permitted to produce 14.7 million Gallons per Day ('MGD') of treated water, expansion is expected to bring the production capacity to 26.7 MGD. Ultimately the JFK-WTP will be expanded to a finished production capacity of 48 MGD and the design of the current expansion is expected to incorporate components that will facilitate streamlined additions for increased capacity.

The raw water source for the JFK-WTP is Randleman Lake, a man-made 3000 acres reservoir created by construction of a roller compacted concrete dam at the confluence of the Deep River and Muddy Creek. Land use in the immediate vicinity of the reservoir is a mix of rural and agricultural uses leading to the creation of a 200-foot buffer around the reservoir to minimize nutrient laden runoff. The upstream watershed is identified as significantly more urbanized development with potential industrial contaminant sources including the City of High Point's Wastewater Discharge, a chemical disposal Superfund Remediation Site, retired and active landfills, airport operating activities and manufacturing and industrial facilities. Given the industrialized nature of the watershed PTRWA has been actively monitoring for emerging compounds in the watershed since concerns around these types of constituents first began garnering interest following the completion of the 3rd round of EPA's unregulated contaminant monitoring. PTRWA has identified several emerging compounds of concern in the reservoir including 1,4 Dioxane at levels in excess of the 1 in 1,000,000 elevated cancer risk threshold and PFAS compounds at levels in excess of EPA's proposed regulatory levels. PTRWA has also identified harmful algal blooms, elevated iron and manganese levels in the raw water and disinfection byproduct as additional constituents that could impact the ability to adequately treat the water in the future. Given the currently regulatory movement regarding these emerging compounds and the potential for constituents that are not yet even monitored to become an issue in the future the PTRWA Board of Directors has made the decision to move forward with a treatment strategy that provides the broadest and highest level of protection currently available, reverse osmosis treatment.

As part of the planning for expansion and emerging compound treatment PTRWA has had a draft Capacity Expansion Technical Memorandum, draft Treatment Improvements Technical Memorandum and a draft Advanced Treatment Evaluation Technical Memorandum developed. All of these documents have been consolidated into a single Preliminary Engineering Report for the JFK-WTP Expansion and Emerging Contaminants ('PER'), the report includes the following:

- Definition of process requirements for the expansion including alternatives where appropriate
- Design criteria for each process, including loading rates, flow conditions, dosage requirements, etc. for each expanded process
- Process flow diagrams for the main treatment and waste stream handling
- Draft Process and Instrumentation Diagrams (P&ID's) for all major processes including waste stream process and chemical feed systems
- Structural basis of design with defined building codes or alternative structural loading criteria
- Building mechanical basis of design for all major structures including required building codes or alternative design criteria
- Preliminary level (approximately 30 percent complete) drawings for major components of the treatment plant
- Cost estimate for expansion

- Evaluation of emerging contaminants treatment option along with conceptual design, site plans and cost estimate

It is expected that this document will be used as the starting point for development of the final design and construction of the treatment plant expansion and emerging compound treatment system.

Given the size and scope of the project, PTRWA has selected Black & Veatch to serve as an advisor through the RFQ selection process. At the conclusion of the RFQ selection process PTRWA may also elect to select a firm to serve as an owner's advisor to assist PTRWA with review of design and submittals, permitting, construction administration, and other tasks as deemed necessary.

1.2 Funding/Authority

PTRWA may use multiple funding sources to complete the project. Potential funding sources include State Revolving Fund loans or grants, local funds, and/or revenue bonds. The PTRWA Board of Directors will approve all project funding. To the extent the Project is financed, in whole or in part, by State Revolving Loan Funds, the selected Design-Builder will be required to comply with the requirements of the Build America, Buy America Act ("BABA"). So that PTRWA can fully evaluate costs associated with accepting funding that requires BABA compliance the Design Builder will be required to clearly disclose all costs associated with compliance.

SECTION 2: OVERVIEW OF PROJECT

2.1 Project Objectives

PTRWA has established the following overall strategic objectives for the JFK-WTP Expansion and Reverse Osmosis Treatment System Installation Project:

- Maintain a safe, injury free work environment and project site.
- Complete the project on, or ahead of, schedule.
- Complete the project in a cost conscious manner that delivers the best overall value to PTRWA.
- Establish a collaborative relationship between the PTRWA, any owner's advisor, other stakeholders, and the Design-Build Team to deliver quality design and construction.
- Design and construct a project that will achieve novel solutions.
- Demonstrate the value and benefits of collaborative delivery through the Progressive Design-Build process.
- Work with the PTRWA's operations, maintenance, and management team to provide maintenance of plant operations during construction.
- Provide seamless transition of start-up activities to the PTRWA's operations, maintenance, and management team.
- Provide opportunities for Minority Businesses (MBEs), Women Businesses (WBEs), Disadvantaged Business Enterprises (DBEs) and other small businesses.
- Incorporate principles of sustainability into the design and construction of the project.
- Prepare a design that where possible matches existing infrastructure to facilitate cohesive operation and maintenance of the facility,

2.2 Anticipated Scope of Work

See Exhibit A.

2.3 Estimated Budget and Schedule

The estimated budget for the Scope of Work referenced in Section 2.2 and as further set forth in Exhibit A is currently One Hundred Seventy-Five Million Dollars ($175,000,000).

PTRWA's has two target project completion dates

Treatment plant expansion substantial completion – December 2026

Advanced treatment process substantial completion – December 2027

2.4 Project Procurement Schedule

The following is the Project Procurement Schedule. The Owner reserves the right to modify the Project Procurement Schedule via Addenda issued prior to the SOQ Due Date set forth below.

Activity	Date
Readvertisement of RFQ	Nov 21, 2023
Last Date to Submit Questions Regarding the RFQ	Nov 24, 2023
SOQ Due Date	Nov 28, 2023
Notification of Short Listed Proposers (Optional)	Dec 5, 2023

Activity	Date
Interviews with Short Listed Proposers (Optional)	Dec 12, 2023
Notify Design-Builder of Intent to Select and Negotiate (Phase 1)	Dec 20, 2023

2.5 Definitions

2.5.1 Business Day: Any day on which the Owner is open for regularly conducted business.

2.5.2 Design-Builder: The entity with the prime design-build contract with the Owner.

2.5.3 Design-Build Team: All entities listed by the Design-Builder as providing services or construction on the Project. The Design-Builder is not required to list all members of the Design-Build Team in the SOQ. Members of the Design-Build Team may also be referred to as "Team Members."

2.5.4 Key Team Members: Individuals who will be assigned to the Project who play an important role in the design, construction, or management of the Project.

2.5.5 Procurement: The Owner's process for selecting a Design-Build Team for this Project.

2.5.6 Procurement Documents: All documents issued by the Owner in connection with the Procurement or Project.

2.5.7 Projects of Similar Scope and Complexity: Projects that had completion dates within the last 5 years and that have many or all of the following characteristics:

a. Projects of a similar size and budget that include:

- Design and construction of drinking water (preferred) or wastewater treatment plants with capacities (or capacity upgrades) of 12 MGD or greater.
- Permitting and preliminary engineering for the above reference facilities.
- Federal or state funding requirements.

b. Projects that utilize an integrated delivery method that require strong coordination and integration of the design and construction professionals and early involvement of the construction professionals during design; and

c. Projects where the Design-Builder was selected prior to the establishment of the final price and schedule and where the Design-Builder collaborated with the Owner to develop the final price and schedule.

SECTION 3: PROCUREMENT PROCESS

3.1 General Information

3.1.1 Compliance with Legal Requirements

This Procurement will be in accordance with N.C.G.S. 143-128.1A and all applicable federal, state, and local laws, and all applicable Owner policies and procedures.

3.1.2 Conflict of Interest and Communications with the Owner

a. Proposers are required to conduct the preparation of their SOQs with professional integrity and free of lobbying activities. Communication with the Owner regarding this Project shall be via email only and directed to the contact person listed on page 2 under Deadline for Questions.

From and after the issuance date of this RFQ, Proposers shall not communicate about the Project or the Procurement with any other Owner employees, representatives, or consultants. Communication with other Owner employees, representatives, or consultants regarding the Procurement may cause the firm involved to be disqualified from submitting under this Procurement. Any verified allegation that a responding Proposer or Team Member or an agent or consultant of the foregoing has made such contact or attempted to influence the evaluation, ranking, and/or selection of short-listed Proposers may be the cause for Owner to disqualify the Proposer team from submitting an SOQ, to disqualify the Team Member from participating in the Procurement, and/or to discontinue any further consideration of such Proposer or Team Member.

b. Following the Owner's option of approval of the Short Listed Proposers, the Owner anticipates that certain communications and contacts will be permitted. The RFQ and/or other written communications from Owner will set forth the rules and parameters of such permitted contacts and communications. To the extent any Proposer intends at any time to initiate contact with the general public regarding the Project, the nature of such intended contact and the substance thereof must be approved in writing by the Owner prior to the commencement of such activities.

3.1.3 Expenses of Proposer

The Owner accepts no liability for the costs and expenses incurred by firms in responding to this Procurement. Each Proposer that enters into the Procurement process shall prepare the required materials and the SOQ at its own expense and with the express understanding that the Proposer cannot make any claims whatsoever for reimbursement from the Owner for the costs and expenses associated with the process, even in the event the Owner cancels this Project or rejects all SOQs.

3.1.4 Public Disclosure

All documentation and submittals provided to the Owner may be considered public documents under applicable laws and may be subject to disclosure. Proposers recognize and agree that the Owner will not be responsible or liable in any way for any losses that the Proposer may suffer from the lawful disclosure of information or materials to third parties.

Any materials requested to be treated as confidential documents, proprietary information, or trade secrets must be clearly identified and readily separable from the balance of the SOQ. Such designations will not necessarily be conclusive, and Proposers may be required to justify why such material should not, upon written request, be disclosed by the Owner under the applicable public records act. The Owner will endeavor to provide at least two (2) Business Days' notice of a public records request for material submitted pursuant to this Procurement. Proposers must respond to the notice in writing with any objection to the production of the documents within two (2) Business Days of receipt of the notice. All costs incurred by Proposers associated with any public records request are the responsibility of the Proposers.

3.1.5 Identification of Projects

For each Project identified in the SOQ, provide the following information. The information required in this section can either be provided in a separate section of the SOQ, in the narrative for each of the evaluative criteria in Section 5.3, or the Proposer can provide a separate table for the identified Projects. The identification of Projects will not be evaluated separately. Rather, the Projects will be evaluated in the context of the criteria set forth in Section 5.3.

a. Name of Project;

b. Owner/Customer;

c. Location of Project (include address);

d. Description of the delivery method and integration of design and construction, identifying the firm(s) role as a prime consultant, subconsultant, contractor, subcontractor, or other;

e. Project description and applicability and relevance of the referenced Project to the evaluation criteria for this Project;

f. Name of each Key Team Member who is proposed for this Project who played a significant role on the Project example, including a description of their Project responsibilities and functions;

g. The initial contract price, the final contract price, and an explanation for any difference between the two amounts;

h. The initial date scheduled for substantial completion, the actual date of substantial completion, and an explanation for any difference between the two dates; and

i. Project contact of the owner or customer (current address, e-mail, and phone number) who can verify the characteristics of the submitted Project example.

3.2 Owner Rights and Procurement Conditions

3.2.1 The Owner reserves without limitation, and may exercise at its sole discretion, the following rights and conditions with regard to this Procurement process:

a. To cancel the Procurement process and reject any and all SOQs;

b. To waive any informality or irregularity;

c. To revise the Procurement Documents and Schedule via an Addendum;

d. To reject any Proposer that submits an incomplete or inadequate response or is not responsive to the requirements of this RFQ;

e. To require confirmation of information furnished by a Proposer, require additional information from a Proposer concerning its SOQ and require additional evidence of qualifications to perform the work described in this RFQ;

f. To provide clarifications or conduct discussions, at any time, with one or more Proposers;

g. To contact references who are not listed in the Proposer’s SOQs and investigate statements on the SOQs and/or qualification of the Proposer and any firms or individuals identified in the SOQ;

h. To consider alternative concepts and/or approaches identified by Proposers;

i. To take any action affecting the RFQ process, or the Project that is determined to be in the Owner’s best interests; and

j. Approve or disapprove of the use of particular Subconsultants, Subcontractors, or Key Team Members and/or substitutions and/or changes to Subconsultants, Subcontractors, or Key Team Members from those identified in the SOQ. Such approval or disapproval shall not be unreasonably exercised.

3.3 Outline of the Procurement Process

3.3.1 Request for Qualifications (RFQ)

a. This RFQ invites firms to submit SOQs describing in detail their technical, management, and financial qualifications to design, permit, construct, commission, and close out the Project. The issuance of this RFQ is the first phase of the Procurement process.

b. Proposers will submit their SOQ and other deliverables required pursuant to this Procurement at the time and in the manner set forth in this RFQ and any Addenda. The Owner will not consider SOQ or other deliverables that are submitted after the Time set forth in the RFQ. Proposers are solely responsible for making sure that the Owner receives the SOQ in a timely fashion.

c. The Owner will evaluate the information submitted by each Proposer to 1) determine whether the Proposer meets the mandatory minimum requirements and 2) evaluate the SOQ provided by each Proposer pursuant to the evaluation system described below. Any Proposer who fails to meet the mandatory minimum requirements set forth in this SOQ will be deemed non-responsive and will not be considered further by the Owner in this Procurement.

d. All SOQs will be evaluated in accordance solely with the criteria established in the RFQ and any Addenda issued thereto. The evaluation criteria are listed below, including the relative weight or importance given to each criterion.

e. Not more than three responsive and responsible firms may be selected as Short-Listed Proposers. Only those firms that have been short-listed will be invited to participate in subsequent interviews.

f. The results of the SOQ evaluations will not be carried forward and included in the final evaluation and selection after the interviews.

g. Design-Build Team Members and individual Key Team Members will be used as a basis for selection. Once shortlisted, neither the Proposer nor Team Members that are submitted to the Owner as part of the SOQ may substitute a listed consultant, subconsultant or subcontractor, or any individual listed as a Key Team Member; however, should a change be necessitated to any submitted Team Member or Key Team Member, this will result in re-evaluation and may result in a change to the evaluation and ranking of the Proposer. Changes to Team Members and individual Key Team Members shall require written approval by the Owner.

3.3.2 Selection Process

a. The Owner will establish an RFQ Evaluation Committee to review and evaluate the SOQs. The RFQ Evaluation Committee will evaluate the SOQs in accordance with the owner's evaluation criteria.

b. At its sole discretion, the Owner may ask written questions of Proposers, seek written clarifications, and conduct discussions with Proposers on the SOQs.

c. The Owner may select based on the SOQs or elect to short-list and interview the Short-Listed Proposers.

d. The Owner will provide written notification to all Short-Listed Proposers of the selection decision at the conclusion of the Procurement.

e. At the Owner's discretion, it will initiate negotiations with the Preferred Proposer. The "Preferred Proposer" is the Proposer that the Owner determines achieves the apparent best overall ranking. If the Owner is unable to execute a contract with the Preferred Proposer, negotiations with the Preferred Proposer may be terminated, and provided that such negotiations are terminated in writing, the Owner may proceed to negotiate with the next Preferred Proposer. The Owner will continue in accordance with this procedure until a contract agreement is reached or the selection process is terminated. Negotiations are at the Owner's sole discretion.

3.3.3 Evaluation and Ranking of Proposers

In the evaluation and ranking of Proposers, the Owner will consider the information submitted in the SOQ with respect to the evaluation criteria set forth in the RFQ. The Owner may select based on the SOQs or elect to short-list Proposers and interview the Short-Listed Proposers. The results of the evaluation will be a comparative ranking of Proposers.

The evaluation criteria will be according to the following score and point criteria:

Item	**Criteria**	**Weight**
1	General Information	5
2	Relevant Firm Experience and References	15
3	Project Team Qualifications and Availability of Resources	15
4	Project Understanding	15
5	Approach to Project Management, Communications and Schedule Adherence	10
6	Innovative Ideas	15
7	Approach to Safety and Quality Control	10
8	Price Factors	5

Item	Criteria	Weight
9	Other Factors	5
10	MBE, WBE, SBE, DBE and Small Business Participation Outreach Plan	5
11	Financial & Legal	Pass/Fail
	Totals	**100**

3.4 Contract Format

3.4.1 The Owner will enter into negotiations for the Design-Build Agreement with the Preferred Proposer. The Design-Build Agreement is anticipated to utilize the Design-Build Institute of America Progressive Design-Build Agreement for Water and Wastewater Projects, Document No. 545, and the DBIA Standard Form of General Conditions of Contract Between Owner and Design-Builder, Document No. 535, as revised and set forth in this SOQ (Exhibits D and E respectively). The DB assumes design and construction risk and has direct authority over the sub-consultants and subcontractors. PTRWA intends to enter into an Agreement with the selected Design-Build firm based upon DBIA standard contract documents. Upon completion of the pre-construction scope of work, PTRWA intends to develop a Lump Sum Guaranteed Maximum Price (GMP) with the selected Design-Build firm for the Project. The Project will be an "open book" job whereby PTRWA may attend any, and all, meetings of the DB firm relating to the Project and have access to any and all books and records of the DB relating to the Project.

SECTION 4: SOQ DOCUMENTATION REQUIREMENTS

4.1 SOQ Submittal Requirements

4.1.1 Proposers wanting to be considered for providing the required services to the PTRWA should submit an electronic proposal to the Owner Contact Person stated on page 2 of the RFQ. Proposals must be in searchable PDF format only and sent as an attachment to the email (Proposers may not provide a link to the document). PDF attachments must be limited to less than 25 MB. Hard copies will not be accepted. The subject line of the email shall include “JFK-WTP Expansion & RO – Progressive Design-Build Services SOQ” and the proposal file name should begin with the Proposer’s name.

4.1.2 Each Proposer is solely responsible for the timely delivery of their SOQ. Proposers accept all risks of late delivery regardless of fault. Proposers accept all risk if file is corrupted, incorrect, incomplete, or not attached. Any SOQ received after the date and time specified shall not be considered. The Owner Contact Person will confirm receipt of SOQs to all Proposers via email within 24 hours of the SOQ deadline.

4.2 SOQ Format Requirements

The SOQs shall comply with the following format requirements:

4.2.1 Pages shall be numbered.

4.2.2 Page limit shall be 50 single-side pages not counting the cover letter, minimum qualifications statements (see section 5.12) or corporate structure questionnaires (see section 5.13), documents needed under paragraph 5.11 and team resumes.

4.2.3 Pages sized greater than 8.5x11-inches will count as two pages. These larger pages may be used in any section at the Proposer's discretion.

4.2.4 Add tabs between sections. Tabs are not included in the page count.

4.2.5 The font shall be no smaller than 11 points for narrative sections, but may be reduced for captions, footnotes, etc. as required while still maintaining legibility.

4.2.6 Proposers may not include hyperlinks, QR codes, or similar, that links to websites or additional online resources in their SOQ. All content submitted for consideration must be printed in the SOQ and adhere to the page limits provided.

4.2.7 SOQs that exceed the page limit may be rejected. The Owner, at its sole discretion, reserves the right to remove pages from the sections of any non-conforming SOQ submittals to bring each non-conforming SOQ submittal within the page count requirement.

SECTION 5: SOQ EVALUATION CRITERIA AND SUBMITTAL INFORMATION

5.1 Evaluation Criteria 1 – General information

5.1.1 Description of firm/team

5.1.2 Legal company organization; organizational chart with names. The organizational chart shall also include major subcontractors.

5.1.3 Identify the Project Manager for the DB firm who will be assigned to this project.

5.1.4 Each Proposer shall submit in its response to this RFQ an explanation of its project team selection consisting of either of the following team selection options:

5.1.5 A list of the licensed contractors, licensed subcontractors, and design professionals whom the design-builder proposes to use for the project's design and construction. If this project team selection option is used, the design-builder may self-perform some or all of the work with employees of the design-builder and, without bidding, also enter into negotiated subcontracts to perform some or all of the work with subcontractors, including, but not exclusively with, those identified in the list. In submitting its list, the design-builder may, but is not required to, include one or more unlicensed subcontractors the design-builder proposes to use. If this project team selection option is used, the design-builder may, at its election and with or without the use of negotiated subcontracts, accept bids for the selection of one or more of its first-tier subcontractors; or

5.1.6 A list of the licensed contractors and design professionals whom the design-builder proposes to use for the project's design and construction and an outline of the strategy the design-builder plans to use for open subcontractor selection based upon the provisions of Article 8 of Chapter 143 of the General Statutes. If this project team selection option is used, the design-builder may also self-perform some of the work with employees of the design-builder,but shall not enter into negotiated contracts with first- tier subcontractors.

5.2 Evaluation Criteria 2 – Relevant firm experience and references

5.2.1 Applicant's service capabilities and quality as it relates to this project.

5.2.2 List and briefly describe 3 comparable projects completed by your firm or currently in progress; include your firm's role, and discuss contract amendment history, if applicable. For each project, include contract value and construction value (original value plus contract amendments, if applicable), project owner, project location, contact name and title, address, current and accurate telephone number, and email address (if available). Projects involving Design-Build and construction of water treatment facilities expansions at or over 25 MGD will have an increased weight in the evaluation process.

5.2.3 A minimum of three referrals and references from other agencies and owners. If possible, references should be from the projects listed above.

5.2.4 Type and amount of total self-performed work that was completed (for completed projects) or is anticipated (for on-going projects).

5.3 <u>Evaluation Criteria 3 – Project team qualifications and availability of resources</u>

5.3.1 Provide an overall organizational chart (showing Team Members, Key Team Members, and their firm affiliation) for all phases of the Project from design through final acceptance and warranty maintenance period with names, including subcontractors.

5.3.2 Briefly describe each team member's role on this project.

5.3.3 Provide "team" experience working together on similar projects.

5.3.4 Explain your understanding of, and experience with, the Progressive Design- Build Delivery Method.

5.3.5 Provide information regarding teaming history and working relationship between the DB and the DB's consulting engineering firm(s).

5.3.6 Provide information regarding teaming history and working relationship between the DB and any proposed major construction subcontractor(s).

5.3.7 Explain the DB team’s current workload and ability to proceed promptly with the project. Provide a statement regarding your assurance that your team has the necessary resources available to complete this project within the schedule provided in this RFQ.

5.3.8 Emphasis will be placed on past performance and expertise in performing substantive work on projects that are of Similar Scope and Complexity, as described in the Definitions above. The Owner reserves the right to award more points to projects that have more of the characteristics set forth in the definition of Projects of Similar Scope and Complexity. The Owner also reserves the right to award more points to successful projects in which the Proposer, Team Members, and/or individual Key Team Members had substantial responsibility for their respective scopes of work. In addition, the Owner reserves the right to award more points to successful projects in which the Proposer, Team Members, and/or individual Key Team Members have completed in the Southeast or Mid-Atlantic regions of the US. Provide location of each team member on the organization chart.

5.4 <u>Evaluation Criteria 4 – Project understanding</u>

5.4.1 Describe your understanding of the project.

5.4.2 Methodology and approach to the design, permitting, and construction services including creative alternatives that could be proposed to add value or cost saving measures.

5.4.3 Describe the Team’s Technical and Project Management Approach to delivering on the Project Objectives outlined in Section 2.1 (it is recommended that this section be organized in an outline fashion as tied back to the Project Objectives in Section 2.1).

5.4.4 Identify and discuss any potential risk during design and construction and possible mitigation measures.

5.4.5 Describe approach to maintaining operations at the existing facilities during construction activities.

5.4.6 Describe the Team's approach to work with the PTRWA's operations, maintenance, and management team to provide maintenance of plant operations during construction

5.4.7 Identify key project risk factors and how the Team plans to mitigate these risks working collaboratively with PTRWA and any Owner's Advisor.

a. Outline the Team's approach to a transparent Progressive Design-Build process.

b. Outline the Team's approach to cost estimating and the challenges with current market volatility.

c. Outline the Team's approach for allowing qualified local and regional contractor participation through a competitive bid process.

d. Describe the Team's approach to differing site conditions during construction, including subsurface geotechnical conditions.

e. Describe the Team's approach to using Building Information Modeling (BIM) to complete design and communicate effectively with Owner.

5.5 Evaluation Criteria 5 – Approach to project management, communications and schedule adherence

5.5.1 Describe your overall Project Management Approach.

5.5.2 Describe your planning, scheduling, estimating, and construction management tools.

5.5.3 Describe your communications approach to PTRWA and their Owner's Advisor.

5.5.4 Describe your quality control plan during design and construction.

5.6 Evaluation Criteria 6 – Innovative ideas

5.6.1 Describe any innovative ideas, alternative design and/or construction concepts that will provide PTRWA added value. For each proposed idea provide the below information in sufficient detail to allow the PTRWA to determine whether the proposed idea is in PTRWA's best interest

a. innovative idea overview and benefits

b. estimated cost savings

c. estimated schedule implications

5.7 Evaluation Criteria 7 – Approach to safety and Quality control

5.7.1 Describe approach to safety management. Provide documentation verifying that proposer has an acceptable safety record, including Experience Modification Rate (EMR) for the last three years. Note, proposers are directed not to submit full safety plans just the approach to safety management.

5.8 Evaluation Criteria 8 – Price factors

Per S.L. 2021-189, Section 1.6, we are requesting price factors. Please fill-in and provide the following table with your SOQ.

Proposers Name:	
Design-Builder's Fee (%) for Phase 2 Services – as defined in DBIA Standard Document 545	%
Design-Builder's Fee (%) for additive Change Orders – as defined in DBIA Standard Document 545	%
Proposers 2022 Rate Table for Key Personnel	$/hr
Project Manager	
Design Manager	
Lead Process Engineer	
Preconstruction Services Manager	
Construction Manager	
Site Superintendent	
Safety Manager	
Start-up Manager	
Principal-in-Charge	

5.9 Evaluation Criteria 9 – Other factors

5.9.1 Provide statement regarding your willingness to abide by PTRWA's standard form Agreements with few or no objections or changes. PTRWA accepts the latest version of DBIA Standard Documents with appropriate modifications agreed upon by both parties.

5.9.2 Provide a statement regarding your assurance that this engagement will not result in a conflict of interest.

5.9.3 Describe relevant factors impacting the quality and value of work.

5.10 Evaluation Criteria 10 - MBE, WBE, SBE, DBE and small business participation outreach plan

5.10.1 Describe your approach to MBE, WBE, SBE, DBE, and Small Business Participation Outreach Plan.

5.10.2 Describe how you will comply with the Federal requirements as per 2 C.F.R. § 200.321.

5.11 Evaluation Criteria 11 - Financial & Legal

5.11.1 The selected DB firm will be required to provide a Performance and Payment Bond in the full amount of the contract. For this submittal, proposers shall provide evidence of their ability to provide and maintain the following:

a. A Performance and Payment Bond in the amount of at least $5M

b. General Liability Insurance at $5M per occurrence and $10M aggregate. Authority must be additional insured and endorsement required.

c. Umbrella Liability Insurance at $5M per occurrence. Authority must be additional insured and endorsement required.

d. Workman’s Compensation $1M Each Accident, $1M Disease-Each Employee, $1M Disease-Policy Limit. Waiver of Subrogation against the Authority and endorsement required.

e. Professional Liability at $2M per occurrence.

f. Auto Liability Insurance $1,000,000 per occurrence combined single limits applicable to claims due to bodily injury and/or property damage. Authority must be additional insured and endorsement required.

g. Builder’s Risk Insurance in the amount of at least $175M.

5.11.2 List and describe any litigation; arbitration; claims filed by your firm against any project owner as a result of a contract dispute; any claim filed against your firm; termination from a project.

a. Any firm wishing to be considered must be properly registered with the Office of the Secretary of State.

5.12 Minimum Qualifications

5.12.1 Statement of Proposer’s Ability to Provide Performance and Payment Bond (Pass/Fail)

As a **mandatory minimum requirement,** the Proposer must have the ability to obtain performance and payment bonds each in the penal amount of not less than $200,000,000. Proposer shall provide a letter signed by an authorized representative of Proposer’s surety company (or agent) confirming that the Proposer can meet this minimum requirement. Any Proposer who fails to meet this mandatory minimum requirement will be considered non-responsive and will not be considered further by the Owner in this Procurement process. The surety shall be a company authorized to conduct business in the state where the Project is located with a minimum rating of A.M. Best A-VII. Letters indicating “unlimited” bonding capability are not acceptable.

5.12.2 Statement of Proposer’s Ability to Meet the Owner’s Insurance Requirements. (Pass/Fail)

As a **mandatory minimum requirement,** the Proposer must document that it has the ability to meet the minimum insurance requirements as set forth in the attached draft Insurance Requirements (section 5.11). Proposer shall provide a letter from Proposer’s insurance company or broker indicating that the Proposer is capable of complying with the insurance requirements specified in section 5.11. Any Proposer who fails to meet this mandatory minimum requirement will be considered non-responsive and will not be considered further by the Owner in this Procurement process. The insurer shall be a company authorized to conduct business in the state where the Project is located with a minimum rating of A.M. Best A-VII.

5.13 Additional Forms (Does not count against page limit)

5.13.1 Submit a completed Corporate Structure Questionnaire (Exhibit C) for Design-Builder and each proposed subcontractor or subconsultant to the Design-Builder that is known at the time of the SOQ submission date.

SECTION 6: ADDITIONAL INFORMATION ABOUT THIS RFQ

6.1 E-Verify

E-Verify is the federal program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program, used to verify the work authorization of newly hired employees pursuant to federal law. Design-Builder shall ensure that Design-Builder and any subcontractor performing work under the contract: (i) complies with the E-Verify requirements set forth in Article 2 of Chapter 64 of the North Carolina General Statutes; and (ii) otherwise complies with applicable law.

6.2 Minority and Small Business Participation Outreach – Good Faith Effort

Minority Businesses (MBEs), Women Businesses (WBEs), Disadvantaged Business Enterprises (DBEs), and other small businesses shall have the opportunity to compete fairly in contracts financed in whole or in part with public funds. Consistent with this policy, PTRWA will not allow any person or business to be excluded from participation in, denied the benefits of, or otherwise is discriminated against in connection with the award and performance of any contract because of sex, race, religion, or national origin. The Proposer’s MBE, WBE, SBE, DBE, and Small Business Participation Outreach Plan shall be evaluated by the PTRWA and given the weight indicated in Section 3.3.3 of this RFQ.

If Design-Builder intends to let any Subcontracts, Design-Builder shall (1) place qualified small and minority businesses and women’s business enterprises on its solicitation lists; (2) assure that small and minority businesses and women's business enterprises are solicited whenever they are potential sources; (3) use the services and assistance, as appropriate, of the Small Business Administration, the Minority Business Development Agency of the Department of Commerce, and the North Carolina Office for Historically Underutilized Businesses.

An entity shall qualify (1) as a "minority business" or "women's business enterprise" if it is currently certified as a North Carolina "historically underutilized business" under Chapter 143, Section 128.4(a) of the N.C. General Statutes (hereinafter G.S.), and (2) as a "small business" if it is independently owned and operated and is qualified under the Small Business Administration criteria and size standards at 13 C.F.R. Part 21.

6.3 Equal Employment Opportunity

All Proposers will be required to follow Federal Equal Employment Opportunity (EEO) policies. PTRWA will affirmatively assure that on any project constructed pursuant to this advertisement, equal employment opportunity will be offered to all persons without regard to race, color, creed, religion, national origin, sex, and marital status, status with regard to public assistance, membership or activity in a local commission, disability, sexual orientation, or age. All submittals submitted in response to this request shall become the property of PTRWA and as such, may be subject to public review. All payroll taxes, liability and worker's compensation are the sole responsibility of the Proposer. The Proposer understands that an employer/employee relationship does not exist under this contract.

6.4 North Carolina Prohibition on Contracts with Companies that Invest in Iran or Boycott Israel

Proposer certifies that: (i) it is not identified on the Final Divestment List or any other list of prohibited investments created by the NC State Treasurer pursuant to N.C.G.S. 147-86.58 (collectively, the "Treasurer's IDA List"); (ii) it has not been designated by the NC State Treasurer pursuant to N.C.G.S. 147-86.81 as a company engaged in the boycott of Israel (such designation being referred to as the "Treasurer's IB List"); and (iii) it will not take any action causing it to appear on the Treasurer's IDA List or the Treasurer's IB List before or during the RFQ. In submitting a proposal in response to this RFQ, Proposer further agrees, as an independent obligation, separate and apart from this RFQ, to reimburse PTRWA for any and all damages, costs and attorneys' fees incurred by PTRWA in connection with any claim that the Proposer's SOQ or any part thereof is void due to Proposer appearing on the Treasurer's IDA List or the Treasurer's IB List at any time before or during the RFQ.

SECTION 7: LIST OF EXHIBITS

a. Project Scope of Work

b. Performance and Payment Bond Instructions

c. Corporate Structure Questionnaire

d. DBIA – DRAFT Progressive Design-Build Agreement for Water and Wastewater Projects (Document No. 545), revised

e. DBIA – DRAFT Standard Form of General Conditions of Contract Between Owner and Design-Builder (Document No. 535), revised

Exhibit A
Project Scope of Work

PROJECT DESCRIPTION

The water treatment plant expansion and emerging compound treatment project is expected to include the following key components:

1. Expansion of the JFK-WTP from a finished water production capacity of 14.7 MGD to a finished water production capacity of 26.7 MGD, acknowledging that the final production capacity of the facility may ultimately be limited by the capacity of the emerging compound treatment train. In general design and construction of the water treatment plant is expected to include:

    - Raw Water Pump – Additional raw pump and related electrical equipment at the raw water pump station
    - Raw Waterline – Provide redundant 42-inch raw waterline and sample lines from the raw water pump station to the water treatment plant
    - Raw Water Metering – New meters and vaults will be required to measure the combined flow coming from the two rater lines, an additional meter and vault will also be required to meter the flow to the new bank of super pulsators
    - Splitter Box – A new splitter box capable of handling the raw water capacity necessary to produce a finished water capacity of 48 MGD at full facility build out will be required, the splitter box will need to be equipped with the capability to direct flows to the different pulsator banks
    - Superpulsators – An additional bank of pulsators with rapid mix and splitter boxes appropriately sized for the designed hydraulic capacity will be required to ensure that adequate flocculation and sedimentation capacity is provided to yield a finished water supply of 26.7 MGD
    - Sludge Holding Tank – Convert the existing sludge thickener into a mixed or aerated sludge holding tank
    - Gravity Sludge Thickener – Provide a new gravity sludge thickener capable of hydraulic handling the wastewater flow to be generated by the expanded water treatment facility
    - Dewatering Facility – Provide sludge belt filter presses for the processing of the sludge to be generated
    - Sludge Storage – Provide new sludge storage facility that has capacity for a minimum of 45 days of sludge storage at a water treatment plant finished water production capacity of 48 MGD
    - Sludge Lift Stations – Modify existing sewage lift stations and provide new lift stations to facilitate necessary pumping between sludge holding tanks, gravity thickeners, belt filter press, sludge lagoon, decant lagoon and discharge flume
    - Chemical Feed Facilities – Provide new chemical storage and pumping facilities for bulk and day tank storage of coagulants and new dry polymer storage, mixing and pumping facilities for use in the Superpulsators
    - Generators – Provide new backup power generators, as part of providing the most efficient use of backup power an analysis of existing backup power generation should be conducted and the existing demand evaluated to determine the most efficient method of incorporating additional backup power into the facility. The evaluation of backup power should also investigate the feasibility and costs associated with providing a floating solar array and backup battery storage that could provide the full backup power requirements for the facility as an alternative to generator provided power;
    - Sustainability Solutions – Provide sustainable solutions with a balance of cost and benefit, determine best-fit solutions for reuse and recycling options. Work in conjunction with the owner's electrical utility provider to examine optimizing energy efficiency in the design of all improvements
    - Other miscellaneous improvements
2. Construction of a new reverse osmosis treatment facility for removal of emerging compounds from the filtered water supply. The reverse osmosis treatment facility will be sized to handle an influent water capacity of 26.7 MGD with what is determined to be the optimum stages of treatment through pilot study to yield the least amount of concentrate that can be treated in the most cost-effective manner. The reverse osmosis treatment facility will also be expected to contain a concentrate wastewater treatment that through pilot study is determined to provide

the most cost-effective method of removal of PFAS and 1,4 Dioxane so that the remaining concentrate stream can either be recycled to the head of the plant, blended with the treated water or sent back to the reservoir via the facility's NPDES permit. In general design and construction of the water treatment plant is expected to include:

- Pilot studying reverse osmosis treatment trains to determine the optimum treatment stages that will yield the least amount of concentrate in the most cost-effective manner in conjunction with also studying the overall performance of several different manufacturers reverse osmosis modules to determine the most beneficial manufacturers performance guarantee for the installed system
- Pilot studying reverse osmosis treatment concentrate treatment options to determine the most cost-effective method of removal of PFAS and 1,4 Dioxane from the concentrate stream to enable potential beneficial use of the water or disposal through traditional methods
- RO Treatment Building - New single standing building that is appropriately sized to house the required electrical gear, cartridge filters, pre-treatment chemicals and membrane skids to ultimately produce 48 MGD of finished reverse osmosis treated water
- Emerging Compound Laboratory Space, RO Equipment Storage and Unisex Restroom – In conjunction with the reverse osmosis treatment building or alternatively if determined to be a more cost-effective option provide laboratory space to establish a laboratory that will hold equipment that will analyze the levels of PFAS and 1,4 Dioxane in the RO influent and effluent. In addition, provide a single unisex restroom with shower and storage space for dedicated reverse osmosis system equipment and cartridge filters
- RO Treatment System – Provide electrical gear, cartridge filters, chemical feed and cleaning equipment and reverse osmosis skids to treat an influent flow of 26.7 MGD with the membranes and cartridge filters being operated in the N+1 configuration
- RO Concentrate Treatment System – Provide what is determined to be the most cost effective, efficient concentrate system that will allow for optimum beneficial use of the treated concentrate stream. Preliminary design analysis indicates that UV/AOP in single standing building, followed by Pressure GAC treatment in a single standing building may be an effective treatment strategy. Pilot studying of the concentrate treatment options will ultimately be used to make this design decision
- Sustainability Solutions – Provide sustainable solutions with a balance of cost and benefit, determine best-fit solutions for reuse and recycling options. Work in conjunction with the owner's electrical utility provider to examine optimizing energy efficiency in the design of all improvements
- Yard Piping – Underground piping improvement and modifications will be necessary to incorporate the reverse osmosis treatment system into the water treatment plants hydraulics. It is expected that these improvements will incorporate options that optimize redundancy and resiliency by providing adequate bypass, recycle and return options for the various treatment trains that flow throughout the overall facility
- Other miscellaneous improvements

PROPOSED PROJECT DELIVERY

This Project will be delivered in a two phased approach as described below.

- Phase 1 – Design and Pre-Construction Services: It is anticipated that the scope of services for Phase 1 will be negotiated on a lump sum basis and will require approval by PTRWA. During this phase, the scope of services will include overall project scoping, design workshops, development of 30% design and an initial opinion of cost, design completion to 60% or greater (with cost opinion update), development of a plan for PTRWA to maintain plant operation during construction, and with the preparation and delivery of a Guaranteed Maximum Price (GMP) and schedule for Phase 2.

  In addition, the PTRWA will work with the Design-Builder to finalize the terms of the Design-Builder Agreement for Phase 2. If the parties can negotiate the Agreement for Phase 2 including, but not limited to: scope, schedule, contract terms, and GMP then the Design-Builder will be authorized to proceed with Phase 2. It should be noted that the PTRWA must be able to demonstrate that execution of the Phase 2 work is cost-effective, allows for local sub-contractor competition, achieves schedule milestones, and meets the needs of the PTRWA. If a Phase 2 Agreement is not reached, then PTRWA will have no further contractual responsibility to the Design-Builder and may seek alternatives to project completion.

- Phase 2 – Design-Build Services Agreement: Phase 2 Design-Build work will include completion of design services, construction, start-up, training, testing and final project completion as outlined in the Design-Build Agreement.

DESIGN-BUILDER WORK SCOPE

The work scope for the Design-Builder for is expected to include, but not be limited, to the following:

1. Implementing a robust safety program for all design and construction related activities.
2. Leading interactive design workshops with PTRWA staff, and the Owner's Advisor.
3. Completing all preliminary and final design engineering efforts for the project with design document submittals at 30%, 60%, 90%, and 100%.
4. Developing an initial opinion of cost and then updating that cost opinion during design development with submittals at the 30% design stage, 60% design stage and GMP. An updated cost opinion should be maintained throughout the Phase 1 effort.
5. Completing all surveying and geotechnical engineering required for successful design and construction and development of construction pricing.
6. Working with Owner's Advisor to finalize all permitting activities and obtain permits required for project construction.
7. Providing all necessary project management, documentation, and progress reporting as required for a successful project.
8. Working with the PTRWA's operations, maintenance, and management team to provide maintenance of plant operations during construction.
9. Executing all design activities using Building Information Modeling (BIM) software.
10. Delivering quality assurance and quality control of design and construction related activities.
11. Providing engineering services during construction to include RFIs, shop drawing reviews, contractor change order requests, factory witness equipment testing observation and reports, preparation of record drawings, and project management support.
12. Construction management services
13. Leading start-up, performance testing, and any necessary training of PTRWA staff in successful operation of the Reverse Osmosis System and all associated processes.
14. Completing project close-out activities including final punch-lists, operations and maintenance manual production, training, project certifications, documentation for asset management, and warranty efforts

REFERENCE DOCUMENTS

The following reference documents are included with this RFQ:

1. Preliminary Engineering Report JFK WTP Expansion and Emerging Contaminants

Exhibit B
Performance and
Payment Bond Instructions

Proposers must submit a statement from their bonding company that the Proposer can meet the bonding requirements set forth in Section 5.12.1.

The Payment and Performance Bonds <u>for the Phase 2</u> activities shall be in the form per DBIA Forms 620 and 625.

Exhibit C
Corporate Structure Questionnaire

1. Proposers shall complete the following information for the Proposed Design-Builder and all proposed Design-Build Team Members:

Legal Name	
Street Address	
Mailing Address	
Point of Contact	
Position	
Email	
Telephone Number	
Type of Business	
D-U-N-S Number	
Federal Tax Identification Number	
State Contractor's Registration Number (if applicable)	
State Business License Number (if applicable)	

2. If the Proposed Design-Builder is a Joint Venture, Proposers must:
    a. Submit the above information the Joint Venture as well as for each member of the Joint Venture; and
    b. Attach a copy of the Joint Venture Agreement to this form.

Exhibit D
DBIA – DRAFT Progressive Design-Build Agreement for
Water and Wastewater Projects
(Document No. 545), revised

DBIA Contract Document #545

Progressive Design-Build Agreement for Water and Wastewater Projects

This Progressive Design-Build Agreement has been developed in conjunction with and endorsed by the Water Collaborative Delivery Association.

Water Collaborative Delivery Association

Better Projects, Together.

Document No. 545

Second Edition, 2022

Design-Build Institute of America - Contract Documents

LICENSE AGREEMENT

By using the DBIA Contract Documents, you agree to and are bound by the terms of this License Agreement.

1. **License.** The Design-Build Institute of America ("DBIA") provides DBIA Contract Documents and licenses their use worldwide. You acknowledge that DBIA Construction Documents are protected by the copyright laws of the United States. You have a limited nonexclusive license to: (a) Use DBIA Contract Documents on any number of machines owned, leased, or rented by your company or organization; (b) Use DBIA Contract Documents in printed form for bona fide contract purposes; and (c) Copy DBIA Contract Documents into any machine-readable or printed form for backup or modification purposes in support of your permitted use.

2. **User Responsibility.** You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from the DBIA Contract Documents. You acknowledge that you understand that the text of the DBIA Contract Documents has important legal consequences and that consultation with an attorney is recommended with respect to use or modification of the text. You will not represent that any of the contract documents you generate from DBIA Contract Documents are DBIA documents unless (a) the document text is used without alteration or (b) all additions and changes to, and deletions from, the text are clearly shown.

3. **Copies.** You may not use, copy, modify, or transfer DBIA Contract Documents, or any copy, modification, or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of DBIA Contract Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited. You will reproduce and include DBIA's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program.

4. **Transfers.** You may not transfer possession of any copy, modification or merged portion of DBIA Contract Documents to another party, except that a party with whom you are contracting may receive and use such transferred material solely for purposes of its contract with you. You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement, and any attempt to do so is void.

5. **Term.** This form is provided to the Water Collaborative Delivery Association (WCDA) under license from DBIA. The license grants WCDA the right to provide this form to WCDA members at no cost. DBIA may elect to terminate the license by written notice to WCDA and/or WCDA members if either party fails to comply with any term or condition of this Agreement.

6. **Limited Warranty.** DBIA warrants the electronic files or other media by which DBIA Contract Documents are furnished to be free from defects in materials and workmanship under normal use during the Term. There is no other warranty of any kind, expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. DBIA does not warrant that the DBIA Contract Documents will meet your requirements or that the operation of DBIA Contract Documents will be uninterrupted or error-free.

7. **Limitations of Remedies.** DBIA's entire liability and your exclusive remedy shall be: the replacement of any document not meeting DBIA's "Limited Warranty," which is returned to DBIA with a copy of your receipt, or at DBIA's election, your money will be refunded. In no event will DBIA be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use DBIA Contract Documents even if DBIA has been advised of the possibility of such damages, or for any claim by any other party. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

8. **Acknowledgement.** You acknowledge that you have read this agreement, understand it, and agree to be bound by its terms and conditions and that it will be governed by the laws of the District of Columbia. You further agree that it is the complete and exclusive statement of your agreement with DBIA which supersedes any proposal or prior agreement, oral or written, and any other communications between the parties relating to the subject matter of this agreement.

INSTRUCTIONS

For DBIA Document No. 545, Progressive Design-Build Agreement for Water and Wastewater Projects (2022 Edition)

Checklist

Use this Checklist to ensure that the Agreement is fully completed and all exhibits are attached.

_______	Page 1	Owner's name, address and form of business
_______	Page 1	Design-Builder's name, address and form of business
_______	Page 1	Project name and address
_______	Section 2.1.7	Identify other exhibits to the Agreement
_______	Section 4.3.2	Complete blanks for additional sum for use of Work Product
_______	Section 5.2.1	Complete blanks for calendar days and note the optional language that is provided
_______	Section 5.2.2	Insert any interim milestones (optional)
_______	Section 5.4	Complete blanks for liquidated damages and note the optional provisions that are provided
_______	Section 5.5	If the parties select the option provided they must insert an amount
	Section 5.6	Complete blanks for early completion bonus and note the optional provision that is provided
_______	Section 5.7	Note the optional provisions that are provided
_______	Section 6.1.1	Complete blank for Phase 1 Services price
_______	Section 6.1.3	Insert basis for pricing specific Work (optional)
_______	Section 6.2	Complete blank for Lump Sum pricing (optional)
_______	Section 6.3	Choose markups for changes
_______	Section 6.4	Choose basis for Fee and complete blanks
_______	Section 6.4.2	Insert financial arrangements for adjustments and note optional provisions
_______	Section 6.5.1.3	Complete blanks for markup; insert or attach personnel names, etc.
_______	Section 6.5.1.4	Note optional language that is provided
_______	Section 6.5.2.4	Note the optional provision that is provided
_______	Section 6.7.4	Note the optional provision that is provided
_______	Section 7.2.1	Complete blanks for day of month
_______	Section 7.3.1	Complete blanks for retention percentage and note optional provision
_______	Section 7.3.2	Note optional provision
_______	Section 7.5	Complete blanks for interest rate
_______	Section 8.1	Choose overhead/profit method for termination for convenience
_______	Section 8.2.1	Complete blanks for percentages
_______	Section 8.2.2	Complete blanks for percentages
_______	Section 9.1.1	Insert Owner's Senior Representative's name, etc. (optional)
_______	Section 9.1.2	Insert Owner's Representative's name, etc. (optional)
_______	Section 9.2.1	Insert Design-Builder's Senior Representative's name, etc. (optional)
_______	Section 9.2.2	Insert Design-Builder's Representative's name, etc. (optional)
_______	Section 10.1	Attach Insurance Exhibit
_______	Section 10.2	Insert amount and conditions of bonds or other security and note the options that are provided
_______	Section 11	Insert any other provisions (optional) or exhibits or documents incorporated or referenced in the Agreement
_______	Section 12	Complete blank for rate
_______	Last Page	Owner's and Design-Builder's execution of the Agreement
_______	Exhibit A, Detail Owner's Project Criteria as referenced at Section 1.1.1	
_______	Exhibit B, Detail Phase 1 Scope of Work as referenced in Section 1.2.1	

General Instructions

No.	Subject	Instruction
1.	Standard Forms	Standard form contracts have long served an important function in the United States and international construction markets. The common purpose of these forms is to provide an economical and convenient way for parties to contract for design and construction services. As standard forms gain acceptance and are used with increased frequency, parties are able to enter into contracts with greater certainty as to their rights and responsibilities.
2.	DBIA Standard Form Contract Documents	Since its formation in 1993, the Design-Build Institute of America ("DBIA") has regularly evaluated the needs of owners, design-builders and other parties to the design-build process in preparation for developing its own contract forms. Consistent with DBIA's mission of promulgating best design-build practices, DBIA believes that the design-build contract should reflect a balanced approach to risk that considers the legitimate interests of all parties to the design-build process. DBIA's Standard Form Contract Documents reflect a modern risk allocation approach, allocating each risk to the party best equipped to manage and minimize that risk, with the goal of promoting best design-build practices.
3.	Use of Non-DBIA Documents	To avoid inconsistencies among documents used for the same project, DBIA's Standard Form Contract Documents should not be used in conjunction with non-DBIA documents unless the non-DBIA documents are appropriately modified on the advice of legal counsel. Moreover, care should also be taken when using different editions of the DBIA Standard Form Documents on the same project to ensure consistency.
4.	Legal Consequences	DBIA Standard Form Contract Documents are legally binding contracts with important legal consequences. Contracting parties are advised and encouraged to seek legal counsel in completing or modifying these Documents.
5.	Reproduction	DBIA hereby grants to purchasers a limited license to reproduce its Documents consistent with the License Agreement accompanying these Documents. At least two original versions of the Agreement should be signed by the parties. Any other reproduction of DBIA Documents is strictly prohibited.
6.	Modifications	Effective contracting is accomplished when the parties give specific thought to their contracting goals and then tailor the contract to meet the unique needs of the project and the design-build team. For that reason, these Documents may require modification for various purposes including, for example, to comply with local codes and laws, or to add special terms. DBIA's latest revisions to its Documents provide the parties an opportunity to customize their contractual relationship by selecting various optional contract clauses that may better reflect the unique needs and risks associated with the project. Any modifications to these Documents should be initialed by the parties. At no time should a document be re-typed in its entirety. Re-creating the document violates copyright laws and destroys one of the advantages of standard forms – familiarity with the terms.
7.	Execution	It is good practice to execute two original copies of the Agreement. Only persons authorized to sign for the contracting parties may execute the Agreement.

Specific Instructions

Section	Title	Instruction
General	Purpose of This Agreement	DBIA Document No. 545 (“Agreement”) should be used for progressive design-build water and wastewater projects. Progressive Design-Build allows an Owner to complete a Design-Build project in two phases. In Phase 1Owner completes preliminary design, sets the construction plan and establishes the Phase 2 costs to complete final design and the planned construction. This Agreement allows for Owner to pay Design-Builder for design services and construction work in Phase 2 using Cost of the Work plus a Fee, with or without a Guaranteed Maximum Price (“GMP”), or Lump Sum. If there is uncertainty about Owner’s final design Project Criteria after Phase 1, or the final design Project Criteria remain to be developed by Owner and Design-Builder together during Phase 2, a cost-plus/GMP contracting approach is desirable. If there is certainty as to Owner’s Project Criteria and project design after Phase 1, a lump sum fixed price for the completion of all design and construction services in Phase 2 may be suitable, especially when Owner procures Design-Builder’s services by competitive means.
General	Purpose of These Instructions	These Instructions are not part of this Agreement but are provided to aid the parties in their understanding of the Agreement and in completing the Agreement.
General	Related Documents	This Agreement shall be used in conjunction with the General Conditions of Contract. Other related Contract Documents are listed in Article 2 of this Agreement.
General	Date	On Page 1, enter the date when both parties reach a final understanding. It is possible, due to logistical reasons, that the dates when the parties execute the Agreement may be different. Once both parties execute the Agreement, the effective date of the Agreement will be the date recorded on Page 1. This date does not, however, determine Contract Time, which is measured according to the terms of Article 5.
General	Parties: Owner and Design-Builder	On Page 1 enter the legal name and full address of Owner and Design-Builder, as well as the legal form of each entity, e.g., corporation, partnership, limited partnership, limited liability company or other.
1.3	Contract Price Amendment and Proposal	When a GMP or Lump Sum is established after execution of this Agreement for Phase 2 work, the Proposal must be attached to the Contract Price Amendment pursuant to Section 1.3.2.3. Both the Contract Price Amendment and Proposal will include those Basis of Design Documents Design-Builder uses as the basis for its Contract Price. This Agreement provides the parties flexibility in establishing the Phase 2 Contract Price. Parties can establish a GMP or Lump Sum for Phase 2 after entering into this Agreement, or elect to proceed on the basis of costs plus a fee, without a GMP or Lump Sum. If a GMP or Lump Sum method is elected, the GMP or Lump Sum should not be established until the Basis of Design Documents are sufficiently defined during Phase 1 to make the GMP or Lump Sum realistic and meaningful. Setting it too early does not permit reasonable opportunity for scope definition and evaluation of Project risk. On the other hand, setting it too late may not achieve Owner’s objective of having an early price guarantee to enable it to make decisions relative to the Project.
1.3	Proposal After Execution of This Agreement	At the completion of Phase 1 Services, Design-Builder shall submit its Proposal, which shall include the items listed in Sections 1.3.1.1 to 1.3.1.12. If the parties agree to additions or deletions from this list, modify Section 1.3 appropriately. The Agreement provides the parties with flexibility as to when the Proposal will be submitted after execution of the Agreement. Prior to execution of the Agreement the parties should discuss when Owner desires Design-Builder to submit its Proposal.

Section	Title	Instruction
1.3.1.4	Schedule	Given that expedited delivery is one of the primary factors driving many owners to select the design-build method, DBIA strongly believes that the parties should discuss and understand what each party must do to support the Project schedule. The entire Work, both design and construction, should be scheduled. The schedule should indicate the dates for the start and completion of the various stages of the Work, including the date when Owner information and approvals are required, and any Owner-created constraints. The Agreement also provides flexibility to establish the Scheduled Substantial Completion Date prior to submission of the Proposal.
1.3.2.3	Acceptance of Proposal	If Owner accepts the Proposal, the parties should amend this Agreement to add the final Proposal as a Contract Document pursuant to Section 2.1.2.
1.3.2.4	Failure to Accept the Proposal	This Agreement provides three options for Owner in the event it fails to accept the Proposal and two choices for Design-Builder if Owner fails to exercise any of the three options. These options are specifically designed to prevent one party from receiving a windfall in the event the parties cannot agree on the GMP or Lump Sum and the Agreement is terminated. This Agreement also states when the Agreement terminates or the Agreement is deemed completed if Owner fails to exercise one of the options. The parties should take note that if Owner exercises its option to terminate for convenience, or Design-Builder suspends performance, Design-Builder will not be entitled to payment for uncompleted Work provided by Section 8.2. However, additional payment for Owner's use of Work Product will be due Design-Builder pursuant to Section 4.3, if Owner proceeds to complete the Project using Design-Builder's Work Product.
2.1.5	Construction Documents	After execution of the Agreement, and consistent with the requirements of Section 2.4 of the General Conditions of Contract, Design-Builder will prepare Construction Documents, subject to Owner's review and approval.
2.1	Order of Precedence	The Contract Documents are listed in Section 2.1 in the order of their precedence. The Contract Price Amendment and Proposal are based on the Basis of Design Documents, which are comprised of various documents. The parties should strongly consider establishing the priority of the various documents comprising the Contract Price Amendment or Proposal to avoid disputes should discrepancies arise among the documents. Moreover, Section 2.1.7 recognizes that there may be other exhibits attached to this Agreement. If this is the case, the parties should discuss whether these exhibits should be part of the Basis of Design Documents. If these exhibits are not made part of the Basis of Design Documents, these exhibits will not take priority over the Basis of Design Documents in the event of a conflict.
3.3	Definitions	Terms, words and phrases used in the Agreement shall have the same meanings used in the General Conditions of Contract.
3.4	Design Specifications	Owner is cautioned that consistent with legal precedent, if it includes design specifications in its Project Criteria Design-Builder is entitled to rely on the information provided and to the extent said information is not accurate, Design-Builder is entitled to an adjustment in the Contract Price and/or Contract Time. Accordingly, Owner should consider using performance specifications to avoid such potential liability.
4.1	Work Product	This Agreement provides that Design-Builder shall retain ownership of the Work Product it produces, but obligates Design-Builder to grant a limited license to Owner to use the Work Product according to the terms and circumstances described in Sections 4.2, 4.3, 4.4 and 4.5.

Section	Title	Instruction
4.2	Owner's Limited License Upon Payment in Full	Design-Builder shall grant Owner, at Owner's sole risk, a limited license to use the Work Product at the completion of the Work in connection with Owner's occupation of the Project. This Section also provides the parties with the option of transferring ownership of some or all of the Work Product to Owner upon payment in full for all Work performed. Generally, where Owner desires ownership of Work Product, it is sufficient to transfer ownership of unique architectural and design elements.
4.3	Owner's Limited License Upon Owner's Termination for Convenience or Design-Builder's Election to Terminate	Owner should not use the Termination for Convenience Clause to obtain Design-Builder's valuable design concepts, and then seek lower bids from other design-builders. Therefore, where Owner terminates this Agreement for its convenience, and then decides to complete the Project with its own or third party forces, Design-Builder shall grant Owner the rights set forth in Section 4.2, provided Owner pays Design-Builder all amounts due Design-Builder as required by the Contract Documents, including paying Design-Builder an additional sum per Section 4.3.2 for the use of the Work Product. In the event Design-Builder elects to terminate this Agreement for cause, for reasons set forth in Section 11.4 of the General Conditions of Contract, these same conditions apply to Owner's use of the Work Product.
4.3.2	Additional Compensation	To minimize disputes, the parties should negotiate prior to the execution of the Agreement the amount Owner shall pay Design-Builder for the use of Design-Builder's Work Product in the event Owner terminates this Agreement for its convenience or Design-Builder elects to terminate this Agreement for cause. Enter this amount.
4.4	Owner's Limited License upon Design-Builder's Default	If Design-Builder is properly terminated for default, Owner is granted a limited license to use the Work Product, to complete the Project, and Owner shall thereafter have the same rights and obligations as set forth in Section 4.2.
4.5	Owner's Indemnification for Use of Work Product	Owner's use or alteration of the Work Product shall be at its sole risk, and Owner must agree to defend, indemnify and hold harmless Design-Builder and anyone working by or through Design-Builder, including Design Consultants of any tier.
5.1	Date of Commencement	Design-Builder's obligation to commence work is triggered by its receipt of a Notice to Proceed unless the parties mutually agree otherwise.
5.2.1	Substantial Completion of the Entire Work	Enter the calendar days of duration by which Substantial Completion has to be achieved. The parties in this Section have the option of modifying the definition of Substantial Completion set forth in the General Conditions of Contract. If this option is selected, Substantial Completion will be deemed to be achieved no later than the date a Temporary Certificate of Occupancy is issued if applicable to the Project.
5.2.2	Interim Milestones	It may be that some portions of the Work must be completed in phases or within a prescribed period of time to accommodate Owner's needs. The parties may, at their option, identify these portions of the Work to be completed prior to Substantial Completion of the entire Work. Enter the calendar days, starting from the Date of Commencement, for achieving Substantial Completion of these identified portions of the Work. If these portions of the Work are required to be substantially completed by certain milestone dates, enter those dates. As presently drafted, no remedy is provided to Owner if an interim milestone is not met. If Owner has special requirements as it relates to interim milestones, Owner may want to consider a remedy for Design-Builder's failure to meet an interim milestone, as well as providing a bonus to Design-Builder for satisfying such interim milestone.

Section	Title	Instruction
5.4	Liquidated Damages	Owner should make a good faith evaluation of the amount that is reasonably necessary to compensate it for delay. Owner should not establish liquidated damages to penalize Design-Builder. Moreover, in the event a GMP or Lump Sum is not established upon execution of the Agreement, it appears prudent for the parties to refrain from establishing liquidated damages until such time as the GMP or Lump Sum is established. Section 5.4 establishes a grace period between the Scheduled Substantial Completion Date and the assessment of liquidated damages in order to prevent disputes as to which party bears responsibility for only a few days of delay. The parties should enter the calendar days that may pass following the Scheduled Substantial Completion Date before liquidated damages will be assessed. The parties are also provided the option of establishing liquidated damages if Design-Builder fails to achieve Final Completion within a specified number of days after Substantial Completion. If this option is selected, the parties must negotiate the number of days, as well as the liquidated damages amount. The parties in negotiating liquidated damages should keep in mind that the amount of liquidated damages for failing to achieve Final Completion should be a considerably scaled down amount and should reflect the financial harm to Owner. In no case should the total amount of liquidated damages for the Project exceed an amount that is reasonably necessary to compensate Owner for Project delay. The parties also have the option here of eliminating liquidated damages altogether, in which case Owner can recover actual damages for Project delay at an amount that is capped by the parties. Owner is cautioned that it still cannot recover consequential damages under Section 10.5.1 of the General Conditions of Contract. Owner is advised to seek the advice of legal counsel as liquidated damages for failing to timely attain Final Completion should constitute a reasonable estimate of the damages Owner will incur if Final Completion is not met within the specified number of days after Substantial Completion. It is foreseeable that such damages would be significantly less than any liquidated damages assessed for failing to timely attain Substantial Completion.
5.5	Liquidated Damages Cap	The parties can agree to cap liquidated damages at a negotiated amount.
5.6	Early Completion Bonus	If the Project economics justify liquidated damages, then it is appropriate to couple these liquidated damages with an early completion bonus. The parties should enter the number of calendar days prior to the Scheduled Substantial Completion Date that will set the Bonus Date. Also, enter the amount of the bonus to be paid per day that will allow Owner to share with Design-Builder the economic benefits of early completion. Moreover, in the event a GMP or Lump Sum is not established upon execution of the Agreement, it appears prudent for the parties to refrain from establishing an early completion bonus until such time as the GMP or Lump Sum is established. The parties also have the option in Section 5.6 of capping the early completion bonus at a negotiated amount.
5.7	Compensation for Force Majeure Events	The parties are provided the opportunity of providing Design-Builder the right to receive compensation for Force Majeure Events. By selecting this option, the parties agree to modify Section 8.2.2 of the General Conditions of Contract, in which case the parties must negotiate how many cumulative days of Force Majeure delays must occur before Design-Builder is entitled to either a negotiated amount per day for delay or the direct costs it has incurred as a result of such delay.

Section	Title	Instruction
6.1	GMP or Lump Sum at Agreement Execution	Enter the GMP or Lump Sum for Phase 2 Services, if appropriate. Attach as an amendment to this Agreement the Basis of Design Documents used to establish the GMP or Lump Sum. These documents comprise the Contract Price Amendment which shall become a Contract Document pursuant to Section 2.1.2 of the Agreement. Design-Builder does not guarantee any specific line item provided as part of a GMP. By selecting the alternate option if using a GMP, Design-Builder agrees to guarantee the line item in its GMP for general conditions costs only. Design-Builder agrees that it is responsible for paying general conditions costs in excess of this line item. Design-Builder does not guarantee any other line items in the GMP.
6.1.3	Optional Pricing	This Agreement allows the parties the flexibility to establish within the Contract Price a different payment basis for certain portions of the Work which may be necessary to permit Design-Builder to furnish Owner with a GMP or Lump Sum.
6.4.1	Design-Builder's Fee	Enter the amount of Design-Builder's Fee as a sum certain or as a percentage of the Cost of the Work. Design-Builder's Fee shall be commensurate with the services it provides and the risk it assumes in providing single point responsibility to Owner.
6.4.2	Adjustments to Design-Builder's Fee	For additive Change Orders, the parties must negotiate the Fee Design-Builder will receive. For deductive Change Orders, the parties have the option by checking the appropriate box of whether there will be no additional reduction or whether there will be an additional reduction based on a negotiated percentage.
6.5.1.3	Wages for Design-Builder's Employees at Principal or Branch Offices	DBIA endorses reimbursing salaries and associated benefits of Design-Builder's Project personnel, such as accountants, stationed at offices other than the field office, when to do so is more efficient and cost effective. Enter the percentage markup to be applied for Project-related overhead associated with such personnel. Insert, or attach as an exhibit, a list of such personnel and their job functions.
6.5.1.4	Employee Benefits	It may be simpler for the parties to agree on a multiplier (rather than actual costs) to compensate Design-Builder for employee benefits. Accordingly, the parties may want to insert the multiplier to be applied to the wages and salaries of its reimbursable employees.
6.5.1.7	Costs for Defective/Non-Conforming Work	The Cost of the Work shall include the costs to repair or correct defective or non-conforming Work (including warranty or corrective work performed after Substantial Completion) unless caused by Design-Builder's negligence. DBIA believes that Design-Builder should not be penalized for inadvertent mistakes which are inevitable when designing and constructing a Project. To do so would encourage ultra-conservatism in every task, the ultimate cost of which would be greater than a proactive approach to performing the Work, which includes ordinary mistakes or inadvertence.
6.5.1.23	Warranty Escrow	At this section, the parties are provided the opportunity to establish prior to Final Completion an escrow account in a negotiated amount to be used to reimburse Design-Builder for its costs incurred in performing warranty Work if a GMP is used. If funds remain in the escrow account after the expiration of the warranty period, the funds are returned to Owner subject to Design-Builder's share of any savings. Note that even if the escrow account is exhausted, if funds remain under the GMP, Owner is still obligated to reimburse Design-Builder for its warranty Work.

Section	Title	Instruction
6.6.2	GMP Contingency	Enter the amount of Design-Builder’s Contingency if using a GMP. The Contingency is for the exclusive use of Design-Builder and covers all unanticipated costs incurred that are not the basis of a Change Order. This section sets forth by way of example only the type of costs that would be funded out of the Contingency. Other costs such as, but not limited to, any deductibles Design-Builder is obligated to pay would be subject to reimbursement. Design-Builder is also required to provide Owner with a monthly status report accounting for the Contingency, including all reasonably foreseen uses and potential uses, of the Contingency for the upcoming three months. While not provided for in the Contingency provision, DBIA recognizes that there may be situations where Owner will want to recapture the Contingency prior to Final Completion. For example, Owner may want to use amounts in the Contingency to fund changes to the Project. Owner’s desire must be balanced against Design-Builder’s need to use the Contingency to fund unanticipated costs for which it is liable. An option to consider to accommodate both interests is to establish an “Owner’s Contingency” and a “Design-Builder’s Contingency” in the GMP. If this option is used, any savings clause in the agreement should be drafted appropriately to address these pools of funds.
6.6.3	Savings	One of the benefits of a GMP approach is the possibility that with good management by Design-Builder and timely support from Owner the actual Cost of the Work and Fee may be less than the GMP. This creates a savings pool that should result in a benefit to both Design-Builder and Owner. Sharing these savings creates an incentive for Design-Builder to save costs. Some factors to consider in determining how the Savings are shared include the timing for the establishment of the GMP and the amount of Design-Builder’s Fee established under Section 6.4.1.
6.6.3.1	Savings Calculations	This section provides that if the actual Cost of the Work and Design-Builder’s Fee is less than the GMP, as such GMP may have been adjusted, the savings, if any, shall be shared. The Agreement offers two choices for distributing Savings. Choose a method and enter the appropriate figures.
6.7.4	Allowance Value	This section recognizes that the parties may agree that certain items of Work should be treated as an Allowance Item and priced based on Allowance values. The Allowance Value for which Design-Builder will be entitled to receive compensation includes direct cost of labor, materials, equipment, transportation, taxes and insurance associated with the Allowance Item. All other costs associated with the Allowance Item, such as design fees, general conditions costs, and Fee are deemed to be included in the Contract Price. However, by checking the box, the parties agree that in the event the actual cost of the Allowance Item is greater than or less than the Allowance Value by a negotiated percentage, then Design-Builder’s right to Fee and markup shall be determined pursuant to Section 6.4.2.
6.8	Performance Incentives	In addition, for the potential of Design-Builder to share in Savings as set forth in Section 6.6.3, there may be other performance incentives that will influence Project success. Such incentives may include award fees tied to Design-Builder achieving certain standards relative to client satisfaction, safety and personnel retention. The parties are encouraged to discuss the use of such incentives during negotiation of this Agreement. Any agreement on the use of incentives should be set forth in an exhibit attached to this Agreement.
7.2.1	Progress Payments	Enter the day of the month when Design-Builder shall submit its Application for Payment.

Section	Title	Instruction
7.3.1	Retainage	Enter the percentage Owner will retain from Progress Payments to Design-Builder until fifty percent (50%) of the Work is completed. Owner should recognize that it creates undue hardship to hold retainage on Subcontractors that have completed their work early in the Project. Owner should accordingly consider releasing retainage on Subcontractors that complete work early in the Project, providing that these Subcontractors have satisfactorily performed their portion of the Work. The parties are provided the option of modifying the retainage provision by checking the box. This option excludes from retainage Design-Builder's General Conditions costs and amounts paid to Design-Builder's Design Consultant. The rationale for selecting this option is that Design-Builder is obligated to pay its General Conditions costs in full each month and that under the design-bid-build delivery method, Owner typically does not retain sums from its Designer.
7.3.2	Release of Retainage	This section requires Owner to release retainage to Design-Builder. If Design-Builder and Owner have established a warranty reserve in accordance with Section 6.5.1.23, the parties shall establish an escrow account at this time.
7.5	Interest	The parties should enter the rate at which interest will accrue on Design-Builder's payments if unpaid five (5) days after due. Late payment creates a hardship for Design-Builder, its Design Consultants, and Subcontractors.
7.6	Record Keeping	Owner is provided access to Design-Builder's accounting information as it relates to Costs of the Work. However, if the parties have agreed to multipliers or markups, the time to challenge and negotiate those percentages is at the time the parties execute the Agreement and not during the Project or after it has been completed. Accordingly, Owner can at any time audit these percentages only to confirm that such percentage has been properly charged and not to challenge the composition of such percentage.
8.1	Termination for Convenience: Overhead and Profit	The parties should choose prior to execution of the Agreement the method that will be used to determine overhead and profit paid to Design-Builder in the event Owner terminates Design-Builder for its convenience. The parties may choose to set percentage rates for overhead and profit prior to execution of the Agreement, or may choose to determine reasonable sums to be paid for overhead and profit at the time of the termination. If the parties choose to set overhead and profit rates prior to execution of the Agreement, the percentages should be entered in Section 8.1.
8.2	Termination for Convenience: Additional Payments	Although it is important for Owner to have a process for terminating this Agreement for convenience, the process must consider the interests of Design-Builder. If Owner terminates this Agreement for its own convenience, compensating Design-Builder for its costs will not be adequate because Design-Builder will have committed its resources for a small amount of revenue. Therefore, in addition to the overhead and profit paid in Section 8.1, Owner shall pay Design-Builder an additional sum, calculated as a percentage of the remaining balance of the Contract Price or, if a GMP or Lump Sum has not been established, the remaining balance of the most recent estimated Contract Price. Enter the percentages Owner shall pay Design-Builder if Owner terminates this Agreement for its own convenience prior to or after the start of construction.

Section	Title	Instruction
Article 9	Representatives of the Parties	Enter the name, title, address and telephone number of Owner's Senior Representative and Owner's Representative at Sections 9.1.1 and 9.1.2, respectively. Enter the name, title, address and telephone number of Design-Builder's Senior Representative and Design-Builder's Representative at Sections 9.2.1 and 9.2.2, respectively. The parties can elect to establish these Representatives during the performance of the Project rather than at the time of execution of this Agreement. If Representatives are identified after execution of the Agreement, an appropriate amendment should be made to the Agreement at the time these individuals are designated.
10.1	Insurance	Attach an Insurance Exhibit setting forth in detail the insurance coverages required for the Project. Parties are advised to familiarize themselves with the terms of Article 5 of the General Conditions of Contract, Insurance and Bonds, and to consult their insurance advisor.
10.2	Bonds	Enter the type and amount of bonds or other performance security required for the Project. Where bonding is not required by statute, Owner may want to evaluate the project risks versus the bonding costs in deciding what type of performance security to require.
11.1	Other Provisions	Insert any other provisions. For example, the parties may elect to have disputes resolved through litigation rather than arbitration, in which case the following optional language in this Section should be included.
11.2	Listing of Exhibits	Include a listing of exhibits and documents incorporated or referenced in the Agreement. This listing includes the exhibits and documents referenced in the Agreement. Additional documents or exhibits referenced in the Agreement should be listed here.
12	Limitation of Liability	This provision establishes a limit of liability of Design-Builder's liability for the Project.

Progressive Design-Build Agreement for Water and Wastewater Projects

This document has important legal consequences. Consultation with an attorney is recommended with respect to its completion or modification.

This **AGREEMENT** is made as of the ________________________________ day of __________________ in the year of 20__________, by and between the following parties, for services in connection with the Project identified below:

OWNER:
(Name and address)

DESIGN-BUILDER:
(Name and address)

PROJECT:
(Include Project name and location as it will appear in the Contract Documents)

In consideration of the mutual covenants and obligations contained herein, Owner and Design-Builder agree as set forth herein.

Article 1

Design-Builder's Services and Responsibilities

1.1 General Services.

1.1.1 Owner shall provide Design-Builder with Owner's Project Criteria describing Owner's program requirements and objectives for the Project as set forth in Exhibit A. Owner's Project Criteria shall include Owner's use, space, price, time, site, performance and expandability requirements. Owner's Project Criteria may include conceptual documents, design specifications, design performance specifications and other technical materials and requirements prepared by or for Owner.

1.1.2 If Owner's Project Criteria have not been developed prior to the execution of this Agreement, Design-Builder will assist Owner in developing Owner's Project Criteria, with such service deemed to be an additional service for which additional compensation shall be paid by Owner to Design-Builder. If Owner has developed Owner's Project Criteria prior to executing this Agreement, Design-Builder shall review and prepare a written evaluation of such criteria, including recommendations to Owner for different and innovative approaches to the design and construction of the Project. The parties shall meet to discuss Design-Builder's written evaluation of Owner's Project Criteria and agree upon what revisions, if any, should be made to such criteria.

1.2 Phased Services.

1.2.1 Phase 1 Services. Design-Builder shall perform the services of design, pricing and other services for the Project based on Owner's Project Criteria, as may be revised in accordance with Section 1.1 hereof, as set forth in Exhibit B, Scope of Services. Design-Builder shall perform such services to the level of completion required for Design-Builder and Owner to establish the Contract Price for Phase 2, as set forth in Section 1.3 below. The Contract Price for Phase 2 shall be developed during Phase 1 on an "open-book" basis. Design-Builder's Compensation for Phase 1 Services is set forth in Section 6.0 herein. The level of completion required for Phase 1 Services is defined in Exhibit B, Scope of Services (either as a percentage of design completion or by defined deliverables).

1.2.2 Phase 2 Services. Design-Builder's Phase 2 services shall consist of the completion of design services for the Project, the procurement of all materials and equipment for the Project, the performance of construction services for the Project, the start-up, testing and commissioning of the Project, and the provision of warranty services, all as further described in the Contract Price Amendment. Upon receipt of Design-Builder's proposed Contract Price for Phase 2, Owner may proceed as set forth in Article 1.3.

1.3 Proposal. Upon completion of the Phase 1 Services and any other Basis of Design Documents upon which the parties may agree, Design-Builder shall submit a proposal to Owner (the "Proposal") for the completion of the design and construction for the Project for the Contract Price, which may be based on Lump Sum or Design-Builder's Fee and Cost of the Work with an option for a Guaranteed Maximum Price (GMP).

1.3.1 The Proposal shall include the following unless the parties mutually agree otherwise:

1.3.1.1 The Contract Price that may be based on a Lump Sum or Design-Builder's Fee and Cost of the Work, with an option for a GMP, which shall be the sum of:

i Design-Builder's Fee as defined in Section 6.4.1 hereof;

ii The estimated Cost of the Work as defined in Section 6.5 hereof, inclusive of any Design-Builder's Contingency as defined in Section 6.6.2 hereof; and iii If applicable, any prices established under Section 6.1.3 hereof;

1.3.1.2 The Basis of Design Documents, which may include, by way of example, Owner's Project Criteria, which are set forth in detail and are attached to the Proposal;

1.3.1.3 A list of the assumptions and clarifications made by Design-Builder in the preparation of the Proposal, which list is intended to supplement the information contained in the drawings and specifications and is specifically included as part of the Basis of Design Documents;

1.3.1.4 The Scheduled Substantial Completion Date upon which the Proposal is based, to the extent said date has not already been established under Section 5.2.1 hereof, and a schedule upon which the Scheduled Substantial Completion Date is based and a Project Schedule for the Work;

1.3.1.5 If applicable, a list of Allowance Items, Allowance Values, and a statement of their basis;

1.3.1.6 If applicable, a schedule of alternate prices;

1.3.1.7 If applicable, a schedule of unit prices;

1.3.1.8 If applicable, a statement of Additional Services which may be performed but which are not included in the Proposal, and which, if performed, shall be the basis for an increase in the Contract Price and/or Contract Time(s);

1.3.1.9 If applicable, a Savings provision;

1.3.1.10 If applicable, Performance Incentives;

1.3.1.11 The time limit for acceptance of the Proposal; and

1.3.1.12 An Owner's permit list, a list detailing the permits and governmental approvals that Owner will bear responsibility to obtain.

1.3.2 Review and Adjustment to Proposal.

1.3.2.1 After submission of the Proposal, Design-Builder and Owner shall meet to discuss and review the Proposal. If Owner has any comments regarding the Proposal, or finds any inconsistencies or inaccuracies in the information presented, it shall promptly give written notice to Design-Builder of such comments or findings. If appropriate, Design-Builder shall, upon receipt of Owner's notice, make appropriate adjustments to the Proposal.

1.3.2.2 Acceptance of Proposal. If Owner accepts the Proposal, as may be amended by Design-Builder, the Contract Price and its basis shall be set forth in an amendment to this Agreement, when mutually agreed between the parties (Contract Price Amendment). Once the parties have agreed upon the Contract Price and Owner has issued a Notice to Proceed with Phase 2, Design-Builder shall perform the Phase 2 Services, all as further described in the Contract Price Amendment, as it may be revised.

1.3.2.3 Failure to Accept the Proposal. If Owner rejects the Proposal, or fails to notify Design-Builder in writing on or before the date specified in the Proposal that it accepts the Proposal, the Proposal shall be deemed withdrawn and of no effect. In such event, Owner and Design-Builder shall meet and confer as to how the Project will proceed, with Owner having the following options:

i Owner may suggest modifications to the Proposal, whereupon, if such modifications are accepted in writing by Design-Builder, the Proposal shall be deemed accepted and the parties shall proceed in accordance with Section 1.3.2.3 above;

ii Owner may authorize Design-Builder to continue to proceed with the Work on the basis of reimbursement as provided in Section 6.1.2 hereof without a Contract Price, in which case all references in this Agreement to the Contract Price shall not be applicable; or

iii Owner may terminate this Agreement for convenience in accordance with Article 8 hereof; provided, however, in this event, Design-Builder shall not be entitled to the payment provided for in Section 8.2 hereof.

If Owner fails to exercise any of the above options, Design-Builder shall have the right to (a) continue with the Work as if Owner had elected to proceed in accordance with Section 1.3.2.4 ii. above, and be paid by Owner accordingly, unless and until Owner notifies it in writing to stop the Work; (b) suspend performance of Work in accordance with Section 11.3.1 of the General Conditions of Contract, provided, however, that in such event Design-Builder shall not be entitled to the payment provided for in Section 8.2 hereof; or (c) may give written notice to Owner that it considers this Agreement completed. If Owner fails to exercise any of the options under Section 1.3.2.4 within ten (10) days of receipt of Design-Builder's notice, then this Agreement shall be deemed completed. If Owner terminates the relationship with Design-Builder under Section 1.3.2.4(iii), or if this Agreement is deemed completed under this paragraph, then Design-Builder shall have no further liability or obligations to Owner under this Agreement.

Article 2

Contract Documents

2.1 The Contract Documents are comprised of the following:

2.1.1 All written modifications, amendments, minor changes and Change Orders to this Agreement issued in accordance with DBIA Document No. 535, *Standard Form of General Conditions of Contract Agreement Between Owner and Design-Builder* (2022 Edition) ("General Conditions of Contract");

2.1.2 The Contract Price Amendment referenced in Section 1.3.2.3 herein or the Proposal accepted by Owner in accordance with Section 1.3 herein;

2.1.3 This Agreement, including all exhibits (list for example, performance standard requirements, performance incentive arrangements, markup exhibits, allowances, unit prices or exhibit detailing offsite reimbursable personnel) but excluding, if applicable, the Contract Price Amendment;

2.1.4 The General Conditions of Contract;

2.1.5 Construction Documents prepared and approved in accordance with Section 1.4 of the General Conditions of Contract;

2.1.6 Exhibit B, Scope of Services; and

2.1.7 The following other documents, if any:

Article 3

Interpretation and Intent

3.1 Design-Builder and Owner, at the time of acceptance of the Proposal by Owner in accordance with Section 1.3 hereof, shall carefully review all the Contract Documents, including the various documents comprising the Basis of Design Documents for any conflicts or ambiguities. Design-Builder and Owner will discuss and resolve any identified conflicts or ambiguities prior to execution of the Agreement, or if applicable, prior to Owner's acceptance of the Proposal.

3.2 The Contract Documents are intended to permit the parties to complete the Work and all obligations required by the Contract Documents within the Contract Time(s) for the Contract Price. The Contract Documents are intended to be complementary and interpreted in harmony so as to avoid conflict, with words and phrases interpreted in a manner consistent with construction and design industry standards. In the event inconsistencies, conflicts or ambiguities between or among the Contract Documents are discovered after Owner's acceptance of the Proposal, Design-Builder and Owner shall attempt to resolve any ambiguity, conflict or inconsistency informally, recognizing that the Contract Documents shall take precedence in the order in which they are listed in Section 2.1 hereof. (Note, the parties are strongly encouraged to establish in the Contract Price Amendment or Proposal (as applicable) the priority of the various documents comprising such exhibit or proposal.)

3.3 Terms, words and phrases used in the Contract Documents, including this Agreement, shall have the meanings given them in the General Conditions of Contract.

3.4 If Owner's Project Criteria contain design specifications: (a) Design-Builder is entitled to reasonably rely on the accuracy of the information represented in the design specifications and their compatibility with other information set forth in Owner's Project Criteria, including any design performance specifications; and (b) Design-Builder shall be entitled to an adjustment in its Contract Price and/or Contract Time(s) to the extent Design-Builder's cost and/or time of performance have been adversely impacted by such inaccurate design specification.

3.5 The Contract Documents form the entire agreement between Owner and Design-Builder and by incorporation herein are as fully binding on the parties as if repeated herein. No oral representations or other agreements have been made by the parties except as specifically stated in the Contract Documents.

Article 4

Ownership of Work Product

4.1 Work Product. All drawings, specifications and other documents and electronic data, including such documents identified in the General Conditions of Contract, furnished by Design-Builder to Owner under this Agreement ("Work Product") are deemed to be instruments of service and Design-Builder shall retain the ownership and property interests therein, including but not limited to any intellectual property rights, copyrights and/or patents, subject to the provisions set forth in Sections 4.2 through 4.5 below.

4.2 Owner's Limited License upon Project Completion and Payment in Full to Design-Builder. Upon Owner's payment in full for all Work performed under the Contract Documents, Design-Builder shall grant Owner a limited license to use the Work Product in connection with Owner's occupancy of the Project, conditioned on Owner's express understanding that its alteration of the Work Product without the involvement of Design-Builder is at Owner's sole risk and without liability or legal exposure to Design-Builder or anyone working by or through Design-Builder, including Design Consultants of any tier (collectively the "Indemnified Parties"), and on Owner's obligation to provide the indemnity set forth in Section 4.5 herein.

4.3 Owner's Limited License upon Owner's Termination for Convenience or Design-Builder's Election to Terminate. If Owner terminates this Agreement for its convenience as set forth in Article 8 hereof, or if

Design-Builder elects to terminate this Agreement in accordance with Section 11.4 of the General Conditions of Contract, Design-Builder shall, upon Owner's payment in full of the amounts due Design-Builder under the Contract Documents, grant Owner a limited license to use the Work Product to complete the Project and subsequently occupy the Project, and Owner shall thereafter have the same rights as set forth in Section 4.2 above, conditioned on the following:

4.3.1 Use of the Work Product is at Owner's sole risk without liability or legal exposure to any Indemnified Party, and on Owner's obligation to provide the indemnity set forth in Section 4.5 herein, and

4.3.2 Owner agrees to pay Design-Builder the additional sum of Dollars ($_________) as compensation for the right to use the Work Product to complete the Project and subsequently use the Work Product in accordance with Section 4.2 if Owner resumes the Project through its employees, agents or third parties.

4.4 Owner's Limited License upon Design-Builder's Default. If this Agreement is terminated due to Design-Builder's default pursuant to Section 11.2 of the General Conditions of Contract, then Design-Builder grants Owner a limited license to use the Work Product to complete the Project and subsequently occupy the Project, and Owner shall thereafter have the same rights and obligations as set forth in Section 4.2 above. Notwithstanding the preceding sentence, if it is ultimately determined that Design-Builder was not in default, Owner shall be deemed to have terminated the Agreement for convenience, and Design-Builder shall be entitled to the rights and remedies set forth in Section 4.3 above.

4.5 Owner's Indemnification for Use of Work Product. Owner recognizes that in the event of an early termination of the Work, whether for convenience or for cause, Design-Builder will not have the opportunity to finish or to finalize its Work Product. Therefore, if Owner uses the Work Product, in whole or in part, or if Owner is required to indemnify any Indemnified Parties based on the use or alteration of the Work Product under any of the circumstances identified in this Article 4, Owner shall defend, indemnify and hold harmless the Indemnified Parties from and against any and all claims, damages, liabilities, losses and expenses, including attorneys' fees, arising out of or resulting from the use or alteration of the Work Product, to the fullest extent permitted by applicable law.

Article 5

Contract Time

5.1 Date of Commencement. The Phase 1 Services shall commence within five (5) days of Design-Builder's receipt of Owner's Notice to Proceed unless the parties mutually agree otherwise in writing. The Work shall commence within five (5) days of Design-Builder's receipt of Owner's Notice to Proceed for Phase 2 Services ("Date of Commencement") if the Proposal is accepted and the Contract Price Amendment is amended to this Agreement unless the parties mutually agree otherwise in writing.

5.2 Substantial Completion and Final Completion.

5.2.1 Substantial Completion of the entire Work shall be achieved no later than _____________ (_________) calendar days after the Date of Commencement ("Scheduled Substantial Completion Date").

[At the parties' option, the following supplemental language may be inserted at the end of Section 5.2.1.]

☐ The parties agree that the definition for Substantial Completion set forth in Section 1.2.19 of the General Conditions of Contract is hereby modified to read as follows:

"*Substantial Completion* is the date on which the Work, or an agreed upon portion of the Work, is sufficiently complete in accordance with the Contract Documents so that Owner can occupy and use the Project or a portion thereof for its intended purposes, provided, however, that Substantial Completion shall be deemed to have been achieved no later than the date of issuance of a Temporary Certificate of Occupancy issued by the local building official, if a Temporary Certificate of Occupancy is applicable to the Project."

5.2.2 Interim milestones and/or Substantial Completion of identified portions of the Work shall be achieved as follows: (Insert any interim milestones ("Scheduled Interim Milestone Dates") for portions of the Work with different scheduled dates for Substantial Completion.)

5.2.3 Final Completion of the Work or identified portions of the Work shall be achieved as expeditiously as reasonably practicable. Final Completion is the date when all Work is complete pursuant to the definition of Final Completion set forth in Section 1.2.8 of the General Conditions of Contract.

5.2.4 All of the dates set forth in this Article 5 ("Contract Time(s)") shall be subject to adjustment in accordance with the General Conditions of Contract.

5.3 Time is of the Essence. Owner and Design-Builder mutually agree that time is of the essence with respect to the dates and times set forth in the Contract Documents.

5.4 Liquidated Damages. Design-Builder understands that if Substantial Completion is not attained by the Scheduled Substantial Completion Date, Owner will suffer damages which are difficult to determine and accurately specify. Design-Builder agrees that if Substantial Completion is not attained by (__________) days after the Scheduled Substantial Completion Date (the "LD Date"), Design-Builder shall pay Owner _______ Dollars ($___________________) as liquidated damages for each day that Substantial Completion extends beyond the LD Date. *(If a GMP is not established upon execution of this Agreement, the parties should consider setting liquidated damages after GMP negotiations.)*

[The parties may want to consider the following supplemental language within Section 5.4 if they want to assess liquidated damages for failing to meet Final Completion. In this case, the first sentence in Section 5.2.3 should be deleted and the language below should be checked and completed.]

☐ Design-Builder understands that if Final Completion is not achieved within ____ days of Substantial Completion Date, Owner will suffer damages which are difficult to determine and accurately specify. Design-Builder agrees that if Final Completion is not achieved within _____________ (___) days of Substantial Completion, Design-Builder shall pay to Owner ________________________ Dollars ($________), as liquidated damages for each calendar day that Final Completion is delayed beyond the above-referenced number of days.

[In lieu of the liquidated damages specified in Section 5.4 or the alternate provided herein, the Parties may decide that the Agreement will provide for actual damages in the event of Project delay, with Owner being cautioned that there is a waiver of consequential damages under Section 10.5.1 of the General Conditions of Contract. In this case, delete Sections 5.4 and 5.5 and insert the following.]

☐ Design-Builder and Owner have agreed not to provide for liquidated damages in this Agreement for failure of Design-Builder to achieve the Contract Time(s) set forth in this Article 5. Design-Builder understands, however, that Owner may suffer actual damages in the event the Contract Time(s) set forth herein are not achieved. Owner shall be able to recover damages from Design-Builder to the extent it can demonstrate that said actual damages have been incurred, are directly related and caused by Design-Builder's failure to meet the Contract Time(s) set forth herein and are not waived by Section 10.5.1 of the General Conditions of Contract. Notwithstanding the foregoing in no event shall Design-Builder's liability for actual damages for delays exceed ________________________ Dollars ($_________).

5.5 Any liquidated damages assessed pursuant to this Agreement shall be in lieu of all liability for any and all extra costs, losses, expenses, claims, penalties and any other damages, whether special or

consequential, and of whatsoever nature, incurred by Owner which are occasioned by any delay in achieving Substantial Completion, Interim Milestone Dates (if any) or Final Completion.
[The Parties may also desire to cap the liquidated damages payable under this Agreement, in which case the following language should be included at the end of Section 5.5.]

☐ Owner and Design-Builder agree that the maximum aggregate liability Design-Builder has for any liquidated damages that may be assessed under this Agreement shall be _______Dollars ($____).

5.6 Early Completion Bonus. If Substantial Completion is attained on or before _________________ (_____________) days before the Scheduled Substantial Completion Date (the "Bonus Date"), Owner shall pay Design-Builder at the time of Final Payment under Section 7.4 hereof an early completion bonus of _ ____________________ Dollars ($ ___________) for each day that Substantial Completion is attained earlier than the Bonus Date. *(If a GMP is not established upon execution of this Agreement, the parties should consider setting the early completion bonus after GMP negotiations. If an early completion bonus is applicable to any dates set forth in Section 5.2.2 or 5.2.3 hereof, this Section 5.6 will need to be modified accordingly.)*

[The Parties may also desire to cap the early completion bonus payable under Section 5.6, in which case the following language should be included.]

☐ Owner and Design-Builder agree that the maximum aggregate amount that Design-Builder shall receive as the early Completion Bonus is _____________________ Dollars ($__________).

[The Parties may also desire to modify Article 8.2.2 of the General Conditions of Contract relative to compensability of delays that would cause the Contract Time(s) to be extended. In such case, the following option can be used.]

☐ In addition to Design-Builder's right to a time extension for those events set forth in Section 8.2.1 of the General Conditions of Contract, Design-Builder shall also be entitled to an appropriate adjustment of the Contract Price for those events set forth in Section 8.2.1 of the General Conditions of Contract, provided, however, for Force Majeure Events, Design-Builder shall be entitled to an increase in the Contract Price providing that: (i) said events must exceed ____________ cumulative days before Design-Builder is entitled to additional compensation; and (ii) said additional compensation shall be limited to:

[Check one box only.]

☐ $ ____________ dollars a day for each day work is delayed beyond the Scheduled Substantial Completion Date.

or

☐ the direct costs and expenses Design-Builder can demonstrate it has reasonably actually incurred as a result of such event.

5.7 Owner's Review Time. The parties have established the following maximum and minimum amount of time for Owner to review Design Submissions and the Project Schedule or any updates thereto unless the parties agree in writing otherwise.

5.7.1 Owner shall have a minimum of _____ days of receipt by Owner to review all Design Submissions, the Project Schedule, and any updates thereto.

5.7.2 Owner shall review and (if applicable) provide a response to Design-Builder on all Design Submissions, the Project Schedule and any updates thereto within ____ days of receipt by Owner.

Article 6

Contract Price

6.1 Contract Price.

6.1.1 Owner shall pay Design-Builder in accordance with Article 6 of the General Conditions of Contract the sum of ____ Dollars ($_______) for the Phase 1 Services, subject to adjustments made in accordance with the General Conditions of Contract. Unless otherwise provided in the Contract Documents, the Phase 1 Services compensation is deemed to include all sales, use, consumer and other taxes mandated by applicable Legal Requirements.

6.1.2 For Phase 2 Services, Owner shall pay Design-Builder in accordance with Article 6 of the General Conditions of Contract a contract price ("Contract Price") equal to the Lump Sum amount set forth in Section 6.2 hereof or in the Contract Price Amendment, or equal to Design-Builder's Fee (as defined in Section 6.4 hereof) plus the Cost of the Work (as defined in Section 6.5 hereof), subject to any GMP established in Section 6.6 hereof or as set forth in the Contract Price Amendment and any adjustments made in accordance with the General Conditions of Contract.

6.1.3 For the specific Work set forth below, Owner agrees to pay Design-Builder, as part of the Contract Price, on the following basis: *(This is an optional section intended to provide the parties with flexibility to identify and price limited services.)*

6.2 Lump Sum. Owner shall pay Design-Builder in accordance with Article 6 of the General Conditions of Contract the sum of ____ Dollars ($) ("Contract Price") for the Work for Phase 2 Services, subject to adjustments made in accordance with the General Conditions of Contract. Unless otherwise provided in the Contract Documents, the Contract Price is deemed to include all sales, use, consumer and other taxes mandated by applicable Legal Requirements.

6.3 Markups for Changes. If the Contract Price requires an adjustment due to changes in the Work, and the cost of such changes is determined under Sections 9.4.1.3 or 9.4.1.4 of the General Conditions of Contract, the following markups shall be allowed on such changes:

6.3.1 For additive Change Orders, including additive Change Orders arising from both additive and deductive items, it is agreed that Design-Builder shall receive a Fee of _________ percent (%) of the additional costs incurred for that Change Order, plus any other markups set forth at Exhibit hereto.

6.3.2 For deductive Change Orders, including deductive Change Orders arising from both additive and deductive items, the deductive amounts shall include:

[Check one box only.]

☐ No additional reduction to account for Design-Builder's Fee or any other markup.

or

☐ An amount equal to the sum of: (a) ______________________________ percent (__________%) applied to the direct costs of the net reduction (which amount will account for a reduction associated with Design-Builder's Fee); plus (b) any other markups set forth at Exhibit _________ hereto applied to the direct costs of the net reduction.

6.4 Design-Builder's Fee.

6.4.1 Design-Builder's Fee shall be:

[Choose one of the following:]

☐ ___________________________Dollars ($ ____________), as adjusted in accordance with Section 6.4.2 below.

or

☐ ___________________________ percent (____________%) of the Cost of the Work, as adjusted in accordance with Section 6.4.2 below.

6.4.2 Design-Builder's Fee will be adjusted as follows for any changes in the Work:

6.4.2.1 or additive Change Orders, including additive Change Orders arising from both additive and deductive items, it is agreed that Design-Builder shall receive a Fee of _____ ____________________ percent (___________ %) of the additional Costs of the Work incurred for that Change Order, plus any other markups set forth at Exhibit ____________ hereto.

6.4.2.2 For deductive Change Orders, including deductive Change Orders arising from both additive and deductive items, the deductive amounts shall include:

[Check one box only.]

☐ No additional reduction to account for Design-Builder's Fee or any other markup.

or

☐ An amount equal to the sum of: (a) ___________ percent (____%) applied to the direct costs of the net reduction (which amount will account for a reduction associated with Design-Builder's Fee); plus (b) any other markups set forth at Exhibit ____ hereto applied to the direct costs of the net reduction.

6.5 Cost of the Work.

6.5.1 The term Cost of the Work shall mean costs reasonably incurred by Design-Builder in the proper performance of the Work. The Cost of the Work shall include only the following:

6.5.1.1 Wages of direct employees of Design-Builder performing the Work at the Site or, with Owner's agreement, at locations off the Site, provided, however, that the costs for those employees of Design-Builder performing design services shall be calculated on the basis of prevailing market rates for design professionals performing such services or, if applicable, those rates set forth in an exhibit to this Agreement.

6.5.1.2 Wages or salaries of Design-Builder's supervisory and administrative personnel engaged in the performance of the Work and who are located at the Site or working off-Site to assist in the production or transportation of material and equipment necessary for the Work.

6.5.1.3 Wages or salaries of Design-Builder's personnel stationed at Design-Builder's principal or branch offices, but only to the extent said personnel are identified in Exhibit ___ and performing the function set forth in said Exhibit. The reimbursable costs of personnel stationed at Design-Builder's principal or branch offices shall include a _______________ ________ percent (_________%) markup to compensate Design-Builder for the Project-related overhead associated with such personnel.

6.5.1.4 Costs incurred by Design-Builder for employee benefits, premiums, taxes, insurance, contributions and assessments required by law, collective bargaining agreements or which are customarily paid by Design-Builder, to the extent such costs are based on wages and salaries paid to employees of Design-Builder covered under Sections 6.5.1.1 through 6.5.1.3 hereof.

[In lieu of the language in Section 6.5.1.4 above, Design-Builder and Owner may want to include the following language:]

☐ A multiplier of _________________ percent (_________ %) shall be applied to the wages and salaries of the employees of Design-Builder covered under Sections 6.5.1.1 through 6.5.1.3 hereof.

6.5.1.5 The reasonable portion of the cost of travel, accommodations and meals for Design-Builder's personnel necessarily and directly incurred in connection with the performance of the Work.

6.5.1.6 Payments properly made by Design-Builder to Subcontractors and Design Consultants for performance of portions of the Work, including any insurance and bond premiums incurred by Subcontractors and Design Consultants.

6.5.1.7 Costs incurred by Design-Builder in repairing or correcting defective, damaged or nonconforming Work (including any warranty or corrective Work performed after Substantial Completion), provided that such Work was beyond the reasonable control of Design-Builder, or caused by the ordinary mistakes or inadvertence, and not the negligence, of Design-Builder or those working by or through Design-Builder. If the costs associated with such Work are recoverable from insurance, Subcontractors or Design Consultants, Design-Builder shall exercise best efforts to obtain recovery from the appropriate source and provide a credit to Owner if recovery is obtained.

6.5.1.8 Costs, including transportation, inspection, testing, storage and handling of materials, equipment and supplies incorporated or reasonably used in completing the Work.

6.5.1.9 Costs less salvage value of materials, supplies, temporary facilities, machinery, equipment and hand tools not customarily owned by the workers that are not fully consumed in the performance of the Work and which remain the property of Design-Builder, including the costs of transporting, inspecting, testing, handling, installing, maintaining, dismantling and removing such items.

6.5.1.10 Costs of removal of debris and waste from the Site.

6.5.1.11 The reasonable costs and expenses incurred in establishing, operating and demobilizing the Site office, including the cost of facsimile transmissions, long-distance telephone calls, postage and express delivery charges, telephone service, photocopying and reasonable petty cash expenses.

6.5.1.12 Rental charges and the costs of transportation, installation, minor repairs and replacements, dismantling and removal of temporary facilities, machinery, equipment and hand tools not customarily owned by the workers, which are provided by Design-Builder at the Site, whether rented from Design-Builder or others, and incurred in the performance of the Work.

6.5.1.13 Premiums for insurance and bonds required by this Agreement or the performance of the Work.

6.5.1.14 All fuel and utility costs incurred in the performance of the Work.

6.5.1.15 Sales, use or similar taxes, tariffs or duties incurred in the performance of the Work.

6.5.1.16 Legal costs, court costs and costs of mediation and arbitration reasonably arising from Design-Builder's performance of the Work, provided such costs do not arise from disputes between Owner and Design-Builder.

6.5.1.17 Costs for permits, royalties, licenses, tests and inspections incurred by Design-Builder as a requirement of the Contract Documents.

6.5.1.18 The cost of defending suits or claims for infringement of patent rights arising from the use of a particular design, process or product required by Owner, paying legal judgments against Design-Builder resulting from such suits or claims, and paying settlements made with Owner's consent.

6.5.1.19 Deposits which are lost, except to the extent caused by Design-Builder's negligence.

6.5.1.20 Costs incurred in preventing damage, injury or loss in case of an emergency affecting the safety of persons and property.

6.5.1.21 Accounting and data processing costs related to the Work.

6.5.1.22 Other costs reasonably and properly incurred in the performance of the Work to the extent approved in writing by Owner.

[Design-Builder and Owner may want to consider adding the following Section 6.5.1.23 to address the payment of warranty work:]

☐ Owner and Design-Builder agree that an escrow account in the amount of ______ ____________________ Dollars ($___________) shall be established prior to Final Completion, which escrow shall be used to reimburse Design-Builder for the Costs of the Work incurred after Final Completion to perform warranty Work. The escrow agreement will provide that any sums not used at the expiration of the warranty period shall be returned to Owner, subject to any savings Design-Builder may be entitled to under this Agreement. In the event the warranty escrow account is exhausted, but funds remain under the GMP, Owner shall be obligated to pay Design-Builder the Costs of the Work incurred after Final Completion to perform warranty Work up to the GMP.

6.5.2 Non-Reimbursable Costs. The following shall be excluded from the Cost of the Work:

6.5.2.1 Compensation for Design-Builder's personnel stationed at Design-Builder's principal or branch offices, except as provided for in Sections 6.5.1.1, 6.5.1.2 and 6.5.1.3 hereof.

6.5.2.2 Overhead and general expenses, except as provided for in Section 6.5.1 hereof, or which may be recoverable for changes to the Work.

6.5.2.3 The cost of Design-Builder's capital used in the performance of the Work.

6.5.2.4 If the parties have agreed on a GMP, costs that would cause the GMP, as adjusted in accordance with the Contract Documents, to be exceeded.

[The parties shall comply with the following Section 6.6 based upon whether the GMP is agreed upon before the execution of this Agreement or will be developed and agreed upon after execution of this Agreement. If the parties do not use a GMP, this Section 6.5 shall be deemed inapplicable and compensation to Design-Builder shall be based on those fees and costs identified in the balance of this Article 6.]

6.6 The Guaranteed Maximum Price.

6.6.1 Design-Builder guarantees that it shall not exceed the GMP of ______________________ Dollars ($___________). Documents used as a basis for the GMP shall be identified in the Contract Price Amendment to this Agreement. Design-Builder does not guarantee any specific line item provided as part of the GMP, and has the sole discretion to apply payment due to overruns in one line item to savings due to underruns in any other line item. Design-Builder agrees, however, that it will be responsible for paying all costs of completing the Work which exceed the GMP, as adjusted in accordance with the Contract Documents. *(While the Contract Price Amendment will be developed in advance or concurrently with the execution of this Agreement, it is recommended that such exhibit include the items set forth in Section 1.3 above, to ensure that the basis for the GMP is well understood.)*

[In lieu of Section 6.6.1, Owner and Design-Builder may want to include the following language.]

☐ Design-Builder guarantees that it shall not exceed the GMP of ______________________ Dollars ($_____________). Documents used as basis for the GMP shall be identified as the Contract Price Amendment to this Agreement. Design-Builder does not guarantee any specific line item provided as part of the GMP, provided, however, that it does guarantee the line item for its general project management and general conditions costs, in the amount of _________________________ Dollars ($______________), and as set forth in the Contract Price Amendment ("General Conditions Cap"). Design-Builder agrees that it will be responsible for paying the applicable general conditions costs in excess of the General Conditions Cap, as well as be responsible for all costs of completing the Work which exceed the GMP, as said general conditions line item and the GMP may be adjusted in accordance with the Contract Documents, including but not limited to the markups for Change Orders set forth in Section 6.3 herein.

6.6.2 The GMP includes a Contingency in the amount of ________________________________ Dollars ($______________) which is available for Design-Builder's exclusive use for unanticipated costs it has incurred that are not the basis for a Change Order under the Contract Documents. By way of example, and not as a limitation, such costs may include: (a) trade buy-out differentials; (b) overtime or acceleration; (c) escalation of materials; (d) correction of defective, damaged or nonconforming Work, design errors or omissions, however caused; (e) Subcontractor defaults; or (f) those events under Section 8.2.2 of the General Conditions of Contract that result in an extension of the Contract Time but do not result in an increase in the Contract Price. The Contingency is not available to Owner for any reason, including changes in scope or any other item which would enable Design-Builder to increase the GMP under the Contract Documents. Design-Builder shall provide Owner notice of all anticipated charges against the Contingency, and shall provide Owner as part of the monthly status report required by Section 2.1.2 of the General Conditions of Contract an accounting of the Contingency, including all reasonably foreseen uses or potential uses of the Contingency in the upcoming three (3) months. Design-Builder agrees that with respect to any expenditure from the Contingency relating to a Subcontractor default or an event for which insurance or bond may provide reimbursement, Design-Builder will in good faith exercise reasonable steps to obtain performance from the Subcontractor and/or recovery from any surety or insurance company. Design-Builder agrees that if Design-Builder is subsequently reimbursed for said costs, then said recovery will be credited back to the Contingency.

6.6.3 Savings.

6.6.3.1 If the sum of the actual Cost of the Work and Design-Builder's Fee (and, if applicable, any prices established under Section 6.1.3 hereof) is less than the GMP, as such GMP may have been adjusted over the course of the Project, the difference ("Savings") shall be shared as follows:

[Choose one of the following:]

☐ ______________________ percent (________%) to Design-Builder and ____________________ percent (________%) to Owner.

or

☐ The first __________________________ Dollars ($ ____________) of Savings shall be provided to (choose either Design-Builder or Owner) ______________________, with the balance of Savings, if any, shared ____________________ percent (_______%) to Design-Builder and _____________________percent (_____________%) to Owner.

6.6.3.2 Savings shall be calculated and paid as part of Final Payment under Section 7.4 hereof, with the understanding that to the extent Design-Builder incurs costs after Final Completion which would have been payable to Design-Builder as a Cost of the Work, the parties shall recalculate the Savings in light of the costs so incurred, and Design-Builder shall be paid by Owner accordingly.

6.7 Allowance Items and Allowance Values.

6.7.1 Any and all Allowance Items, as well as their corresponding Allowance Values, are set forth in the Contract Price Amendment or the Proposal.

6.7.2 Design-Builder and Owner have worked together to review the Allowance Items and Allowance Values based on design information then available to determine that the Allowance Values constitute reasonable estimates for the Allowance Items. Design-Builder and Owner will continue working closely together during the preparation of the design to develop Construction Documents consistent with the Allowance Values. Nothing herein is intended in any way to constitute a guarantee by Design-Builder that the Allowance Item in question can be performed for the Allowance Value.

6.7.3 No work shall be performed on any Allowance Item without Design-Builder first obtaining in writing advance authorization to proceed from Owner. Owner agrees that if Design-Builder is not provided written authorization to proceed by the date set forth in the Project schedule, due to no fault of Design-Builder, Design-Builder may be entitled to an adjustment of the Contract Time(s) and Contract Price.

6.7.4 The Allowance Value includes the direct cost of labor, materials, equipment, transportation, taxes and insurance associated with the applicable Allowance Item. All other costs, including design fees, Design-Builder's overall project management and general conditions costs, overhead and Fee, are deemed to be included in the original Contract Price, and are not subject to adjustment notwithstanding the actual amount of the Allowance Item.

[Alternatively, the parties may want to delete Section 6.7.4 and add the following provision.]

☐ In the event the actual direct cost of labor, materials, equipment, transportation, taxes and insurance associated with the applicable Allowance Item is ______________________________ percent (________________ %) greater than or less than the Allowance Value, Design-Builder and

Owner agree that Design-Builder's right to Fee and markup shall be determined in accordance with Section 6.4.

6.7.5 Whenever the actual costs for an Allowance Item is more than or less than the stated Allowance Value, the Contract Price shall be adjusted accordingly by Change Order, subject to Section 6.7.4. The amount of the Change Order shall reflect the difference between actual costs incurred by Design-Builder for the particular Allowance Item and the Allowance Value.

6.8 Performance Incentives.

6.8.1 Owner and Design-Builder have agreed to the performance incentive arrangements set forth in Exhibit ______________.

(The parties are encouraged to discuss and agree upon performance incentives that will influence project success. These incentives may consist of Award Fees, incentives for safety, personnel retention, client satisfaction and similar items.)

Article 7

Procedure for Payment

7.1 Payment for Preliminary Services. Design-Builder and Owner agree upon the following method for partial and final payment to Design-Builder for the services hereunder: *(Insert terms.)*

7.2 Contract Price Progress Payments.

7.2.1 Design-Builder shall submit to Owner on the ________________ (_____________) day of each month, beginning with the first month after the Date of Commencement, Design-Builder's Application for Payment in accordance with Article 6 of the General Conditions of Contract.

7.2.2 Owner shall make payment within ten (10) days after Owner's receipt of each properly submitted and accurate Application for Payment in accordance with Article 6 of the General Conditions of Contract, but in each case less the total of payments previously made, and less amounts properly withheld under Section 6.3 of the General Conditions of Contract.

7.2.3 If Design-Builder's Fee under Section 6.4 hereof is a fixed amount, the amount of Design-Builder's Fee to be included in Design-Builder's monthly Application for Payment and paid by Owner shall be proportional to the percentage of the Work completed, less payments previously made on account of Design-Builder's Fee.

7.3 Retainage on Progress Payments.

7.3.1 Owner will retain __________________ percent (___________%) of each Application for Payment provided, however, that when fifty percent (50%) of the Work has been satisfactorily completed by Design-Builder and Design-Builder is otherwise in compliance with its contractual obligations, Owner will not retain any additional retention amounts from Design-Builder's subsequent Applications for Payment. Owner will also reasonably consider reducing retainage for Work completed early in the Project.

[Design-Builder and Owner may want to consider substituting the following retainage provision.]

☐ Owner will retain __________________ percent (___________ %) of the cost of Work, exclusive of General Conditions costs, and any amounts paid to Design-Builder's Design Consultant, from each Application for Payment provided, however, that when fifty percent (50%) of the Work has been satisfactorily completed by Design-Builder and Design-Builder is otherwise in compliance with its contractual obligations, Owner will not retain any additional amounts from

Design-Builder's subsequent Applications for Payment. Owner will also reasonably consider reducing retainage for Work completed early in the Project.

7.3.2 Within fifteen (15) days after Substantial Completion of the entire Work or, if applicable, any portion of the Work, pursuant to Section 6.6 of the General Conditions of Contract, Owner shall release to Design-Builder all retained amounts relating, as applicable, to the entire Work or completed portion of the Work, less an amount equal to: (a) the reasonable value of all remaining or incomplete items of Work as noted in the Certificate of Substantial Completion; and (b) all other amounts Owner is entitled to withhold pursuant to Section 6.3 of the General Conditions of Contract.

[For public projects, Design-Builder and Owner may want to consider substituting the following retainage provision.]

☐ Owner will retain __________________ percent (____________ %) from Design-Builder's Applications for Payment pursuant to applicable state law.

[Design-Builder and Owner may want to consider substituting the following retainage provision.]

Because Owner has obtained a performance bond and payment bond pursuant to Article 9 below, Owner will not retain retainage from Design-Builder on this Project.

[If Owner and Design-Builder have established a warranty reserve pursuant to Section 6.5.1.23 above, the following provision should be included.]

☐ If a warranty reserve has been established pursuant to Section 6.5.1.23 above, Owner shall at the time of Substantial Completion retain the agreed-upon amounts and establish an escrow account as contemplated by Section 6.5.1.23 above.

7.4 Final Payment. Design-Builder shall submit its Final Application for Payment to Owner in accordance with Section 6.7 of the General Conditions of Contract. Owner shall make payment on Design-Builder's properly submitted and accurate Final Application for Payment (less any amount the parties may have agreed to set aside for warranty work) within ten (10) days after Owner's receipt of the Final Application for Payment, provided that Design-Builder has satisfied the requirements for final payment set forth in Section 6.7.2 of the General Conditions of Contract.

7.5 Interest. Payments due and unpaid by Owner to Design-Builder, whether progress payments or final payment, shall bear interest commencing five (5) days after payment is due at the rate of _________ _______ percent (____________%) per month until paid.

7.6 Record Keeping and Finance Controls. Design-Builder acknowledges that this Agreement is to be administered on an "open book" arrangement relative to Costs of the Work. Design-Builder shall keep full and detailed accounts and exercise such controls as may be necessary for proper financial management, using accounting and control systems in accordance with generally accepted accounting principles and as may be provided in the Contract Documents. During the performance of the Work and for a period of three (3) years after Final Payment, Owner and Owner's accountants shall be afforded access to, and the right to audit from time to time, upon reasonable notice, Design-Builder's records, books, correspondence, receipts, subcontracts, purchase orders, vouchers, memoranda and other data relating to the Work, all of which Design-Builder shall preserve for a period of three (3) years after Final Payment. Such inspection shall take place at Design-Builder's offices during normal business hours unless another location and time is agreed to by the parties. Any multipliers or markups agreed to by Owner and Design-Builder as part of this Agreement are only subject to audit to confirm that such multiplier or markup has been charged in accordance with this Agreement, but the composition of such multiplier or markup is not subject to audit. Any lump sum agreed to by Owner and Design-Builder as part of this Agreement is not subject to audit.

Article 8

Termination for Convenience

8.1 If Design-Builder is terminated for convenience pursuant to Section 11.6 of the General Conditions, and the parties have agreed to a payment to Design-Builder in the case of such termination of convenience, Owner shall pay Design-Builder for the following in addition to the amount set forth in Section 11.6.1 of the General Conditions:

[***Choose one of the following:]***

☐ The fair and reasonable sums for overhead and profit on the sum of items set forth in Section 11.6.1 of the General Conditions.

or

☐ Overhead and profit in the amount of ________________________ percent (______ ______%) on the sum of items set forth in Section 11.6.1 of the General Conditions.

8.2 In addition to the amounts set forth in Section 8.1 above and Section 11.6.1 of the General Conditions, Design-Builder shall be entitled to receive one of the following if the parties agree to an additional payment:

8.2.1 If Owner terminates this Agreement prior to commencement of construction, Design-Builder shall be paid _______________ percent (___________%) of the remaining balance of the Contract Price or, if a GMP has not been established, the remaining balance of the most recent estimated Contract Price.

8.2.2 If Owner terminates this Agreement after commencement of construction, Design-Builder shall be paid _______________ percent (___________%) of the remaining balance of the Contract Price or, if a GMP has not been established, the remaining balance of the most recent estimated Contract Price.

[The following Article 9 should only be used if Owner and Design-Builder agree to establish their respective representatives at the time the Agreement is executed rather than during the performance of the Project.]

Article 9

Representatives of the Parties

9.1 Owner's Representatives.

9.1.1 Owner designates the individual listed below as its Senior Representative ("Owner's Senior Representative"), which individual has the authority and responsibility for avoiding and resolving disputes under Section 10.2.3 of the General Conditions of Contract: *(Identify individual's name, title, address and telephone numbers.)*

9.1.2 Owner designates the individual listed below as its Owner's Representative, which individual has the authority and responsibility set forth in Section 3.4 of the General Conditions of Contract: (*Identify individual's name, title, address and telephone numbers.)*

9.2 Design-Builder's Representatives.

9.2.1 Design-Builder designates the individual listed below as its Senior Representative ("Design-Builder's Senior Representative"), which individual has the authority and responsibility for avoiding and resolving disputes under Section 10.2.3 of the General Conditions of Contract: *(Identify individual's name, title, address and telephone numbers.)*

9.2.2 Design-Builder designates the individual listed below as its Design-Builder's Representative, which individual has the authority and responsibility set forth in Section 2.1.1 of the General Conditions of Contract: (Identify individual's name, title, address and telephone numbers.)

Article 10

Bonds and Insurance

10.1 Insurance. Design-Builder and Owner shall procure the insurance coverages set forth in the Insurance Exhibit attached hereto and in accordance with Article 5 of the General Conditions of Contract.

10.2 Bonds and Other Performance Security. Design-Builder shall provide the following performance bond and labor and material payment bond or other performance security:

Performance Bond.

[Check one box only. If no box is checked, then no bond is required.]

☐ Required ☐ Not Required

Payment Bond.

[Check one box only. If no box is checked, then no bond is required.]

☐ Required ☐ Not Required

Other Performance Security.

[Check one box only. If no box is checked, then no other performance security is required. If the "Required" box is checked, identify below the specific performance security that is being required and all salient commercial terms associated with that security.]

☐ Required ☐ Not Required

Article 11

Other Provisions

11.1 Other provisions, if any, are as follows: (Insert any additional provisions.)

11.2 Listing of Exhibits and documents incorporated herein:

Exhibit A – Owner's Project Criteria
Exhibit B – Scope of Services
DBIA Document No. 535, Standard Form of General Conditions of Contract Between Owner and Design-Builder (2022 Edition) ("General Conditions of Contract")

Contract Price Amendment, if any.

[In lieu of Sections 10.3.1 through 10.3.3 of the General Conditions of Contract, the Parties may want to delete such sections and include the following alternative disputes proceeding clause.]

☐ Any claims, disputes or controversies between the parties arising out of or related to the Agreement, or the breach thereof, which have not been resolved in accordance with the procedures set forth in Section 10.2 of the General Conditions of Contract shall be resolved in a court of competent jurisdiction in the state in which the Project is located.

[Section 2.9.1 of the General Conditions contains an option for the parties to establish a limited time frame for Design-Builder's warranty. If the parties agree to such a limited time frame, the parties may insert it below.]

☐ The parties have agreed to limit the time frame that Owner can make a claim pursuant to Section 2.9.1 of the General Conditions. Owner must make all claims pursuant to Section 2.9.1 of the General Conditions within __________________ years of the date of Final Completion of the Project.

Article 12

Limitation of Liability

12.1 Limitation. To the fullest extent permitted by law, and notwithstanding any other provision of this Agreement, the total liability, in the aggregate, of Design-Builder, its Design Consultants, and Subcontractors, surety (if any) and their respective officers, directors, employees and agents, and any of them, to Owner and anyone claiming by, through or under Owner, for any and all claims, losses, liabilities, costs or damages whatsoever arising out of, resulting from or in any way related to the Project or this Agreement from any cause, including but not limited to the negligence, indemnity, professional errors or omissions, strict liability, breach of contract or warranty (express or implied), shall not exceed ______percent (___%) of the Contract Price. The parties agree that specific consideration has been given by Design-Builder for this limitation and that it is deemed adequate.

In executing this Agreement, Owner and Design-Builder each individually represents that it has the necessary financial resources to fulfill its obligations under this Agreement, and each has the necessary corporate approvals to execute this Agreement, and perform the services described herein.

OWNER:	**DESIGN-BUILDER:**
______________________________	______________________________
(Name of Owner)	*(Name of Design-Builder)*
______________________________	______________________________
(Signature)	*(Signature)*
______________________________	______________________________
(Printed Name)	*(Printed Name)*
______________________________	______________________________
(Title)	*(Title)*
Date: _________________________	Date: _________________________

Caution: An original DBIA document has this caution printed in blue. This is a printable copy and an original assures that changes will not be obscured as may occur when documents are reproduced.

Questions? We're here to help.

Contact us

Design-Build Institute of America
1001 Pennsylvania Ave. NW, Suite 410
Washington, DC 20004

(202) 682-0110
dbia@dbia.org

Exhibit E
DBIA – DRAFT Standard Form of General Conditions of Contract Between Owner and Design-Builder (Document No. 535), revised

DBIA Contract Document #535

Standard Form of General Conditions of Contract Between Owner and Design-Builder

Document No. 535
Third Edition, 2022

Design-Build Institute of America - Contract Documents

LICENSE AGREEMENT

By using the DBIA Contract Documents, you agree to and are bound by the terms of this License Agreement.

1. **License.** The Design-Build Institute of America ("DBIA") provides DBIA Contract Documents and licenses their use worldwide. You acknowledge that DBIA Contract Documents are protected by the copyright laws of the United States. You have a limited nonexclusive license to: (a) Use DBIA Contract Documents on any number of machines owned, leased or rented by your company or organization; (b) Use DBIA Contract Documents in printed form for bona fide contract purposes; and (c) Copy DBIA Contract Documents into any machine-readable or printed form for backup or modification purposes in support of your permitted use.

2. **User Responsibility.** You assume sole responsibility for the selection of specific documents or portions thereof to achieve your intended results, and for the installation, use, and results obtained from the DBIA Contract Documents. You acknowledge that you understand that the text of the DBIA Contract Documents has important legal consequences and that consultation with an attorney is recommended with respect to use or modification of the text. You will not represent that any of the contract documents you generate from DBIA Contract Documents are DBIA documents unless (a) the document text is used without alteration or (b) all additions and changes to, and deletions from, the text are clearly shown.

3. **Copies.** You may not use, copy, modify, or transfer DBIA Contract Documents, or any copy, modification or merged portion, in whole or in part, except as expressly provided for in this license. Reproduction of DBIA Contract Documents in printed or machine-readable format for resale or educational purposes is expressly prohibited. You will reproduce and include DBIA's copyright notice on any printed or machine-readable copy, modification, or portion merged into another document or program.

4. **Transfers.** You may not transfer possession of any copy, modification or merged portion of DBIA Contract Documents to another party, except that a party with whom you are contracting may receive and use such transferred material solely for purposes of its contract with you. You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement, and any attempt to do so is void.

5. **Term.** The license is effective for one year from the date of purchase. DBIA may elect to terminate it earlier, by written notice to you, if you fail to comply with any term or condition of this Agreement.

6. **Limited Warranty.** DBIA warrants the electronic files or other media by which DBIA Contract Documents are furnished to be free from defects in materials and workmanship under normal use during the Term. There is no other warranty of any kind, expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state. DBIA does not warrant that the DBIA Contract Documents will meet your requirements or that the operation of DBIA Contract Documents will be uninterrupted or error free.

7. **Limitations of Remedies.** DBIA's entire liability and your exclusive remedy shall be: the replacement of any document not meeting DBIA's "Limited Warranty" which is returned to DBIA with a copy of your receipt, or at DBIA's election, your money will be refunded. In no event will DBIA be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use DBIA Contract Documents even if DBIA has been advised of the possibility of such damages, or for any claim by any other party. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

8. **Acknowledgment.** You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions and that it will be governed by the laws of the District of Columbia. You further agree that it is the complete and exclusive statement of your agreement with DBIA which supersedes any proposal or prior agreement, oral or written, and any other communications between the parties relating to the subject matter of this agreement.

INSTRUCTIONS

For DBIA Document No. 535 Standard Form of General Conditions of Contract Between Owner and Design-Builder (2022 Edition)

General Instructions

No.	Subject	Instruction
1.	Standard Forms	Standard form contracts have long served an important function in the United States and international construction markets. The common purpose of these forms is to provide an economical and convenient way for parties to contract for design and construction services. As standard forms gain acceptance and are used with increased frequency, parties are able to enter into contracts with greater certainty as to their rights and responsibilities.
2.	DBIA Standard Form Contract Documents	Since its formation in 1993, the Design-Build Institute of America (DBIA) has regularly evaluated the needs of Owners, Design-Builders, and other parties to the design-build process in preparation for developing its own contract forms. Consistent with DBIA's mission of promulgating best design-build practices, DBIA believes that the design-build contract should reflect a balanced approach to risk that considers the legitimate interests of all parties to the design-build process. DBIA's Standard Form Contract Documents reflect a modern risk allocation approach, allocating each risk to the party best equipped to manage and minimize that risk, with the goal of promoting best design-build practices.
3.	Use of Non-DBIA Documents	To avoid inconsistencies among documents used for the same project, DBIA's Standard Form Contract Documents should not be used in conjunction with non-DBIA documents unless the non-DBIA documents are appropriately modified on the advice of legal counsel. Moreover, care should also be taken when using different editions of the DBIA Standard Form Document on the same project to ensure consistency.
4.	Legal Consequences	DBIA Standard Form Contract Documents are legally binding contracts with important legal consequences. Contracting parties are advised and encouraged to seek legal counsel in completing or modifying these Documents.
5.	Reproduction	DBIA hereby grants to purchasers a limited license to reproduce its Documents consistent with the License Agreement accompanying these Documents. At least two original versions of the Agreement should be signed by the parties. Any other reproduction of DBIA Documents is strictly prohibited.
6.	Modifications	Effective contracting is accomplished when the parties give specific thought to their contracting goals and then tailor the contract to meet the unique needs of the project and the design-build team. For that reason, these Documents may require modification for various purposes including, for example, to comply with local codes and laws, or to add special terms. DBIA's latest revisions to its Documents provide the parties an opportunity to customize their contractual relationship by selecting various optional contract clauses that may better reflect the unique needs and risks associated with the project. Any modifications to these Documents should be initialed by the parties. At no time should a document be re-typed in its entirety. Re-creating the document violates copyright laws and destroys one of the advantages of standard forms – familiarity with the terms.
7.	Execution	It is good practice to execute two original copies of the Agreement. Only persons authorized to sign for the contracting parties may execute the Agreement.

Specific Instructions

Section	Title	Instruction
General	Purpose of This Document	The General Conditions of Contract provide the terms and conditions under which the Work of the Project will be performed. This document accompanies DBIA Document No. 525 and DBIA Document No. 530 (each referred to herein generally as "Agreement"). It may also be incorporated by reference into other related agreements, as between Design-Builder and Design Consultant, and Design-Builder and Subcontractor.
General	Checklist	The following Sections reference documents that are to be attached to the Agreement: Section 3.5.1 Owner's Permit List Article 5 Insurance and Bonds Section 9.4.2 Unit Prices
2.1.3	Schedule	The parties are encouraged, if possible, to agree to a schedule for the execution of the Work upon execution of the Agreement or upon establishing the GMP.
2.2.1	Design Professional Services	The parties should be aware that in addition to requiring compliance with state licensing laws for design professionals, some states also require that the design professional have a corporate professional license.
2.3.1	Standard of Care for Design Professional's Services	Design-Builder's obligation is to deliver a design that meets prevailing industry standards. However, DBIA has provided the parties at Article 11 of the Agreement an optional provision whereby if Owner can identify specific performance standards that can be objectively measured, Design-Builder is obligated to design the Project to satisfy these standards if this optional provision is selected. To avoid any confusion and to ensure that the parties fully understand what their obligations are, the specific performance standards should be clearly identified and should be able to be objectively measured. Design-Builder should recognize that this is a heightened standard of care that has insurance ramifications that should be discussed with Design-Builder's insurance advisor.
3.5.1	Government Approvals and Permits	Design-Builder is responsible for obtaining all necessary permits, approvals, and licenses, except to the extent specific permits, approvals, and licenses are set forth in an Owner's Permit List, which must be attached as an exhibit to the Agreement. The parties, prior to execution of the Agreement, should discuss which permits, approvals and licenses need to be obtained for the Project and which party is in the best position to do so.
5.1.1	Design-Builder's Insurance Requirements	Design-Builder is obligated to provide insurance coverage from insurance carriers that meet the criteria set forth in the Insurance Exhibit attached to Section 10.1 of the Agreement.
5.1.2	Exclusions to Design-Build	Parties are advised that their standard insurance policies may contain exclusions for the design-build delivery method. This Section 5.1.2 requires that any such exclusions be deleted from the policy.
5.2	Owner's Insurance Requirements	Owner, in addition to providing the insurance set forth in this Section and Section 5.3, is also obligated to procure the insurance coverages for the amounts and consistent with the terms set forth in the Insurance Exhibit made part of the Agreement.
5.4	Bonds and Other Performance Security	Design-Builder is only obligated to provide bonds or other forms of performance security to the extent called for in Section 10.2 of the Agreement.

Section	Title	Instruction
8.2.2	Compensability for Force Majeure Events	The parties are provided the option in the Agreement of negotiating whether Design-Builder is entitled to compensation for Force Majeure Events.
9.4.1	Contract Price Adjustments	Unit prices, if established, shall be attached pursuant to Article 2 of the Agreement.
9.4.3	Payment/ Performance of Disputed Services	When Owner disputes Design-Builder's entitlement to a change order or disagrees with Design-Builder regarding the scope of Work, and nevertheless expects Design-Builder to perform the services, Design-Builder's cash flow and ability to complete the Work will be hampered if Owner fails to pay Design-Builder for the disputed services. This Section provides a balanced approach whereby Design-Builder is required to perform the services, but Owner is required to pay fifty percent (50%) of Design-Builder's reasonable estimated direct costs of performing such services until the dispute is settled. By so doing, Owner does not forfeit its right to deny total responsibility for payment, and Design-Builder does not give up its right to demand full payment. The dispute shall be resolved according to Article 10.
Article 10	Contract Adjustments and Disputes	DBIA endorses the use of partnering, negotiation, mediation and arbitration for the prevention and resolution of disputes. The General Conditions of Contract provides for the parties' Representatives and Senior Representatives to attempt to negotiate the dispute or disagreement. If this attempt fails, the dispute shall be submitted to mandatory, non-binding mediation. Any dispute that cannot be resolved by mediation shall then be submitted to binding arbitration, unless the parties elect in the Agreement to submit their dispute to a court of competent jurisdiction.
10.3.4	Arbitration	The prevailing party in any arbitration shall receive reasonable attorneys' fees from the other party. DBIA supports this "loser pays" provision to encourage parties to negotiate or mediate their differences and to minimize the number of frivolous disputes.
10.4	Duty to Continue Performance	Pending the resolution of any dispute or disagreement, both Owner and Design-Builder shall continue to perform their respective duties under the Contract Documents, unless the parties provide otherwise in the Contract Documents.
10.5	Consequential Damages	DBIA believes that it is inappropriate for either Owner or Design-Builder to be responsible to the other for consequential damages arising from the Project. This limitation on consequential damages in no way restricts, however, the payment of liquidated damages, if any, under Article 5 of the Agreement.
11.4	Design-Builder's Right to Terminate for Cause	If Design-Builder properly terminates the Agreement for cause, it shall recover from Owner in the same way as if Owner had terminated the Agreement for convenience under Section 11.6 of the General Conditions. Owner shall pay to Design-Builder its costs, reasonable overhead and profit on the costs, and an additional payment based on a percentage of the remaining balance of the Contract Price, all as set forth in Article 8 of the Agreement.
11.6.2	Termination for Convenience: Owner's Use of Work Product	Owner should not use the Termination for Convenience clause to obtain Design-Builder's valuable design concepts and then seek lower bids from another design-builder. If Owner terminates this Agreement for its own convenience, and chooses to proceed with the Project using Design-Builder's Work Product, Owner should pay an additional sum for the use of Design-Builder's Work Product pursuant to Section 4.3 of the Agreement.
Article 12	Electronic Data	Design-Builder and Owner shall agree on the software and format for the transmission of Electronic Data. Ownership of Work Product in electronic form is governed by Article 4 of the Agreement. The transmitting party disclaims all warranties with respect to the media transmitting the Electronic Data, but nothing in this Article is intended to negate duties with respect to the standard of care in creating the Electronic Data.

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Article 1

General

1.1 Mutual Obligations.

1.1.1 *Owner and Design-Builder* commit at all times to cooperate fully with each other and proceed on the basis of trust and good faith, to permit each party to realize the benefits afforded under the Contract Documents.

1.2 Basic Definitions.

1.2.1 *Agreement* refers to the executed contract between Owner and Design-Builder under either DBIA Document No. 525, *Standard Form of Agreement Between Owner and Design-Builder – Lump Sum* (2022 Edition); DBIA Document No. 530, *Standard Form of Agreement Between Owner and Design-Builder – Cost Plus Fee With an Option for a Guaranteed Maximum Price* (2022 Edition); DBIA Document No. 544, *Standard Form of Progressive Design-Build Agreement* (2022 Edition); or DBIA Document No. 545, *Standard Form of Progressive Design-Build Agreement for Water and Wastewater Projects* (2022 Edition).

1.2.2 *Basis of Design Documents* are as follows: For DBIA Document No. 530, *Standard Form of Agreement Between Owner and Design-Builder – Cost Plus Fee With an Option for a Guaranteed Maximum Price*, the Basis of Design Documents are those documents specifically listed in, as applicable, the GMP Exhibit or GMP Proposal as being the “Basis of Design Documents.” For DBIA Document No. 525, *Standard Form of Agreement Between Owner and Design-Builder – Lump Sum*, for DBIA Document No. 544, *Standard Form of Progressive Design-Build Agreement*, the Basis of Design Documents are Owner’s Project Criteria, Design-Builder’s Proposal, and the Deviation List, if any. For DBIA Document No. 545, *Standard Form of Progressive Design-Build Agreement for Water and Wastewater Projects,* the Basis of Design Documents are Owner’s Project Criteria, Design-Builder’s Proposal and the Deviation List, if any.

1.2.3 *Construction Documents* are the documents, consisting of Drawings and Specifications, to be prepared or assembled by Design-Builder consistent with the Basis of Design Documents unless a deviation from the Basis of Design Documents is specifically set forth in a Change Order executed by both Owner and Design-Builder, as part of the design review process contemplated by Section 2.4 of these General Conditions of Contract.

1.2.4 *Day* or *Days* shall mean calendar days unless otherwise specifically noted in the Contract Documents.

1.2.5 *Design-Build Team* is comprised of Design-Builder, Design Consultant, and key Subcontractors identified by Design-Builder.

1.2.6 *Design Consultant* is a qualified, licensed design professional who is not an employee of Design-Builder, but is retained by Design-Builder, or employed or retained by anyone under contract with Design-Builder, to furnish design services required under the Contract Documents. A Design Sub-Consultant is a qualified, licensed design professional who is not an employee of Design Consultant but is retained by Design Consultant or employed or retained by anyone under contract to Design Consultant, to furnish design services required under the Contract Documents.

1.2.7 *Design Submission* means any and all documents, shop drawings, electronic information, including computer programs and computer generated materials, data, plans, drawings, sketches, illustrations, specifications, descriptions, models, and other information developed, prepared, furnished, delivered or required to be delivered by, or for, Design-Builder.

1.2.8 *Final Completion* is the date on which all Work is complete in accordance with the Contract Documents, including but not limited to, any items identified in the punch list prepared under

Section 6.6.1 and the submission of all documents set forth in Section 6.7.2.

1.2.9 *Force Majeure Events* are those events that are beyond the control of both Design-Builder and Owner, including the events of war, floods, labor disputes, earthquakes, epidemics, adverse weather conditions not reasonably anticipated, and other acts of God.

1.2.10 *General Conditions of Contract* refer to this DBIA Document No. 535, *Standard Form of General Conditions of Contract Between Owner and Design-Builder* (2022 Edition).

1.2.11 *GMP Exhibit* means that exhibit attached to DBIA Document No. 530, *Standard Form of Agreement Between Owner and Design-Builder – Cost Plus Fee With an Option for a Guaranteed Maximum Price*, which exhibit will have been agreed upon by Owner and Design-Builder prior to the execution of the Agreement.

1.2.12 *GMP Proposal* or *Proposal* means that proposal developed by Design-Builder in accordance with Section 6.6 of DBIA Document No. 530, *Standard Form of Agreement Between Owner and Design-Builder, Cost Plus Fee With an Option for a Guaranteed Maximum* Price or with Section 2.3 of DBIA Document No. 544, *Progressive Design-Build Agreement,* or DBIA Document No. 545, *Progressive Design-Build Agreement for Water and Wastewater Projects.*

1.2.13 *Hazardous Conditions* are any materials, wastes, substances and chemicals deemed to be hazardous under applicable Legal Requirements, or the handling, storage, remediation, or disposal of which are regulated by applicable Legal Requirements.

1.2.14 *Legal Requirements* are all applicable federal, state and local laws, codes, ordinances, rules, regulations, orders and decrees of any government or quasi-government entity having jurisdiction over the Project or Site, the practices involved in the Project or Site, or any Work.

1.2.15 *Owner's Project Criteria* are developed by or for Owner to describe Owner's program requirements and objectives for the Project, including use, space, price, time, site and expandability requirements, as well as submittal requirements and other requirements governing Design-Builder's performance of the Work. Owner's Project Criteria may include conceptual documents, design criteria, design performance specifications, design specifications, and LEED® or other sustainable design criteria and other Project-specific technical materials and requirements.

1.2.16 *Site* is the land or premises on which the Project is located.

1.2.17 *Subcontractor* is any person or entity retained by Design-Builder as an independent contractor to perform a portion of the Work and shall include materialmen and suppliers.

1.2.18 *Sub-Subcontractor* is any person or entity retained by a Subcontractor as an independent contractor to perform any portion of a Subcontractor's Work and shall include materialmen and suppliers.

1.2.19 *Substantial Completion* or *Substantially Complete* means the date on which the Work, or an agreed upon portion of the Work, is sufficiently complete in accordance with the Contract Documents so that Owner can occupy and use the Project or a portion thereof for its intended purposes.

1.2.20 *Work* is comprised of all Design-Builder's design, construction and other services required by the Contract Documents, including procuring and furnishing all materials, equipment, services and labor reasonably inferable from the Contract Documents.

Article 2

Design-Builder's Services and Responsibilities

2.1 General Services.

2.1.1 Design-Builder's Representative shall be reasonably available to Owner and shall have the necessary expertise and experience required to supervise the Work. Design-Builder's Representative shall communicate regularly with Owner and shall be vested with the authority to act on behalf of Design-Builder. Design-Builder's Representative may be replaced only with the mutual agreement of Owner and Design-Builder.

2.1.2 Unless the parties agree on a different time period for submission of a status report, Design-Builder shall provide Owner with a monthly status report detailing the progress of the Work, including (i) whether the Work is proceeding according to schedule; (ii) whether discrepancies, conflicts, or ambiguities exist in the Contract Documents that require resolution; (iii) whether health and safety issues exist in connection with the Work; (iv) status of the contingency account to the extent provided for in the *Standard Form of Agreement Between Owner and Design-Builder – Cost Plus Fee With an Option for a Guaranteed Maximum Price*; and (v) other items that require resolution so as not to jeopardize Design-Builder's ability to complete the Work for the Contract Price and within the Contract Time(s). Status reports shall be submitted with Design-Builder's draft Payment Applications as a pre-requisite to payment.

2.1.3 Unless a schedule for the execution of the Work has been attached to the Agreement as an exhibit at the time the Agreement is executed, Design-Builder shall prepare and submit, at least three (3) days prior to the meeting contemplated by Section 2.1.4 hereof, a schedule for the execution of the Work for Owner's review and response. The schedule shall indicate the dates for the start and completion of the various stages of Work, including the dates when Owner information and approvals are required to enable Design-Builder to achieve the Contract Time(s). The schedule shall be revised as required by conditions and progress of the Work, but such revisions shall not relieve Design-Builder of its obligations to complete the Work within the Contract Time(s), as such dates may be adjusted in accordance with the Contract Documents. Owner's review of, and response to, the schedule shall not be construed as relieving Design-Builder of its complete and exclusive control over the means, methods, sequences and techniques for executing the Work.

2.1.4 The parties will meet within seven (7) days after execution of the Agreement to discuss issues affecting the administration of the Work and to implement the necessary procedures, including those relating to submittals and payment, to facilitate the ability of the parties to perform their obligations under the Contract Documents.

2.2 Design Professional Services.

2.2.1 Design-Builder shall, consistent with applicable state licensing laws, provide through qualified, licensed design professionals employed by Design-Builder, or procured from qualified, independent licensed Design Consultants, the necessary design services, including architectural, engineering and other design professional services, for the preparation of the required drawings, specifications and other design submittals to permit Design-Builder to complete the Work consistent with the Contract Documents. Nothing in the Contract Documents is intended or deemed to create any legal or contractual relationship between Owner and any Design Consultant.

2.2.2 Design-Builder shall employ only Design Consultants and/or Design Subconsultants who are duly licensed and qualified to perform the Work consistent with the Contract Documents. Prior to the date that Design Consultants and/or Design Subconsultants perform Work on the Project, Design-Builder shall identify in writing to Owner all Design Consultants and Design Subconsultants. To the extent that Design-Builder has not selected a Design Consultant or Design Subconsultant prior to performing the Work, Design-Builder shall provide Owner in writing a list of any subsequently added Design Consultants and/or Design Subconsultants and their scope of Work prior to their performing Work on the Project. Owner may reasonably object to Design-Builder's selection of any Design Consultant or Design Subconsultant, provided that the Contract Price and/or Contract Time(s) shall be adjusted to the extent that Owner's decision impacts Design-Builder's cost and/or time of performance. Design-Builder shall not substitute a listed Design Consultant or Subconsultant without obtaining Owner's prior written consent; such consent shall not be unreasonably withheld. Nothing in the Contract Documents is intended or deemed to create any legal or contractual relationship between Owner and any Design Consultant or Design Subconsultant, including but not limited to any third-party beneficiary rights.

2.3 Standard of Care for Design Professional Services.

2.3.1 The standard of care for all design professional services performed to execute the Work shall be the care and skill ordinarily used by members of the applicable profession practicing under similar conditions at the same time and locality of the Project.

2.4 Design Development Services.

2.4.1 Design-Builder and Owner shall, consistent with any applicable provision of the Contract Documents, agree upon any interim Design Submissions that Owner may wish to review, which interim Design Submissions may include design criteria, drawings, diagrams and specifications setting forth the Project requirements.

2.4.1.1 Design Submissions shall be consistent with the Owner's Project Criteria as well as the Basis of Design Documents, as the Basis of Design Documents may have been changed or supplemented through the design process set forth in this Section 2.4.1. By submitting Design Submissions, Design-Builder represents to the Owner that the Work depicted and otherwise shown, contained, or reflected in Design Submissions may be constructed in compliance with the then current Contract Price and Contract Time. Notwithstanding the above, Design-Builder may propose Design Submissions that may alter the Basis of Design Documents, the Contract Price and/or Contract Time; however, Design-Builder must provide notice thereof in accordance with Article 10 of the General Conditions and obtain a Change Order before such proposed Design Submissions are incorporated into the Construction Documents.

2.4.1.2 On or about the time of the Design Submissions, Design-Builder and Owner shall meet and confer about the Design Submissions, with Design-Builder identifying during such meetings, among other things, the evolution of the design and any changes to the Basis of Design Documents, or, if applicable, previously submitted Design Submissions. Changes to the Basis of Design Documents, including those that are deemed minor changes under Section 9.3.1, shall be processed in accordance with Article 9. Minutes of the meetings, including a full listing of all changes, will be maintained by Design-Builder and provided to all attendees for review. Following the design review meeting, Owner shall review and approve the interim Design Submissions and meeting minutes in a time that is consistent with the turnaround times set forth in Design-Builder's schedule.

2.4.1.3 Owner shall review and respond to Design Submissions, providing any comments and/or concerns about the Design Submissions. Owner shall provide all comments on the Design Submissions within the time provided by the Contract Documents. Design-Builder shall revise the Design Submissions (and any other deliverables) in response to Owner's comments and incorporate said responses into the next submission of Design Submissions.

2.4.1.4 If incorporation of Owner's comments results in a design that is inconsistent with or otherwise gives rise to a change in Owner's Project Criteria, the Basis of Design Documents, the Contract Price and/or the Contract Time, Design-Builder shall provide notice thereof in accordance with Articles 9 and 10 of the General Conditions. Changes to the Basis of Design Documents, the Contract Price and/or the Contract Time, including those that are deemed minor changes, shall be processed in accordance with Article 9 of the General Conditions.

2.4.2 Design-Builder shall submit to Owner Construction Documents setting forth in detail drawings and specifications describing the requirements for construction of the Work. The Construction Documents shall be consistent with the latest set of interim Design Submissions, as such submissions may have been modified in a design review meeting and recorded in the meeting minutes. The parties shall have a design review meeting to discuss, and Owner shall review and approve, the Construction Documents in accordance with the procedures set forth in Section 2.4.1 above. Design-Builder shall proceed with construction in accordance with the approved Construction Documents and shall submit one set of approved Construction Documents to Owner prior to commencement of construction.

2.4.3 Owner's review and approval of interim Design Submissions, meeting minutes, and the Construction Documents is for the purpose of mutually establishing a conformed set of Contract Documents compatible with the requirements of the Work. Neither Owner's review nor approval of any interim Design Submissions, meeting minutes, and Construction Documents shall be deemed to transfer any design liability from Design-Builder to Owner. Design-Builder shall provide Owner with sufficient time in the Project Schedule to review and approve the Design Submissions.

2.4.4 To the extent not prohibited by the Contract Documents or Legal Requirements, Design-Builder may prepare interim Design Submissions and Construction Documents for a portion of the Work to permit construction to proceed on that portion of the Work prior to completion of the Construction Documents for the entire Work.

2.5 Legal Requirements.

2.5.1 Design-Builder shall perform the Work in accordance with all Legal Requirements and shall provide all notices applicable to the Work as required by the Legal Requirements.

2.5.2 The Contract Price and/or Contract Time(s) shall be adjusted to compensate Design-Builder for the effects of any changes in the Legal Requirements enacted after the date of the Agreement affecting the performance of the Work, or if a Guaranteed Maximum Price is established after the date of the Agreement, the date the parties agree upon the Guaranteed Maximum Price. Such effects may include, without limitation, revisions Design-Builder is required to make to the Construction Documents because of changes in Legal Requirements.

2.6 Government Approvals and Permits.

2.6.1 Except as identified in an Owner's Permit List attached as an exhibit to the Agreement, Design-Builder shall obtain and pay for all necessary permits, approvals, licenses, government charges and inspection fees required for the prosecution of the Work by any government or quasi-government entity having jurisdiction over the Project.

2.6.2 Design-Builder shall provide reasonable assistance to Owner in obtaining those permits, approvals and licenses that are Owner's responsibility.

2.7 Design-Builder's Construction Phase Services.

2.7.1 Unless otherwise provided in the Contract Documents to be the responsibility of Owner or a separate contractor, Design-Builder shall provide through itself or Subcontractors the necessary supervision, labor, inspection, testing, start-up, material, equipment, machinery, temporary utilities and other temporary facilities to permit Design-Builder to complete construction of the Project consistent with the Contract Documents.

2.7.2 Design-Builder shall perform all construction activities efficiently and with the requisite expertise, skill and competence to satisfy the requirements of the Contract Documents. Design-

Builder shall at all times exercise complete and exclusive control over the means, methods, sequences and techniques of construction.

2.7.3 Design-Builder shall employ only Subcontractors who are duly licensed and qualified to perform the Work consistent with the Contract Documents. Prior to the date that Subcontractors perform Work on the Project, Design-Builder shall identify in writing to Owner all Subcontractors. To the extent that Design-Builder has not selected a Subcontractor prior to performing the Work, Design-Builder shall provide Owner in writing a list of any subsequently added Subcontractors prior to their performing Work on the Project. Owner may reasonably object to Design-Builder's selection of any Subcontractor, provided that the Contract Price and/or Contract Time(s) shall be adjusted to the extent that Owner's decision impacts Design-Builder's cost and/or time of performance. Design-Builder may not substitute listed Subcontractors without Owner's prior written consent; such consent shall not be unreasonably withheld.

2.7.4 Design-Builder assumes responsibility to Owner for the proper performance of the Work of Subcontractors and any acts and omissions in connection with such performance. Nothing in the Contract Documents is intended or deemed to create any legal or contractual relationship between Owner and any Subcontractor or Sub-Subcontractor, including but not limited to any third-party beneficiary rights.

2.7.5 Design-Builder shall coordinate the activities of all Subcontractors. If Owner performs other work on the Project or at the Site with separate contractors under Owner's control, Design-Builder agrees to reasonably cooperate and coordinate its activities with those of such separate contractors so that the Project can be completed in an orderly and coordinated manner without unreasonable disruption.

2.7.6 Design-Builder shall keep the Site reasonably free from debris, trash and construction wastes to permit Design-Builder to perform its construction services efficiently, safely and without interfering with the use of adjacent land areas. Upon Substantial Completion of the Work, or a portion of the Work, Design-Builder shall remove all debris, trash, construction wastes, materials, equipment, machinery and tools arising from the Work or applicable portions thereof to permit Owner to occupy the Project or a portion of the Project for its intended use.

2.8 Design-Builder's Responsibility for Project Safety.

2.8.1 Design-Builder recognizes the importance of performing the Work in a safe manner so as to prevent damage, injury or loss to (i) all individuals at the Site, whether working or visiting; (ii) the Work, including materials and equipment incorporated into the Work or stored on-Site or off-Site; and (iii) all other property at the Site or adjacent thereto. Design-Builder assumes responsibility for implementing and monitoring all safety precautions and programs related to the performance of the Work. Design-Builder shall, prior to commencing construction, designate a Safety Representative with the necessary qualifications and experience to supervise the implementation and monitoring of all safety precautions and programs related to the Work. Unless otherwise required by the Contract Documents, Design-Builder's Safety Representative shall be an individual stationed at the Site who may have responsibilities on the Project in addition to safety. The Safety Representative shall make routine daily inspections of the Site and shall hold weekly safety meetings with Design-Builder's personnel, Subcontractors and others as applicable.

2.8.2 Design-Builder and Subcontractors shall comply with all Legal Requirements relating to safety, as well as any Owner-specific safety requirements set forth in the Contract Documents, provided that such Owner-specific requirements do not violate any applicable Legal Requirement. Design-Builder will immediately report in writing any safety-related injury, loss, damage or accident arising from the Work to Owner's Representative and, to the extent mandated by Legal Requirements, to all government or quasi-government authorities having jurisdiction over safety-related matters involving the Project or the Work.

2.8.3 Design-Builder's responsibility for safety under this Section 2.8 is not intended in any way to relieve Subcontractors and Sub-Subcontractors of their own contractual and legal obligations and responsibility for (i) complying with all Legal Requirements, including those related to health and safety matters; and (ii) taking all necessary measures to implement and monitor all safety precautions and programs to guard against injuries, losses, damages or accidents resulting from their performance of the Work.

2.9 Design-Builder's Warranty.

2.9.1 Design-Builder warrants to Owner that the construction, including all materials and equipment furnished as part of the construction, shall be new unless otherwise specified in the Contract Documents, of good quality, in conformance with the Contract Documents and free of defects in materials and workmanship. If the parties have opted in Section ___ of the Agreement to establish a limited time frame for the warranty set forth in this Section, the warranty in this section shall be limited to the time frame set forth in Section ____ of the Agreement. Design-Builder's warranty obligation excludes defects caused by abuse, alterations, or failure to maintain the Work in a commercially reasonable manner. Nothing in this warranty is intended to limit any manufacturer's warranty which provides Owner with greater warranty rights than set forth in this Section 2.9 or the Contract Documents. Design-Builder will provide Owner with all manufacturers' warranties upon Substantial Completion.

2.10 Correction of Defective Work.

2.10.1 Design-Builder agrees to correct any Work that is found to not be in conformance with the Contract Documents, including that part of the Work subject to Section 2.9 hereof, within a period of one year from the date of Substantial Completion of the Work or any portion of the Work, or within such longer period to the extent required by any specific warranty included in the Contract Documents.

2.10.2 Design-Builder shall, within seven (7) days of receipt of written notice from Owner that the Work is not in conformance with the Contract Documents, take meaningful steps to commence correction of such nonconforming Work, including the correction, removal or replacement of the nonconforming Work and any damage caused to other parts of the Work affected by the nonconforming Work. If Design-Builder fails to commence the necessary steps within such seven (7) day period, Owner, in addition to any other remedies provided under the Contract Documents, may provide Design-Builder with written notice that Owner will commence correction of such nonconforming Work with its own forces. If Owner does perform such corrective Work, Design-Builder shall be responsible for all reasonable costs incurred by Owner in performing such correction. If the nonconforming Work creates an emergency requiring an immediate response, the seven (7) day period identified herein shall be deemed inapplicable.

2.10.3 The one-year period referenced in Section 2.10.1 above applies only to Design-Builder's obligation to correct nonconforming Work and is not intended to constitute a period of limitations for any other rights or remedies Owner may have regarding Design-Builder's other obligations under the Contract Documents.

Article 3

Owner's Services and Responsibilities

3.1 Duty to Cooperate.

3.1.1 Owner shall, throughout the performance of the Work, cooperate with Design-Builder and perform its responsibilities, obligations and services in a timely manner to facilitate Design-Builder's timely and efficient performance of the Work and so as not to delay or interfere with Design-

Builder's performance of its obligations under the Contract Documents.

3.1.2 Owner shall provide timely reviews and approvals of interim Design Submissions and Construction Documents consistent with the turnaround times set forth in Design-Builder's schedule.

3.1.3 Owner shall give Design-Builder timely notice of any Work that Owner notices to be defective or not in compliance with the Contract Documents.

3.2 Furnishing of Services and Information.

3.2.1 Unless expressly stated to the contrary in the Contract Documents, Owner shall provide, at its own cost and expense, for Design-Builder's information and use the following, all of which Design-Builder is entitled to rely upon in performing the Work:

3.2.1.1 Surveys describing the property, boundaries, topography and reference points for use during construction, including existing service and utility lines;

3.2.1.2 Geotechnical studies describing subsurface conditions, and other surveys describing other latent or concealed physical conditions at the Site;

3.2.1.3 Temporary and permanent easements, zoning and other requirements and encumbrances affecting land use, or necessary to permit the proper design and construction of the Project and enable Design-Builder to perform the Work;

3.2.1.4 A legal description of the Site;

3.2.1.5 To the extent available, record drawings of any existing structures at the Site; and

3.2.1.6 To the extent available, environmental studies, reports and impact statements describing the environmental conditions, including Hazardous Conditions, in existence at the Site.

3.2.2 Owner is responsible for securing and executing all necessary agreements with adjacent land or property owners that are necessary to enable Design-Builder to perform the Work. Owner is further responsible for all costs, including attorneys' fees, incurred in securing these necessary agreements.

3.3 Financial Information.

3.3.1 At Design-Builder's written request, Owner shall promptly furnish reasonable evidence satisfactory to Design-Builder that Owner has adequate funds available and committed to fulfill all of Owner's contractual obligations under the Contract Documents. If Owner fails to furnish such financial information in a timely manner, Design-Builder may stop Work under Section 11.3 hereof or exercise any other right permitted under the Contract Documents.

3.3.2 Design-Builder shall cooperate with the reasonable requirements of Owner's lenders or other financial sources. Notwithstanding the preceding sentence, after execution of the Agreement Design-Builder shall have no obligation to execute for Owner or Owner's lenders or other financial sources any documents or agreements that require Design-Builder to assume obligations or responsibilities greater than those existing obligations Design-Builder has under the Contract Documents.

3.4 Owner's Representative.

3.4.1 Owner's Representative shall be responsible for providing Owner-supplied information and approvals in a timely manner to permit Design-Builder to fulfill its obligations under the Contract

Documents. Owner's Representative shall also provide Design-Builder with prompt notice if it observes any failure on the part of Design-Builder to fulfill its contractual obligations, including any errors, omissions or defects in the performance of the Work. Owner's Representative shall communicate regularly with Design-Builder and shall be vested with the authority to act on behalf of Owner.

3.5 Government Approvals and Permits.

3.5.1 Owner shall obtain and pay for all necessary permits, approvals, licenses, government charges and inspection fees set forth in Owner's Permit List attached as an exhibit to the Agreement.

3.5.2 Owner shall provide reasonable assistance to Design-Builder in obtaining those permits, approvals and licenses that are Design-Builder's responsibility.

3.6 Owner's Separate Contractors.

3.6.1 Owner is responsible for all work performed on the Project or at the Site by separate contractors under Owner's control. Owner shall contractually require its separate contractors to cooperate with and coordinate their activities so as not to interfere with Design-Builder in order to enable Design-Builder to timely complete the Work consistent with the Contract Documents.

Article 4

Hazardous Conditions and Differing Site Conditions

4.1 Hazardous Conditions.

4.1.1 Unless otherwise expressly provided in the Contract Documents to be part of the Work, Design-Builder is not responsible for any Hazardous Conditions encountered at the Site. Upon encountering any Hazardous Conditions, Design-Builder will stop Work immediately in the affected area and duly notify Owner and, if required by Legal Requirements, all government or quasi-government entities with jurisdiction over the Project or Site.

4.1.2 Upon receiving notice of the presence of suspected Hazardous Conditions, Owner shall take the necessary measures required to ensure that the Hazardous Conditions are remediated or rendered harmless. Such necessary measures shall include Owner retaining qualified independent experts to (i) ascertain whether Hazardous Conditions have actually been encountered, and, if they have been encountered, (ii) prescribe the remedial measures that Owner must take either to remove the Hazardous Conditions or render the Hazardous Conditions harmless.

4.1.3 Design-Builder shall be obligated to resume Work at the affected area of the Project only after Owner's expert provides it with written certification that (i) the Hazardous Conditions have been removed or rendered harmless; and (ii) all necessary approvals have been obtained from all government and quasi-government entities having jurisdiction over the Project or Site.

4.1.4 Design-Builder will be entitled, in accordance with these General Conditions of Contract, to an adjustment in its Contract Price and/or Contract Time(s) to the extent Design-Builder's cost and/or time of performance have been adversely impacted by the presence of Hazardous Conditions.

4.1.5 To the fullest extent permitted by law, Owner shall indemnify, defend and hold harmless Design-Builder, Design Consultants, Subcontractors, anyone employed directly or indirectly by any of them, and their officers, directors, employees and agents, from and against any and all claims, losses, damages, liabilities and expenses, including reasonable attorneys' fees and expenses, arising out of or resulting from the presence, removal or remediation of Hazardous Conditions at the Site.

4.1.6 Notwithstanding the preceding provisions of this Section 4.1, Owner is not responsible for Hazardous Conditions introduced to the Site by Design-Builder, Subcontractors or anyone for whose acts they may be liable. To the fullest extent permitted by law, Design-Builder shall indemnify, defend and hold harmless Owner and Owner's officers, directors, employees and agents from and against all claims, losses, damages, liabilities and expenses, including attorneys' fees and expenses, arising out of or resulting from those Hazardous Conditions introduced to the Site by Design-Builder, Subcontractors or anyone for whose acts they may be liable.

4.2 Differing Site Conditions.

4.2.1 Concealed or latent physical conditions or subsurface conditions at the Site that (i) materially differ from the conditions indicated in the Contract Documents or (ii) are of an unusual nature, differing materially from the conditions ordinarily encountered and generally recognized as inherent in the Work, are collectively referred to herein as "Differing Site Conditions." If Design-Builder encounters a Differing Site Condition, Design-Builder will be entitled to an adjustment in the Contract Price and/or Contract Time(s) to the extent Design-Builder's cost and/or time of performance are adversely impacted by the Differing Site Condition.

4.2.2 Upon encountering a Differing Site Condition, Design-Builder shall provide prompt written notice to Owner of such condition, which notice shall not be later than fourteen (14) days after such condition has been encountered. Design-Builder shall, to the extent reasonably possible, provide such notice before the Differing Site Condition has been substantially disturbed or altered.

Article 5

Insurance and Bonds

5.1 Design-Builder's Insurance Requirements.

5.1.1 Design-Builder is responsible for procuring and maintaining the insurance for the coverage amounts all as set forth in the Insurance Exhibit to the Agreement. Coverage shall be secured from insurance companies authorized to do business in the state in which the Project is located, and with a minimum rating set forth in the Agreement.

5.1.2 Design-Builder's insurance shall specifically delete any design-build or similar exclusions that could compromise coverages because of the design-build delivery of the Project.

5.1.3 Prior to commencing any construction services hereunder, Design-Builder shall provide Owner with certificates evidencing that (i) all insurance obligations required by the Contract Documents are in full force and in effect and will remain in effect for the duration required by the Contract Documents; and (ii) no insurance coverage will be canceled, renewal refused, or materially changed unless at least thirty (30) days' prior written notice is given to Owner. If any of the foregoing insurance coverages are required to remain in force after final payment is reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the Final Application for Payment. If any information concerning reduction of coverage is not furnished by the insurer, it shall be furnished by Design-Builder with reasonable promptness according to Design-Builder's information and belief.

5.2 Owner's Liability Insurance.

5.2.1 Owner shall procure and maintain from insurance companies authorized to do business in the state in which the Project is located such liability insurance as set forth in the Insurance Exhibit to the Agreement to protect Owner from claims which may arise from the performance of Owner's obligations under the Contract Documents or Owner's conduct during the course of the Project.

5.3 Owner's Property Insurance.

5.3.1 Unless otherwise provided in the Contract Documents, Owner shall procure and maintain from insurance companies authorized to do business in the state in which the Project is located property insurance upon the entire Project to the full insurable value of the Project, including professional fees, overtime premiums and all other expenses incurred to replace or repair the insured property. The property insurance obtained by Owner shall be the broadest coverage commercially available, and shall include as additional insureds the interests of Owner, Design-Builder, Design Consultants and Subcontractors of any tier. Such insurance shall include but not be limited to the perils of fire and extended coverage, theft, vandalism, malicious mischief, collapse, flood, earthquake, debris removal and other perils or causes of loss as called for in the Contract Documents. The property insurance shall include physical loss or damage to the Work, including materials and equipment in transit, at the Site or at another location as may be indicated in Design-Builder's Application for Payment and approved by Owner. Owner is responsible for the payment of any deductibles under the insurance required by this Section 5.3.1.

5.3.2 Unless the Contract Documents provide otherwise, Owner shall procure and maintain boiler and machinery insurance that will include the interests of Owner, Design-Builder, Design Consultants, and Subcontractors of any tier. Owner is responsible for the payment of any deductibles under the insurance required by this Section 5.3.2.

5.3.3 Prior to Design-Builder commencing any Work, Owner shall provide Design-Builder with certificates evidencing that (i) all Owner's insurance obligations required by the Contract Documents are in full force and in effect and will remain in effect until Design-Builder has completed all of the Work and has received final payment from Owner; and (ii) no insurance coverage will be canceled, renewal refused, or materially changed unless at least thirty (30) days' prior written notice is given to Design-Builder. Owner's property insurance shall not lapse or be canceled if Owner occupies a portion of the Work pursuant to Section 6.6.3 hereof. Owner shall provide Design-Builder with the necessary endorsements from the insurance company prior to occupying a portion of the Work.

5.3.4 Any loss covered under Owner's property insurance shall be adjusted with Owner and Design-Builder and made payable to both of them as trustees for the insureds as their interests may appear, subject to any applicable mortgage clause. All insurance proceeds received as a result of any loss will be placed in a separate account and distributed in accordance with such agreement as the interested parties may reach. Any disagreement concerning the distribution of any proceeds will be resolved in accordance with Article 10 hereof.

5.3.5 Owner and Design-Builder waive against each other and Owner's separate contractors, Design Consultants, Subcontractors, agents and employees of each and all of them, all damages covered by property insurance provided herein, except such rights as they may have to the proceeds of such insurance. Design-Builder and Owner shall, where appropriate, require similar waivers of subrogation from Owner's separate contractors, Design Consultants and Subcontractors and shall require each of them to include similar waivers in their contracts. These waivers of subrogation shall not contain any restriction or limitation that will impair the full and complete extent of its applicability to any person or entity unless agreed to in writing prior to the execution of this Agreement.

5.4 Bonds and Other Performance Security.

5.4.1 If Owner requires Design-Builder to obtain performance and labor and material payment bonds, or other forms of performance security, the amount, form and other conditions of such security shall be as set forth in the Agreement.

5.4.2 All bonds furnished by Design-Builder shall be in a form satisfactory to Owner. The surety shall be a company qualified and registered to conduct business in the state in which the Project is located.

Article 6

Payment

6.1 Schedule of Values.

6.1.1 Unless required by Owner upon execution of this Agreement, within ten (10) days of execution of the Agreement, Design-Builder shall submit for Owner's review and approval a schedule of values for all of the Work. The Schedule of Values will (i) subdivide the Work into its respective parts; (ii) include values for all items comprising the Work; and (iii) serve as the basis for monthly progress payments made to Design-Builder throughout the Work.

6.1.2 Owner will timely review and approve the schedule of values so as not to delay the submission of Design-Builder's first application for payment. Owner and Design-Builder shall timely resolve any differences so as not to delay Design-Builder's submission of its first application for payment.

6.2 Monthly Progress Payments.

6.2.1 On or before the date established in the Agreement, Design-Builder shall submit for Owner's review and approval its Application for Payment requesting payment for all Work performed as of the date of the Application for Payment. The Application for Payment shall be accompanied by all supporting documentation required by the Contract Documents and/or established at the meeting required by Section 2.1.4 hereof.

6.2.2 The Application for Payment may request payment for equipment and materials not yet incorporated into the Project, provided that (i) Owner is satisfied that the equipment and materials are suitably stored at either the Site or another acceptable location; (ii) the equipment and materials are protected by suitable insurance; and (iii) upon payment, Owner will receive the equipment and materials free and clear of all liens and encumbrances.

6.2.3 All discounts offered by Subcontractors, Sub-Subcontractors, and suppliers to Design-Builder for early payment shall accrue one hundred percent to Design-Builder to the extent Design-Builder advances payment. Unless Owner advances payment to Design-Builder specifically to receive the discount, Design-Builder may include in its Application for Payment the full undiscounted cost of the item for which payment is sought.

6.2.4 The Application for Payment shall constitute Design-Builder's representation that the Work described therein has been performed consistent with the Contract Documents, has progressed to the point indicated in the Application for Payment, and that title to all Work will pass to Owner free and clear of all claims, liens, encumbrances, and security interests upon the incorporation of the Work into the Project, or upon Design-Builder's receipt of payment, whichever occurs earlier.

6.3 Withholding of Payments.

6.3.1 On or before the date established in the Agreement, Owner shall pay Design-Builder all amounts properly due. If Owner determines that Design-Builder is not entitled to all or part of an Application for Payment as a result of Design-Builder's failure to meet its obligations hereunder, it will notify Design-Builder in writing at least five (5) days prior to the date payment is due. The notice shall indicate the specific amounts Owner intends to withhold, the reasons and contractual basis for the withholding, and the specific measures Design-Builder must take to rectify Owner's concerns. Design-Builder and Owner will attempt to resolve Owner's concerns prior to the date payment is due. If the parties cannot resolve such concerns, Design-Builder may pursue its rights under the Contract Documents, including those under Article 10 hereof.

6.3.2 Notwithstanding anything to the contrary in the Contract Documents, Owner shall pay Design-Builder all undisputed amounts in an Application for Payment within the times required by the Agreement.

6.4 Right to Stop Work and Interest.

6.4.1 If Owner fails to pay timely Design-Builder any undisputed amount that becomes due, Design-Builder, in addition to all other remedies provided in the Contract Documents, may stop Work pursuant to Section 11.3 hereof. All payments due and unpaid shall bear interest at the rate set forth in the Agreement.

6.5 Design-Builder's Payment Obligations.

6.5.1 Design-Builder will pay Design Consultants and Subcontractors, in accordance with its contractual obligations to such parties, all the amounts Design-Builder has received from Owner on account of their work. Design-Builder will impose similar requirements on Design Consultants and Subcontractors to pay those parties with whom they have contracted. Design-Builder will indemnify and defend Owner against any claims for payment and mechanic's liens as set forth in Section 7.3 hereof.

6.6 Substantial Completion.

6.6.1 Design-Builder shall notify Owner when it believes the Work, or to the extent permitted in the Contract Documents, a portion of the Work, is Substantially Complete. Within five (5) days of Owner's receipt of Design-Builder's notice, Owner and Design-Builder will jointly inspect such Work to verify that it is Substantially Complete in accordance with the requirements of the Contract Documents. If such Work is Substantially Complete, Owner shall prepare and issue a Certificate of Substantial Completion that will set forth (i) the date of Substantial Completion of the Work or portion thereof; (ii) the remaining items of Work that have to be completed before final payment; (iii) provisions (to the extent not already provided in the Contract Documents) establishing Owner's and Design-Builder's responsibility for the Project's security, maintenance, utilities and insurance pending final payment; and (iv) an acknowledgment that warranties commence to run on the date of Substantial Completion, except as may otherwise be noted in the Certificate of Substantial Completion.

6.6.2 Upon Substantial Completion of the entire Work or, if applicable, any portion of the Work, Owner shall release to Design-Builder all retained amounts relating, as applicable, to the entire Work or completed portion of the Work, less an amount equal to the reasonable value of all remaining or incomplete items of Work as noted in the Certificate of Substantial Completion.

6.6.3 Owner, at its option, may use a portion of the Work which has been determined to be Substantially Complete, provided, however, that (i) a Certificate of Substantial Completion has been issued for the portion of Work addressing the items set forth in Section 6.6.1 above; (ii) Design-Builder and Owner have obtained the consent of their sureties and insurers, and to the extent applicable, the appropriate government authorities having jurisdiction over the Project; and (iii) Owner and Design-Builder agree that Owner's use or occupancy will not interfere with Design-Builder's completion of the remaining Work.

6.7 Final Payment.

6.7.1 After receipt of a Final Application for Payment from Design-Builder, Owner shall make final payment by the time required in the Agreement, provided that Design-Builder has achieved

Final Completion.

6.7.2 At the time of submission of its Final Application for Payment, Design-Builder shall provide the following information:

6.7.2.1 An affidavit that there are no claims, obligations or liens outstanding or unsatisfied for labor, services, material, equipment, taxes or other items performed, furnished or incurred for or in connection with the Work which will in any way affect Owner's interests;

6.7.2.2 A general release executed by Design-Builder waiving, upon receipt of final payment by Design-Builder, all claims, except those claims previously made in writing to Owner and remaining unsettled at the time of final payment;

6.7.2.3 Consent of Design-Builder's surety, if any, to final payment;

6.7.2.4 All operating manuals, warranties and other deliverables required by the Contract Documents; and

6.7.2.5 Certificates of insurance confirming that required coverages will remain in effect consistent with the requirements of the Contract Documents.

6.7.3 Upon making final payment, Owner waives all claims against Design-Builder except claims relating to (i) Design-Builder's failure to satisfy its payment obligations, if such failure affects Owner's interests; (ii) Design-Builder's failure to complete the Work consistent with the Contract Documents, including defects appearing after Substantial Completion; and (iii) the terms of any special warranties required by the Contract Documents.

6.7.4 Deficiencies in the Work discovered after Substantial Completion, whether or not such deficiencies would have been included on the punch list if discovered earlier, shall be deemed warranty Work. Such deficiencies shall be corrected by Design-Builder under Sections 2.9 and 2.10 herein and shall not be a reason to withhold final payment from Design-Builder, provided, however, that Owner shall be entitled to withhold from the Final Payment the reasonable value of completion of such deficient work until such work is completed.

Article 7

Indemnification

7.1 Patent and Copyright Infringement.

7.1.1 Design-Builder shall defend any action or proceeding brought against Owner based on any claim that the Work, or any part thereof, or the operation or use of the Work or any part thereof, constitutes infringement of any United States patent or copyright, now or hereafter issued. Owner shall give prompt written notice to Design-Builder of any such action or proceeding and will reasonably provide authority, information and assistance in the defense of same. Design-Builder shall indemnify and hold harmless Owner from and against all damages and costs, including but not limited to attorneys' fees and expenses awarded against Owner or Design-Builder in any such action or proceeding. Design-Builder agrees to keep Owner informed of all developments in the defense of such actions.

7.1.2 If Owner is enjoined from the operation or use of the Work, or any part thereof, as the result of any patent or copyright suit, claim, or proceeding, Design-Builder shall at its sole expense take reasonable steps to procure the right to operate or use the Work. If Design-Builder cannot so procure such right within a reasonable time, Design-Builder shall promptly, at Design-Builder's option and at Design-Builder's expense, (i) modify the Work so as to avoid infringement of any such patent or copyright; or (ii) replace said Work with Work that does not infringe or violate any such patent or copyright.

7.1.3 Sections 7.1.1 and 7.1.2 above shall not be applicable to any suit, claim or proceeding based on infringement or violation of a patent or copyright (i) relating solely to a particular process or product of a particular manufacturer specified by Owner and not offered or recommended by Design-Builder to Owner; or (ii) arising from modifications to the Work by Owner or its agents after acceptance of the Work. If the suit, claim or proceeding is based upon events set forth in the preceding sentence, Owner shall defend, indemnify and hold harmless Design-Builder to the same extent Design-Builder is obligated to defend, indemnify and hold harmless Owner in Section 7.1.1 above.

7.1.4 The obligations set forth in this Section 7.1 shall constitute the sole agreement between the parties relating to liability for infringement of violation of any patent or copyright.

7.2 Tax Claim Indemnification.

7.2.1 If, in accordance with Owner's direction, an exemption for all or part of the Work is claimed for taxes, Owner shall indemnify, defend and hold harmless Design-Builder from and against any liability, penalty, interest, fine, tax assessment, attorneys' fees or other expenses or costs incurred by Design-Builder as a result of any action taken by Design-Builder in accordance with Owner's directive. Owner shall furnish Design-Builder with any applicable tax exemption certificates necessary to obtain such exemption, upon which Design-Builder may rely.

7.3 Payment Claim Indemnification.

7.3.1 Provided that Owner is not in breach of its contractual obligation to make payments to Design-Builder for the Work, Design-Builder shall indemnify, defend and hold harmless Owner from any claims or mechanic's liens brought against Owner or against the Project as a result of the failure of Design-Builder, or those for whose acts it is responsible, to pay for any services, materials, labor, equipment, taxes or other items or obligations furnished or incurred for or in connection with the Work. Within three (3) days of receiving written notice from Owner that such a claim or mechanic's lien has been filed, Design-Builder shall commence to take the steps necessary to discharge said claim or lien, including, if necessary, the furnishing of a mechanic's lien bond. If Design-Builder fails to do so, Owner will have the right to discharge the claim or lien and hold Design-Builder liable for costs and expenses incurred, including attorneys' fees.

7.4 Design-Builder's General Indemnification.

7.4.1 Except as set forth in Section 7.4.2 below, Design-Builder, to the fullest extent permitted by law, shall indemnify, hold harmless and defend Owner, its officers, directors, and employees from and against claims, losses, damages, liabilities, including attorneys' fees and expenses, for non-party bodily injury, sickness or death and non-party property damage or destruction (other than to the Work itself) but only to the extent resulting from the negligent acts or omissions of Design-Builder, Design Consultants, Subcontractors, anyone employed directly or indirectly by any of them or anyone for whose acts any of them may be liable.

7.4.2 For indemnity obligations that arise from professional errors and omissions, Design-Builder, to the fullest extent permitted by law, shall indemnify Owner, its officers, directors, and employees from and against claims, losses, damages, liabilities, including attorneys' fees and expenses, for non-party bodily injury, sickness, or death and non-party property damage or destruction (other than to the Work itself) but only to the extent resulting from the negligent acts or omissions of Design-Builder, Design Consultants, Subcontractors, anyone employed directly or indirectly by any of them or anyone for whose acts any of them may be liable.

7.4.3 If an employee of Design-Builder, Design Consultants, Subcontractors, anyone employed directly or indirectly by any of them or anyone for whose acts any of them may be liable has a claim against Owner, its officers, directors, employees, or agents, Design-Builder's indemnity obligations set forth in Sections 7.4.1 and 7.4.2 above shall not be limited by any limitation on the amount of damages, compensation or benefits payable by or for Design-Builder, Design Consultants, Subcontractors, or other entity under any employee benefit acts, including workers' compensation or disability acts.

7.5 Owner's General Indemnification.

7.5.1 Owner, to the fullest extent permitted by law, shall indemnify, hold harmless and defend Design-Builder and any of Design-Builder's officers, directors, and employees, from and against claims, losses, damages, liabilities, including attorneys' fees and expenses, for bodily injury, sickness or death, and property damage or destruction (other than to the Work itself) but only to the extent resulting from the negligent acts or omissions of Owner, Owner's separate contractors or anyone for whose acts any of them may be liable.

7.6 Limited Recourse.

7.6.1 None of the obligations set forth in this Agreement (on behalf of any party) constitute personal obligations of any natural persons who are the officers, shareholders, members, partners, employees, or agents of any party unless the natural person is expressly identified as a contracting party. All Parties to this Agreement shall not seek recourse against any natural person described herein. This provision, however, shall not protect such natural persons from liability for willful misconduct, illegal acts or intentional violation of any duty of corporate loyalty.

Article 8

Time

8.1 Obligation to Achieve the Contract Times.

8.1.1 Design-Builder agrees that it will commence performance of the Work and achieve the Contract Time(s) in accordance with Article 5 of the Agreement.

8.2 Delays to the Work.

8.2.1 If Design-Builder is delayed on the critical path in the performance of the Work due to acts, omissions, conditions, events, or circumstances beyond its control and due to no fault of its own or those for whom Design-Builder is responsible, the Contract Time(s) for performance shall be reasonably extended by Change Order. By way of example, events that will entitle Design-Builder to an extension of the Contract Time(s) include acts or omissions of Owner or anyone under Owner's control (including separate contractors), changes in the Work, Differing Site Conditions, Hazardous Conditions, and Force Majeure Events.

8.2.2 In addition to Design-Builder's right to a time extension for those events set forth in Section 8.2.1 above, Design-Builder shall also be entitled to an appropriate adjustment of the Contract Price provided, however, that the Contract Price shall not be adjusted for Force Majeure Events unless otherwise provided in the Agreement.

Article 9

Changes to the Contract Price and Time

9.1 Change Orders.

9.1.1 A Change Order is a written instrument issued after execution of the Agreement signed by Owner and Design-Builder, stating their agreement upon all of the following:

9.1.1.1 The scope of the change in the Work;

9.1.1.2 The amount of the adjustment to the Contract Price; and

9.1.1.3 The extent of the adjustment to the Contract Time(s).

9.1.2 All changes in the Work authorized by applicable Change Order shall be performed under the applicable conditions of the Contract Documents. Owner and Design-Builder shall negotiate in good faith and as expeditiously as possible the appropriate adjustments for such changes.

9.1.3 If Owner requests a proposal for a change in the Work from Design-Builder and subsequently elects not to proceed with the change, a Change Order shall be issued to reimburse Design-Builder for reasonable costs incurred for estimating services, design services and services involved in the preparation of proposed revisions to the Contract Documents.

9.2 Work Change Directives.

9.2.1 A Work Change Directive is a written order prepared and signed by Owner directing a change in the Work prior to agreement on an adjustment in the Contract Price and/or the Contract Time(s).

9.2.2 Owner and Design-Builder shall negotiate in good faith and as expeditiously as possible the appropriate adjustments for the Work Change Directive. Upon reaching an agreement, the parties shall prepare and execute an appropriate Change Order reflecting the terms of the agreement.

9.3 Minor Changes in the Work.

9.3.1 Minor changes in the Work do not involve an adjustment in the Contract Price and/or Contract Time(s) and do not materially and adversely affect the Work, including the design, quality, performance and workmanship required by the Contract Documents. Design-Builder may make minor changes in the Work consistent with the intent of the Contract Documents, provided, however, that Design-Builder shall promptly inform Owner, in writing, of any such changes and record such changes on the documents maintained by Design-Builder.

9.4 Contract Price Adjustments.

9.4.1 The increase or decrease in Contract Price resulting from a change in the Work shall be determined by one or more of the following methods:

9.4.1.1 Unit prices set forth in the Agreement or as subsequently agreed to between the parties;

9.4.1.2 A mutually accepted lump sum, properly itemized and supported by sufficient substantiating data to permit evaluation by Owner;

9.4.1.3 Costs, fees and any other markups set forth in the Agreement; or

9.4.1.4 If an increase or decrease cannot be agreed to as set forth in items 9.4.1.1 through 9.4.1.3 above and Owner issues a Work Change Directive, the cost of the change of the Work shall be determined by the reasonable expense and savings in the performance of the Work resulting from the change, including a reasonable overhead and profit, as may be set forth in the Agreement.

9.4.2 If unit prices are set forth in the Contract Documents or are subsequently agreed to by the parties, but application of such unit prices will cause substantial inequity to Owner or Design-Builder because of differences in the character or quantity of such unit items as originally contemplated, such unit prices shall be equitably adjusted.

9.4.3 If Owner and Design-Builder disagree upon whether Design-Builder is entitled to be paid for any services required by Owner, or if there are any other disagreements over the scope of Work or proposed changes to the Work, Owner and Design-Builder shall resolve the disagreement pursuant to Article 10 hereof. As part of the negotiation process, Design-Builder shall furnish Owner with a good faith estimate of the costs to perform the disputed services in accordance with Owner's interpretations. If the parties are unable to agree and Owner expects Design-Builder to perform the services in accordance with Owner's interpretations, Design-Builder shall proceed to perform the disputed services, conditioned upon Owner issuing a written order to Design-Builder (i) directing Design-Builder to proceed; and (ii) specifying Owner's interpretation of the services that are to be performed. If this occurs, Design-Builder shall be entitled to submit in its Applications for Payment an amount equal to fifty percent (50%) of its reasonable estimated direct cost to perform the services, and Owner agrees to pay such amounts, with the express understanding that (i) such payment by Owner does not prejudice Owner's right to argue that it has no responsibility to pay for such services; and (ii) receipt of such payment by Design-Builder does not prejudice Design-Builder's right to seek full payment of the disputed services if Owner's order is deemed to be a change to the Work.

9.5 Emergencies.

9.5.1 In any emergency affecting the safety of persons and/or property, Design-Builder shall act, at its discretion, to prevent threatened damage, injury or loss. Any change in the Contract Price and/or Contract Time(s) on account of emergency work shall be determined as provided in this Article 9.

Article 10

Contract Adjustments and Disputes

10.1 Requests for Contract Adjustments and Relief.

10.1.1 If either Design-Builder or Owner believes that it is entitled to relief against the other for any event arising out of or related to the Work or Project, such party shall provide written notice to the other party of the basis for its claim for relief. Such notice shall, if possible, be made prior to incurring any cost or expense and in accordance with any specific notice requirements contained in applicable sections of these General Conditions of Contract. In the absence of any specific notice requirement, written notice shall be given within a reasonable time, not to exceed twenty-one (21) days, after the occurrence giving rise to the claim for relief or after the claiming party reasonably should have recognized the event or condition giving rise to the request, whichever is later. The claimant shall provide more complete information with respect to the claim within fourteen (14) days of the initial notice. The more complete information shall include sufficient information to advise the other party of the circumstances giving rise to the claim for relief, the specific contractual adjustment or relief requested and the basis of such request.

10.2 Dispute Avoidance and Resolution.

10.2.1 The parties are fully committed to working with each other throughout the Project and agree to communicate regularly with each other at all times so as to avoid or minimize disputes or disagreements. If disputes or disagreements do arise, Design-Builder and Owner each commit to resolving such disputes or disagreements in an amicable, professional and expeditious manner so as to avoid unnecessary losses, delays and disruptions to the Work.

10.2.2 Design-Builder and Owner will first attempt to resolve disputes or disagreements at the field level through discussions between Design-Builder's Representative and Owner's Representative which shall conclude within fourteen (14) days of the written notice provided for in Section 10.1.1 unless Owner and Design-Builder mutually agree otherwise.

10.2.3 If a dispute or disagreement cannot be resolved through Design-Builder's Representative and Owner's Representative, Design-Builder's Senior Representative and Owner's Senior Representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than thirty (30) days after such a request is made, to attempt to resolve such dispute or disagreement. Five (5) days prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving their dispute or disagreement.

10.2.4 If after meeting the Senior Representatives determine that the dispute or disagreement cannot be resolved on terms satisfactory to both parties, the parties shall submit within thirty (30) days of the conclusion of the meeting of Senior Representatives the dispute or disagreement to non-binding mediation. The mediation shall be conducted by a mutually agreeable impartial mediator, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator. Unless otherwise mutually agreed by Owner and Design-Builder and consistent with the mediator's schedule, the mediation shall commence within ninety (90) days of the submission of the dispute to mediation. Representatives of the parties with authority to resolve the dispute shall be present at any mediation.

10.3 Arbitration.

10.3.1 Any claims, disputes or controversies between the parties arising out of or relating to the Agreement, or the breach thereof, which have not been resolved in accordance with the procedures set forth in Section 10.2 above, shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the AAA then in effect, unless the parties mutually agree otherwise.

10.3.2 The award of the arbitrator(s) shall be final and binding upon the parties without the right of appeal to the courts. Judgment may be entered upon it in accordance with applicable law by any court having jurisdiction thereof.

10.3.3 Design-Builder and Owner expressly agree that any arbitration pursuant to this Section 10.3 may be joined or consolidated with any arbitration involving any other person or entity (i) necessary to resolve the claim, dispute or controversy; or (ii) substantially involved in or affected by such claim, dispute or controversy. Both Design-Builder and Owner will include appropriate provisions in all contracts they execute with other parties in connection with the Project to require such joinder or consolidation.

10.3.4 The prevailing party in any arbitration, or any other final, binding dispute proceeding upon which the parties may agree, shall be entitled to recover from the other party reasonable attorneys' fees and expenses incurred by the prevailing party. The prevailing party, if any, shall be determined by the applicable binding dispute tribunal.

10.4 Duty to Continue Performance.

10.4.1 Unless provided to the contrary in the Contract Documents, Design-Builder shall continue to perform the Work and Owner shall continue to satisfy its payment obligations for undisputed amounts to Design-Builder as well as any further amounts pursuant to Section 9.4.3, pending the final resolution of any dispute or disagreement between Design-Builder and Owner.

10.5 CONSEQUENTIAL DAMAGES.

10.5.1 NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY (EXCEPT AS SET FORTH IN SECTION 10.5.2 BELOW), NEITHER DESIGN-BUILDER NOR OWNER SHALL BE LIABLE TO THE OTHER FOR ANY CONSEQUENTIAL LOSSES OR DAMAGES, WHETHER ARISING IN CONTRACT, WARRANTY, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO LOSSES OF USE, PROFITS, BUSINESS, REPUTATION OR FINANCING.

10.5.2 The consequential damages limitation set forth in Section 10.5.1 above is not intended to affect the payment of liquidated damages or lost early completion bonus, if any, set forth in Article 5 of the Agreement, which both parties recognize has been established, in part, to reimburse Owner or reward Design-Builder for some damages that might otherwise be deemed to be consequential.

Article 11

Stop Work and Termination

11.1 Owner's Right to Stop Work.

11.1.1 Owner may, without cause and for its convenience, order Design-Builder in writing to stop and suspend the Work. Such suspension shall not exceed sixty (60) consecutive days or aggregate more than ninety (90) days during the duration of the Project.

11.1.2 Design-Builder is entitled to seek an adjustment of the Contract Price and/or Contract Time(s) if its cost or time to perform the Work has been adversely impacted by any suspension of stoppage of the Work by Owner.

11.2 Owner's Right to Perform and Terminate for Cause.

11.2.1 If Design-Builder persistently fails to (i) provide a sufficient number of skilled workers, (ii) supply the materials required by the Contract Documents, (iii) comply with applicable Legal Requirements, (iv) timely pay, without cause, Design Consultants or Subcontractors, (v) prosecute the Work with promptness and diligence to ensure that the Work is completed by the Contract Time(s), as such times may be adjusted, or (vi) perform material obligations under the Contract Documents, then Owner, in addition to any other rights and remedies provided in the Contract Documents or by law, shall have the rights set forth in Sections 11.2.2 and 11.2.3 below.

11.2.2 Upon the occurrence of an event set forth in Section 11.2.1 above, Owner may provide written notice to Design-Builder that it intends to terminate the Agreement unless the problem cited is cured, or commenced to be cured, within seven (7) days of Design-Builder's receipt of such notice. If Design-Builder fails to cure, or reasonably commence to cure, such problem, then Owner may give a second written notice to Design-Builder of its intent to terminate within an additional seven (7) day period. If Design-Builder, within such second seven (7) day period, fails to cure, or reasonably commence to cure, such problem, then Owner may declare the Agreement terminated for default by providing written notice to Design-Builder of such declaration.

11.2.3 Upon declaring the Agreement terminated pursuant to Section 11.2.2 above, Owner may enter upon the premises and take possession, for the purpose of completing the Work, of all materials, equipment, scaffolds, tools, appliances and other items thereon, which have been purchased or provided for the performance of the Work, all of which Design-Builder hereby transfers, assigns and sets over to Owner for such purpose, and to employ any person or persons to complete the Work and provide all of the required labor, services, materials, equipment and other items. In the event of such termination, Design-Builder shall not be entitled to receive any further payments under the Contract Documents until the Work shall be finally completed in accordance with the Contract Documents. At such time, if the unpaid balance of the Contract Price exceeds the cost and expense incurred by Owner in completing the Work, such excess shall be paid by Owner to Design-Builder. Notwithstanding the preceding sentence, if the Agreement establishes a Guaranteed Maximum Price, Design-Builder will only be entitled to be paid for Work performed prior to its default. If Owner's cost and expense of completing the Work exceeds the unpaid balance of the Contract Price, then Design-Builder shall be obligated to pay the difference to Owner. Such costs and expense shall include not only the cost of completing the Work, but also losses, damages, costs and expense, including attorneys' fees and expenses, incurred by Owner in connection with the reprocurement and defense of claims arising from Design-Builder's default, subject to the waiver of consequential damages set forth in Section 10.5 hereof.

11.2.4 If Owner improperly terminates the Agreement for cause, the termination for cause will be converted to a termination for convenience in accordance with the provisions of Section 11.6 hereof.

11.3 Design-Builder's Right to Stop Work.

11.3.1 Design-Builder may, in addition to any other rights afforded under the Contract Documents or at law, stop the Work for the following reasons:

11.3.1.1 Owner's failure to provide financial assurances as required under Section 3.3 hereof; or

11.3.1.2 Owner's failure to pay amounts properly due under Design-Builder's Application for Payment.

11.3.2 Should any of the events set forth in Section 11.3.1 above occur, Design-Builder has the right to provide Owner with written notice that Design-Builder will stop the Work unless said event is cured within seven (7) days from Owner's receipt of Design-Builder's notice. Design-Builder shall not stop work unless it provides such written notice and Owner has failed to cure the reason for default within the seven (7) day cure period. If Owner does not cure the problem within such seven (7) day period, Design-Builder may stop the Work. In such case, Design-Builder shall be entitled to make a claim for adjustment to the Contract Price and Contract Time(s) to the extent it has been adversely impacted by such stoppage.

11.4 Design-Builder's Right to Terminate for Cause.

11.4.1 Design-Builder, in addition to any other rights and remedies provided in the Contract Documents or by law, may terminate the Agreement for cause for the following reasons:

11.4.1.1 The Work has been stopped for sixty (60) consecutive days, or more than ninety (90) days during the duration of the Project, because of court order, any government authority having jurisdiction over the Work, or orders by Owner under Section 11.1.1 hereof, provided that such stoppages are not due to the acts or omissions of Design-Builder or anyone for whose acts Design-Builder may be responsible.

11.4.1.2 Owner's failure to provide Design-Builder with any information, permits or approvals that are Owner's responsibility under the Contract Documents which result in the Work being stopped for sixty (60) consecutive days, or more than ninety (90) days during the duration of the Project, even though Owner has not ordered Design-Builder in writing to stop and suspend the Work pursuant to Section 11.1.1 hereof.

11.4.1.3 Owner's failure to cure the problems set forth in Section 11.3.1 above after Design-Builder has stopped the Work.

11.4.2 Upon the occurrence of an event set forth in Section 11.4.1 above, Design-Builder may provide written notice to Owner that it intends to terminate the Agreement unless the problem cited is cured, or commenced to be cured, within seven (7) days of Owner's receipt of such notice. If Owner fails to cure, or reasonably commence to cure, such problem, then Design-Builder may give a second written notice to Owner of its intent to terminate within an additional seven (7) day period. If Owner, within such second seven (7) day period, fails to cure, or reasonably commence to cure, such problem, then Design-Builder may declare the Agreement terminated for default by providing written notice to Owner of such declaration. In such case, Design-Builder shall be entitled to recover in the same manner as if Owner had terminated the Agreement for its convenience under Article 8 of the Agreement.

11.5 Bankruptcy of Owner or Design-Builder.

11.5.1 If either Owner or Design-Builder institutes or has instituted against it a case under the United States Bankruptcy Code (such party being referred to as the "Bankrupt Party"), such event may impair or frustrate the Bankrupt Party's ability to perform its obligations under the Contract Documents. Accordingly, should such event occur:

11.5.1.1 The Bankrupt Party, its trustee or other successor, shall furnish, upon request of the non-Bankrupt Party, adequate assurance of the ability of the Bankrupt Party to perform all future material obligations under the Contract Documents, which assurances shall be provided within ten (10) days after receiving notice of the request; and

11.5.1.2 The Bankrupt Party shall file an appropriate action within the bankruptcy court to seek assumption or rejection of the Agreement within sixty (60) days of the institution of the bankruptcy filing and shall diligently prosecute such action.

If the Bankrupt Party fails to comply with its foregoing obligations, the non-Bankrupt Party shall be entitled to request the bankruptcy court to reject the Agreement, declare the Agreement terminated and pursue any other recourse available to the non-Bankrupt Party under this Article 11.

11.5.2 The rights and remedies under Section 11.5.1 above shall not be deemed to limit the ability of the non-Bankrupt Party to seek any other rights and remedies provided by the Contract Documents or by law, including its ability to seek relief from any automatic stays under the United States Bankruptcy Code or the right of Design-Builder to stop Work under any applicable provision of these General Conditions of Contract.

11.6 Termination for Convenience.

11.6.1 Upon ten (10) days' written notice to Design-Builder, Owner may, for its convenience and without cause, elect to terminate this Agreement. In such event, Owner shall pay Design-Builder for the following:

11.6.1.1 All Work executed and for proven loss, cost or expense in connection with the Work;

11.6.1.2 The reasonable costs and expenses attributable to such termination, including demobilization costs and amounts due in settlement of terminated contracts with Subcontractors and Design Consultants; and

11.6.1.3 The amount set forth in Article 8 of the Agreement.

11.6.2 If Owner terminates this Agreement pursuant to Section 11.6.1 above and proceeds to design and construct the Project through its employees, agents or third parties, Owner's rights to use the Work Product shall be as set forth in Section 4.3 of the Agreement. Such rights may not be transferred or assigned to others without Design-Builder's express written consent and such third parties' agreement to the terms of Article 4 of the Agreement.

Article 12

Electronic Data

12.1 Electronic Data.

12.1.1 The parties recognize that Contract Documents, including drawings, specifications and three-dimensional modeling (such as Building Information Models) and other Work Product may be transmitted among Owner, Design-Builder and others in electronic media as an alternative to paper hard copies (collectively "Electronic Data").

12.2 Transmission of Electronic Data.

12.2.1 Owner and Design-Builder shall agree upon the software and the format for the transmission of Electronic Data. Each party shall be responsible for securing the legal rights to access the agreed-upon format, including, if necessary, obtaining appropriately licensed copies of the applicable software or electronic program to display, interpret and/or generate the Electronic Data.

12.2.2 Neither party makes any representations or warranties to the other with respect to the functionality of the software or computer program associated with the electronic transmission of Work Product. Unless specifically set forth in the Agreement, ownership of the Electronic Data does not include ownership of the software or computer program with which it is associated, transmitted, generated or interpreted.

12.2.3 By transmitting Work Product in electronic form, the transmitting party does not transfer or assign its rights in the Work Product. The rights in the Electronic Data shall be as set forth in Article 4 of the Agreement. Under no circumstances shall the transfer of ownership of Electronic Data be deemed to be a sale by the transmitting party of tangible goods.

12.3 Electronic Data Protocol.

12.3.1 The parties acknowledge that Electronic Data may be altered or corrupted, intentionally or otherwise, due to occurrences beyond their reasonable control or knowledge, including but not limited to compatibility issues with user software, manipulation by the recipient, errors in transcription or transmission, machine error, environmental factors, and operator error. Consequently, the parties understand that there is some level of increased risk in the use of Electronic Data for the communication of design and construction information and, in consideration of this, agree, and shall require their independent contractors, Subcontractors and Design Consultants to agree, to the following protocols, terms and conditions set forth in this Section 12.3.

12.3.2 Electronic Data will be transmitted in the format agreed upon in Section 12.2.1 above, including file conventions and document properties, unless prior arrangements are made in advance in writing.

12.3.3 The Electronic Data represents the information at a particular point in time and is subject to change. Therefore, the parties shall agree upon protocols for notification by the author to the recipient of any changes which may thereafter be made to the Electronic Data, which protocol shall also address the duty, if any, to update such information, data or other information contained in the electronic media if such information changes prior to Final Completion of the Project.

12.3.4 The transmitting party specifically disclaims all warranties, expressed or implied, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, with respect to the media transmitting the Electronic Data. However, transmission of the Electronic Data via electronic means shall not invalidate or negate any duties pursuant to the applicable standard of care with respect to the creation of the Electronic Data, unless such data is materially changed or altered after it is transmitted to the receiving party, and the transmitting party did not participate in such change or alteration.

Article 13

Miscellaneous

13.1 Confidential Information.

13.1.1 Confidential Information is defined as information which is determined by the transmitting party to be of a confidential or proprietary nature and: (i) the transmitting party identifies as either confidential or proprietary; (ii) the transmitting party takes steps to maintain the confidential or proprietary nature of the information; and (iii) the document is not otherwise available in or considered to be in the public domain. The receiving party agrees to maintain the confidentiality of the Confidential Information and agrees to use the Confidential Information solely in connection with the Project.

13.2 Assignment.

13.2.1 Neither Design-Builder nor Owner shall, without the written consent of the other assign, transfer or sublet any portion or part of the Work or the obligations required by the Contract Documents.

13.3 Successorship.

13.3.1 Design-Builder and Owner intend that the provisions of the Contract Documents are binding upon the parties, their employees, agents, heirs, successors and assigns.

13.4 Governing Law.

13.4.1 The Agreement and all Contract Documents shall be governed by the laws of the location of the Project, without giving effect to its conflict of law principles.

13.5 Severability.

13.5.1 If any provision or any part of a provision of the Contract Documents shall be finally determined to be superseded, invalid, illegal, or otherwise unenforceable pursuant to any applicable Legal Requirements, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

13.6 No Waiver.

13.6.1 The failure of either Design-Builder or Owner to insist, in any one or more instances, on the performance of any of the obligations required by the other under the Contract Documents shall not be construed as a waiver or relinquishment of such obligation or right with respect to future performance.

13.7 Headings.

13.7.1 The headings used in these General Conditions of Contract, or any other Contract Document, are for ease of reference only and shall not in any way be construed to limit or alter the meaning of any provision.

13.8 Notice.

13.8.1 Whenever the Contract Documents require that notice be provided to the other party, notice will be deemed to have been validly given (i) if delivered in person to the individual intended to receive such notice; (ii) four (4) days after being sent by registered or certified mail, postage prepaid to the address indicated in the Agreement; (iii) if transmitted by facsimile, by the time stated in a machine-generated confirmation that notice was received at the facsimile number of the intended recipient; or (iv) by electronic mail, by the time frame stated in the email-generated confirmation that notice was received by the email of the intended recipient.

13.9 Amendments.

13.9.1 The Contract Documents may not be changed, altered, or amended in any way except in writing signed by a duly authorized representative of each party.

Questions? We're here to help.

Contact us

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Washington, DC 20004

(202) 682-0110
dbia@dbia.org

Reference Document 1

Preliminary Engineering Report

Preliminary Engineering Report

JFK WTP Expansion and Emerging Contaminants

Piedmont Triad Regional Water Authority

Randleman, North Carolina

September 13, 2023

NORTH CAROLINA
PROFESSIONAL
SEAL
053283
ENGINEER
KATIE WALKER

13-Sept-2023

HDR No. 10343268

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1 Introduction

The Piedmont Triad Regional Water Authority (PTRWA) serves as the regional drinking water wholesale provider for six governmental agencies in the Piedmont Triad region including the Cities of Archdale, Greensboro, High Point, and Randleman, the Town of Jamestown, and Randolph County (Partners). PTRWA owns and operates the John Franklin Kime Water Treatment Plant (JFK WTP or WTP), Randleman Lake, which serves as the raw water source for the WTP, and its dam. PTRWA is currently in the preliminary stages of expanding the WTP and HDR Engineering, Inc. of the Carolinas (HDR) has been selected to serve as the engineer for the preliminary design of this expansion.

1.1 Project Background

The WTP was designed at a finished water capacity to 12 million gallons per day (MGD) and was later rerated to 14.7 MGD (HDR, 2016); it operates close to full capacity year-round (see Figure 1-1). The core systems and processes include raw water pumping and transmission, rapid mix, SuperPulsator flocculation and sedimentation, dual media gravity filtration, submerged microfiltration (MF) membranes, gravity granular activated carbon (GAC) contactors, primary disinfection using free chlorine, secondary disinfection using chloramines, corrosion control with a phosphate-based chemical, clearwell storage, and finished water pumping. As originally designed, the membranes acted as a secondary filtration step downstream of the media filters; while this operation is still used at times, PTRWA now has the ability to operate the membranes parallel to the media filters. The WTP also has solids handling systems including equalization, thickening, dewatering, and dewatered sludge storage. Figure 1-1 presents a process flow diagram of the existing plant.

The Piedmont Triad region is experiencing significant growth and increased water demands are anticipated soon. To satisfy customer needs, PTRWA plans to expand the WTP's capacity from 12 MGD to a total of 26.7 MGD by 2026.

In addition to responding to growth-related drivers, the WTP experiences raw water quality challenges. These include elevated concentrations of iron, manganese, and total organic carbon (TOC) as well as presence of emerging contaminants such as per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. In the future, the plant may also be susceptible to additional regulations regarding harmful algal blooms and disinfection by-products. A pilot plant is currently being conducted to determine the applicable technologies to treat PFAS and 1,4-dioxane. Additional bench-scale studies will be conducted to evaluate the effectiveness of advanced oxidative processes (AOPs) to treat 1,4-dioxane.

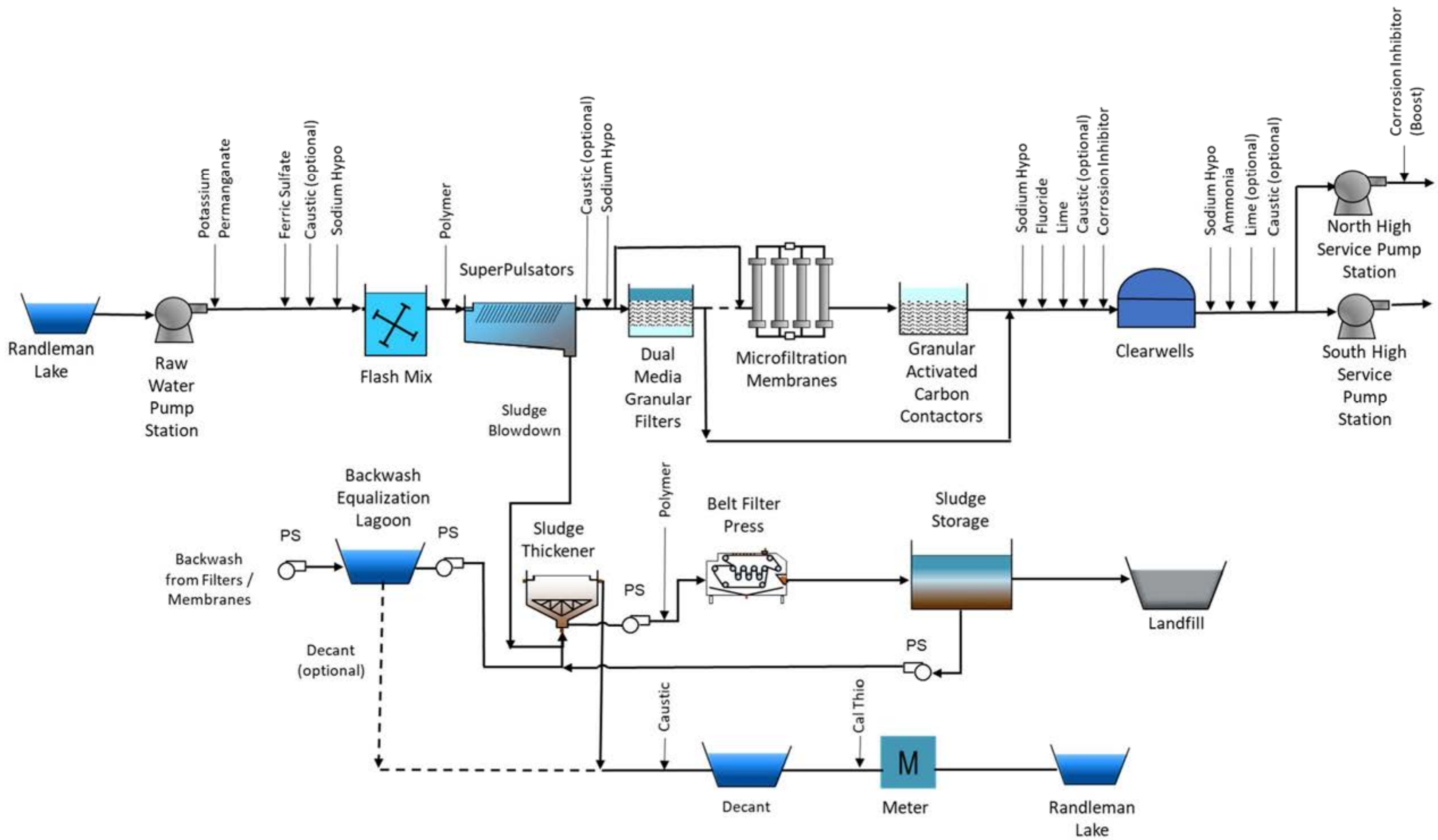

Figure 1-1. JFK WTP Existing Process Flow Diagram

1.2 Report Purpose and Organization

HDR previously prepared a draft Capacity Expansion Technical Memorandum (TM), a draft Treatment Improvements TM, and a draft Advanced Treatment Evaluation TM. This Preliminary Engineering Report (PER) compiles these documents into a consolidated report and includes the following:

- Definition of process requirements for the expansion including alternatives where appropriate
- Design criteria for each process, including loading rates, flow conditions, dosage requirements, etc. for each expanded process
- Process flow diagrams for the main treatment and waste stream handling
- Draft Process and Instrumentation Diagrams (P&IDs) for all major processes including waste stream process and chemical feed systems
- Structural basis of design with defined building codes or alternative structural loading criteria
- Building mechanical basis of design for all major structures including required building codes or alternative design criteria
- Preliminary level (approximately 30 percent complete) drawings for major components of the treatment plant
- Cost estimate for the expansion
- Evaluation of emerging contaminants treatment options along with conceptual design, site plans, and cost estimates

This report is organized based on the following:

- Summary of applicable water quality regulations that impact the design of expanded treatment processes
- Description of the plant capacity and future phases
- Summary of source and finished water quality
- Summary of previously conducted water quality evaluations and potential water improvements
- Design criteria for water treatment and residual handling processes, and chemical systems
- Basis of design for structural, architectural, mechanical, electrical, instrumentation and control, site civil, and fire and life safety
- Summary of emerging contaminant treatment options

2 Summary of Water Quality Regulations

2.1 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) is the principal federal regulation that governs water quality produced and delivered by public water systems by establishing protective barriers, prioritizing risks, and ensuring safe drinking water supply. The protective barriers consist of regulatory standards related to source water protection, treatment, distribution, maintenance, and public information. Pertinent contaminants are listed in tables below, as they are presented by the EPA.

2.2 National Primary Drinking Water Standards

National Primary Drinking Water Regulations (NPDWRs) are legally enforceable water quality standards that limit the allowable concentration of contaminants in drinking water. These constituents are regulated by a maximum contaminant level (MCL) or treatment technique (TT). The standards that will be focused on here are: (1) Disinfectants and disinfection byproducts, (2) Microbiological contaminants, (3) Inorganic chemicals, and (4) Organic chemicals.

2.2.1 Disinfectants and Disinfection By-Products

Disinfection is employed to reduce or eliminate the activity of pathogenic microorganisms, and disinfection can be achieved via a variety of chemical or physical agents. Since the mid-1970s, research has shown that reactions between certain constituents, namely natural organic matter (NOM) and bromide, with chemical oxidants leads to disinfection byproducts (i.e., trihalomethanes or haloacetic acids) that can lead to adverse health impacts. The production and speciation of disinfection by-products (DBPs) depends on properties and concentrations of NOM, disinfection methods, and various water quality parameters. For TTHMs and HAAs, although there is not a collective maximum contaminant level goal (MCLG) for the specific contaminant groups, there are individual MCLGs for some of the individual contaminants. The MCLGs for dichloroacetic acid and trichloroacetic acid are 0 mg/L and 0.3 mg/L, respectively. The MCLGs for bromodichloromethane, bromoform, and dibromochloromethane are 0 mg/L, 0 mg/L, and 0.06 mg/L, respectively. Table 2-1 and Table 2-2 show disinfectants and potential disinfection byproducts that are regulated. The regulations for TTHMs and HAAs are based on locational running annual averages in the distribution system.

Table 2-1. Disinfection – Regulatory Standards

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Chloramines (as Cl_2)	MRDLG=4	MRDL=4.0	Water additive used to control microbes
Chlorine (as Cl_2)	MRDLG=4	MRDL=4.0	Water additive used to control microbes
Chlorine dioxide (as ClO_2)	MRDLG=0.8	MRDL=0.8	Water additive used to control microbes

Table 2-2. Disinfection By-Products – Regulatory Standards

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Bromate	zero	0.010	Byproduct of drinking water disinfection
Chlorite	0.8	1.0	Byproduct of drinking water disinfection
Haloacetic acids (HAA5)	N/A	0.060	Byproduct of drinking water disinfection
Total Trihalomethanes (TTHMs)	N/A	0.080	Byproduct of drinking water disinfection

2.2.2 Microbiological Contaminants

The SDWA has been iteratively amended to ensure both protection against microbiological contaminants and control of halogenated DBPs. Table 2-3 shows potential microbial contaminants and their regulatory limits. The following regulations are established to concurrently maintain microbial protection and meet DBP reduction goals:

- Total Coliform Rule (TCR) establishes MCLs for total and fecal coliforms based on percentage of positive samples collected in the distribution system. The presence of Fecal coliform or *E. coli* may indicate potential contaminants that have the potential to induce gastrointestinal illnesses.
- Surface Water Treatment Rule (SWTR) establishes multiple protective barriers against pathogenic microorganisms. Specifically, the SWTR requires 3-log (99.9%) and 4-log (99.99%) removal and/or inactivation of *Giardia lamblia* and viruses, respectively.
- Interim Enhanced Surface Water Treatment Rule (IESWTR) was promulgated to improve the removal and/or inactivation of microbial pathogens, such as viruses, *Giardia lamblia*, and particularly *Cryptosporidium*, by reducing the concentration of particles in filter effluent and/or through inactivation by disinfection processes. The increased level of removal is demonstrated by lowered filtered water turbidity levels. This rule applies to systems serving more than 10,000 persons.
- Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) extends those requirements established with IESWTR to systems serving fewer than 10,000 persons.
- Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) employs a risk-based treatment strategy to further define *Cryptosporidium* removal and/or inactivation requirements.
- Filter Backwash Rule (FBR) was established to mandate that recycled flows be returned to the head of the plant, to ensure complete treatment of the recycle stream.
- Groundwater Rule (GWR) requires periodic sanitary surveys of groundwater to increase protection against microbial pathogens.

Table 2-3. Microorganisms – Regulatory Standards

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Cryptosporidium	Zero	TT	Human and animal fecal waste
Giardia lamblia	Zero	TT	Human and animal fecal waste
Heterotrophic plate count (HPC)	N/A	TT	HPC measures a range of bacteria that are naturally present in the environment
Legionella	Zero	TT	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and E. Coli)	Zero	Positive sample followed by a positive repeat sample	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and E. coli only come from human and animal fecal waste.
Turbidity	N/A	TT	Soil runoff
Viruses (enteric)	Zero	TT	Human and animal fecal waste

2.2.3 Inorganic Chemicals (IOCs)

Inorganic chemicals, such as metals, asbestos, nitrate, and nitrite are regulated by MCLs, in addition to having monitoring requirements. Table 2-4 shows a complete list of inorganic contaminants that are regulated by the EPA.

Table 2-4. Inorganic Contaminants – Regulatory Standards

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Antimony	0.006	0.006	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0	0.010 as of 01/23/06	Erosion of natural deposits; runoff from orchards, runoff from glass and electronics production wastes
Asbestos (fiber > 10 micrometers)	7 million fibers per liter (MFL)	7 MFL	Decay of asbestos cement in water mains; erosion of natural deposits
Barium	2	2	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Beryllium	0.004	0.004	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	0.1	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	TT; Action Level=1.3	Corrosion of household plumbing systems; erosion of natural deposits
Cyanide (as free cyanide)	0.2	0.2	Discharge from steel/metal factories; discharge from plastic and fertilizer factories

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Fluoride	4.0	4.0	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories
Lead	zero	TT; Action Level=0.015	Corrosion of household plumbing systems; erosion of natural deposits
Mercury (inorganic)	0.002	0.002	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	10	Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	0.05	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines
Thallium	0.0005	0.002	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories

2.2.4 Organic Chemicals

Organic chemicals, either synthetic or volatile, are regulated by MCLs, and also have monitoring requirements. Some examples of synthetic organic chemicals are atrazine, PAHs, or PCBs. Some examples of volatile organic chemicals are benzene, chlorobenzene, or toluene. Table 2-5 shows a list of regulated organic contaminants.

Table 2-5. Organic Chemicals – Regulatory Standards

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Acrylamide	zero	TT	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Runoff from herbicide used on row crops
Atrazine	0.003	0.003	Runoff from herbicide used on row crops
Benzene	zero	0.005	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene (PAHs)	zero	0.0002	Leaching from linings of water storage tanks and distribution lines
Carbofuran	0.04	0.04	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	0.005	Discharge from chemical plants and other industrial activities
Chlordane	zero	0.002	Residue of banned termiticide
Chlorobenzene	0.1	0.1	Discharge from chemical and agricultural chemical factories
2,4-D	0.07	0.07	Runoff from herbicide used on row crops

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Dalapon	0.2	0.2	Runoff from herbicide used on rights of way
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards
o-Dichlorobenzene	0.6	0.6	Discharge from industrial chemical factories
p-Dichlorobenzene	0.075	0.075	Discharge from industrial chemical factories
1,2-Dichloroethane	zero	0.005	Discharge from industrial chemical factories
1,1-Dichloroethylene	0.007	0.007	Discharge from industrial chemical factories
cis-1,2-Dichloroethylene	0.07	0.07	Discharge from industrial chemical factories
trans-1,2-Dichloroethylene	0.1	0.1	Discharge from industrial chemical factories
Dichloromethane	zero	0.005	Discharge from drug and chemical factories
1,2-Dichloropropane	zero	0.005	Discharge from industrial chemical factories
Di(2-ethylhexyl) adipate	0.4	0.4	Discharge from industrial chemical factories
Di(2-ethylhexyl) phthalate	zero	0.006	Discharge from rubber and chemical factories
Dinoseb	0.007	0.007	Runoff from herbicide used on soybeans and vegetables
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	Emissions from waste incineration and other combustion; discharge from chemical factories
Diquat	0.02	0.02	Runoff from herbicide use
Endothall	0.1	0.1	Runoff from herbicide use
Endrin	0.002	0.002	Residue of banned insecticide
Epichlorohydrin	zero	TT	Discharge from industrial chemical factories; an impurity of some water treatment chemicals
Ethylbenzene	0.7	0.7	Discharge from petroleum refineries
Ethylene dibromide	zero	0.00005	Discharge from petroleum refineries
Glyphosate	0.7	0.7	Runoff from herbicide use
Heptachlor	zero	0.0004	Residue of banned termiticide
Heptachlor epoxide	zero	0.0002	Breakdown of heptachlor
Hexachlorobenzene	zero	0.001	Discharge from metal refineries and agricultural chemical factories
Hexachlorocyclopentadiene	0.05	0.05	Discharge from industrial chemical factories

Contaminant	MCLG (mg/L)	MCL or TT (mg/L)	Source
Lindane	0.0002	0.0002	Runoff/leaching from insecticide used on cattle, lumber, gardens
Methoxychlor	0.04	0.04	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock
Oxamyl (Vydate)	0.2	0.2	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes
Polychlorinated biphenyls (PCBs)	zero	0.0005	Runoff from landfills; discharge of waste chemicals
Pentachlorophenol	zero	0.001	Discharge from wood preserving factories
Picloram	0.5	0.5	Herbicide runoff
Simazine	0.004	0.004	Herbicide runoff
Styrene	0.1	0.1	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Discharge from factories and dry cleaners
Toluene	1	1	Discharge from petroleum factories
Toxaphene	zero	0.003	Runoff/leaching from insecticide used on cotton and cattle
2,4,5-TP (Silvex)	0.05	0.05	Residue of banned herbicide
1,2,4-Trichlorobenzene	0.07	0.07	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.20	0.2	Discharge from metal degreasing sites and other factories
1,1,2-Trichloroethane	0.003	0.005	Discharge from industrial chemical factories
Trichloroethylene	zero	0.005	Discharge from metal degreasing sites and other factories
Vinyl chloride	zero	0.002	Leaching from PVC pipes; discharge from plastic factories
Xylenes (total)	10	10	Discharge from petroleum factories; discharge from chemical factories

2.3 Unregulated Parameters

Unregulated water quality parameters in drinking water include parameters located on the EPA's Contaminant Candidate List (CCL) and under the Unregulated Contaminant Monitoring Rule (UCMR). Based on a review of PTRWA's historical water quality, CECs of importance include PFAS, 1,4-dioxane, harmful algal blooms (HABs), and DBPs.

2.3.1 PFAS

Per- and poly-fluoroalkyl substances (PFAS) have been in production for almost one hundred years and can pose a threat to public health when adsorbed and accumulated in the human body. These compounds are present in a wide variety of applications and have been linked to developmental, reproductive, and immune issues in laboratory animals when ingested. While there are thousands of PFAS, there are only a handful that are detectable using currently available methods.

The drinking water industry has taken several steps towards understanding and regulating PFAS, as shown in Figure 2-1.

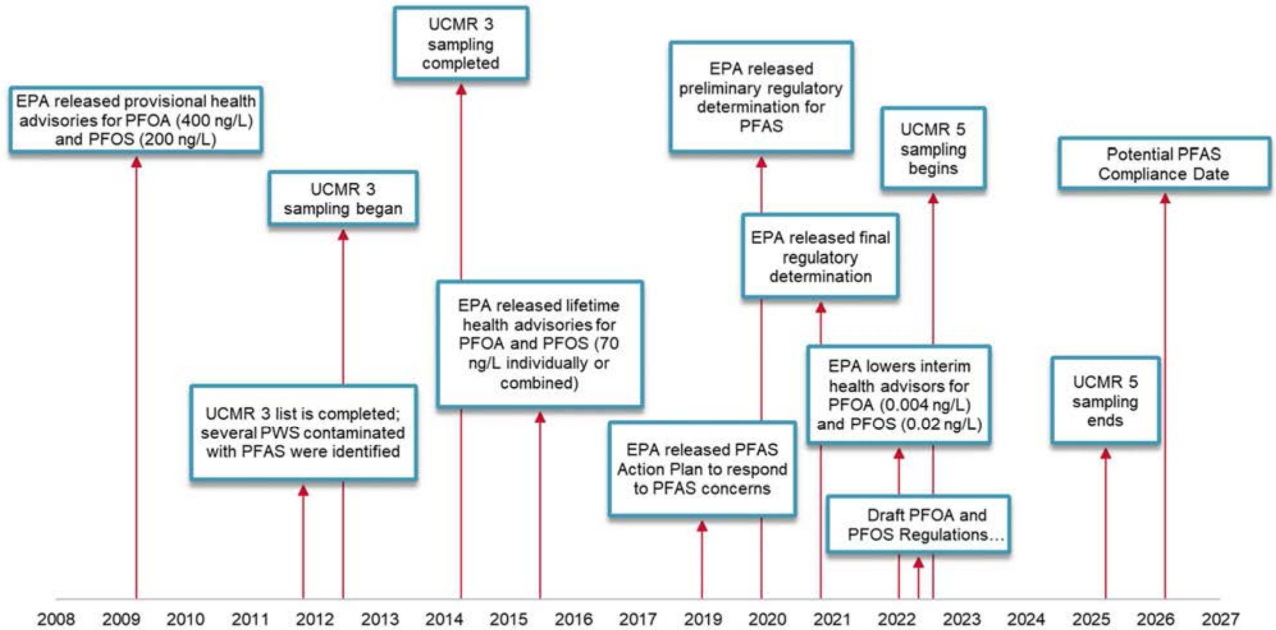

Figure 2-1. EPA Steps in Addressing PFAS

The EPA initially issued health advisories for PFAS in 2009 and compounds were included as part of UCMR 3 collection from 2013 through 2015. Following the conclusion of UCMR 3, the EPA updated their PFAS health advisories. In June 2022, the EPA released revised health advisories. Table 2-6 summarizes the history of PFAS health advisories for specific compounds.

Table 2-6. History of PFAS Health Advisories

Compound	2009 Provisional Health Advisory	2016 Health Advisory	2022 Health Advisory
PFOA	400 ng/L	PFOS + PFOA < 70 ng/L	0.004 ng/L
PFOS	200 ng/L		0.020 ng/L
Gen X	N/A	140*	10 ng/L
PFBS	N/A		2000 ng/L

*Gen X health advisory was issued by the North Carolina Department of Health and Human Services

The EPA has made the regulatory determination to move forward with an initial set of PFAS regulations. Table 2-7 summarizes the draft regulations for PFAS that were issued on March 14, 2023. The Hazard Index is calculated based on Equation 2-1 and using the health-based water concentrations in Table 2-7, which are considered to be the MCLG for these PFAS.

$$Hazard\ Index = \left(\frac{[GenX]}{10\ ppt}\right) + \left(\frac{[PFBS]}{2000\ ppt}\right) + \left(\frac{[PFNA]}{10\ ppt}\right) + \left(\frac{[PFHxS]}{9\ ppt}\right)$$

Equation 2-1. Hazard Index Calculation

A hazard index greater than 1.0 will be considered an exceedance of the proposal hazard index MCL.

Table 2-7. Draft PFAS Regulations

Compound	MCL (ng/L)	MCLG (ng/L)	Hazard Index	Health-Based Water Concentration (ng/L)
PFOA	4.0	0.0	N/A	N/A
PFOS	4.0	0.0	N/A	N/A
GenX	N/A	N/A	Combined less than 1.0	10
PFBS	N/A	N/A		2000
PFNA	N/A	N/A		10
PFHxS	N/A	N/A		9

2.3.2 1,4-Dioxane

1,4-Dioxane is a synthetic industrial chemical used as a solvent stabilizer and is considered to be a probable human carcinogen. Data on the prevalence of 1,4-dioxane was collected during UCMR 3. The EPA has established a health-based drinking water level at 0.35 µg/L. However, it is unlikely to issue a regulatory determination, similar to PFAS, in the near term. Some states have issued their own regulations for 1,4-dioxane; for example, New York has a MCL of 1 µg/L. It is possible for North Carolina to issue its own regulatory determination for 1,4-dioxane.

2.3.3 HABs

HABs are driven by nutrient runoff and are exacerbated by warmer waters. HABs can produce a wide range of water quality challenges including the production of cyanotoxins or taste and odor compounds, such as methyl iso-borneol (MIB) and geosmin. The most commonly found cyanotoxins within the United States include microcystins, cylindrospermopsin, anatoxins, and saxitoxins, and can pose a threat to human and animal health. Table 2-8 summarizes the health impacts of the commonly found cyantoxins.

Table 2-8. Health Impacts of Cyanotoxins

Toxin	Health Impact	Genera
Anatoxin–a	Neurotoxin	Anabaena Planktothrix Aphanizomenon Cylindrospermopsis
Cylindrospermopsin	Impacts liver, potentially carcinogenic	Cylindrospermopsis Aphanizomenon
Microcystin	Hepatotoxin; impacts liver, potentially carcinogenic	Microcystis Anabaena Planktothrix Anabaenopsis
Saxitoxin	Neurotoxin	Anabaena Planktothrix Aphanizomenon Cylindrospermopsis

The EPA has issued health advisories for specific cyanotoxins as presented in Table 2-9.

Table 2-9. EPA Health Advisory Levels for Cyanotoxins

Cyanotoxin	Drinking Water Health Advisory – Bottle-fed Infants and Pre-School Children	Drinking Water Health Advisory – School-Age Children and Adults
Microcystins	0.3 μg/L	1.6 μg/L
Cylindrospermopsin	0.7 μg/L	3.0 μg/L

Cyanotoxins were included under the UCMR 4 with samples collected between 2018 and 2020. In general, very few utilities identified cyanotoxins within their water system; however, the lack of positive samples may be due to the limitations of the sampling program. For example, algal blooms may not have been present when samples were collected. In 2014, the Association of State Drinking Water Administrators (ASDWA) collected data from state primacy agencies on how they were regulating HABs; the data is presented in Table 2-10.

Table 2-10. ASDWA 2014 Survey of Cyanotoxin Drinking Water Advisory Thresholds

Toxin	Florida	Ohio	Oklahoma	Oregon	Minnesota
Anatoxin–a	None	20 μg/L	None	3 μg/L	None
Cylindrospermopsin	None	1 μg/L	None	1 μg/L	None
Microcystin	10 μg/L (based Microcystin-LR)	1 μg/L (based on Microcystin-LR)	1 μg/L (goal of non-detect)	1 μg/L in finished water	0.04 μg/L (based on Microcystin-LR)
Saxitoxin	None	0.2 μg/L	None	3 μg/L	None

Although HABs are unlikely to be regulated in the near-term future, cyanotoxins pose a risk to the general public, wildlife, and domestic animals, while the prevalence of taste and odor compounds can erode customer trust in a utility.

2.3.4 DBPs

While some DBPs are currently regulated, the regulations are focused primarily on reducing groups of DBPs. During UCMR4, three groups of brominated haloacetic acids (HAA) groups were analyzed including HAA5, HAA6Br, and HAA9. In addition to considering new steps to cover unregulated DBPs, the EPA is conducting a review of the National Public Drinking Water Rules (NPDWR) including those covering DBP formation. It is likely that the EPA will regulate additional DBP groups in the future or issue MCLs for DBP compounds instead of regulating them as a group. Given their greater toxicity, bromated DBPs are an area of focus.

2.3.5 Unregulated Contaminant Monitoring Rule

The UCMR is published every five years and requires public water systems to sample a list of up to 30 contaminants over 12 months. The purpose of the UCMR is to collect data for contaminants that are suspected in drinking water but not regulated under the SDWA. UCMR contaminants are generally considered to be emerging contaminants. The EPA establishes minimum reporting levels (MRLs) for each contaminant under evaluation during UCMR sampling. In UCMR4, 10 new cyanotoxins were monitored and minimum reporting levels were established; additionally, HAAs were monitored, but no minimum reporting levels were established. Concerns over HAAs may lead to a third DBP rule; historically, the UCMR process has had minimal impact on regulating future contaminants to date. The next UCMR is UCMR 5. Sampling for UCMR 5 will occur from January 2023 through 2025 and includes 29 PFAS and one heavy metal. These constituents are presented in Table 2-11. Previous PFAS testing covered with UCMR 3 only considered six different PFAS compounds at significantly higher MRLs; it is anticipated that UCMR5 will result in a significant number of utilities finding PFAS in water supplies.

Table 2-11. UCMR 5 Monitored Contaminants

Contaminant	Minimum Reporting Level	Analytical Methods
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11Cl-PF3OUdS)	0.005 µg/L	EPA Method 533
9-chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)	0.002 µg/L	EPA Method 533
4,8-dioxa-3H-perfluorononanoic acid (ADONA)	0.003 µg/L	EPA Method 533
hexafluoropropylene oxide dimer acid (HFPO DA)	0.005 µg/L	EPA Method 533
nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	0.02 µg/L	EPA Method 533
perfluorobutanoic acid (PFBA)	0.005 µg/L	EPA Method 533
perfluorobutanesulfonic acid (PFBS)	0.003 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorodecane sulfonic acid (8:2FTS)	0.005 µg/L	EPA Method 533
perfluorodecanoic acid (PFDA)	0.003 µg/L	EPA Method 533
perfluorododecanoic acid (PFDoA)	0.003 µg/L	EPA Method 533

Contaminant	Minimum Reporting Level	Analytical Methods
perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	0.003 µg/L	EPA Method 533
perfluoroheptanesulfonic acid (PFHpS)	0.003 µg/L	EPA Method 533
perfluoroheptanoic acid (PFHpA)	0.003 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorohexane sulfonic acid (4:2FTS)	0.003 µg/L	EPA Method 533
perfluorohexanesulfonic acid (PFHxS)	0.003 µg/L	EPA Method 533
perfluorohexanoic acid (PFHxA)	0.003 µg/L	EPA Method 533
perfluoro-3-methoxypropanoic acid (PFMPA)	0.004 µg/L	EPA Method 533
perfluoro-4-methoxybutanoic acid (PFMBA)	0.003 µg/L	EPA Method 533
perfluorononanoic acid (PFNA)	0.004 µg/L	EPA Method 533
1H,1H, 2H, 2H-perfluorooctane sulfonic acid (6:2FTS)	0.005 µg/L	EPA Method 533
perfluorooctanesulfonic acid (PFOS)	0.004 µg/L	EPA Method 533
perfluorooctanoic acid (PFOA)	0.004 µg/L	EPA Method 533
perfluoropentanoic acid (PFPeA)	0.003 µg/L	EPA Method 533
perfluoropentanesulfonic acid (PFPeS)	0.004 µg/L	EPA Method 533
perfluoroundecanoic acid (PFUnA)	0.002 µg/L	EPA Method 533
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	0.005 µg/L	EPA Method 537.1
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	0.006 µg/L	EPA Method 537.1
perfluorotetradecanoic acid (PFTA)	0.008 µg/L	EPA Method 537.1
perfluorotridecanoic acid (PFTrDA)	0.007 µg/L	EPA Method 537.1
lithium	9 µg/L	EPA Method 200.7; SM 3120 B (2017); SM 3120 B-99 (1999); ASTM D1976-20

3 Facility Design Considerations

3.1 Plant Phasing, Capacity, and Losses

As a regional water provider, PTRWA operates the WTP at baseflow throughout the year. Figure 3-1 shows the trends of raw and finished water flow rates from 2018 to 2022. In this period, the raw water flow rate has averaged 12.3 MGD and finished water has averaged 10.9 MGD, representing an average process water loss of 11.4%. Although this water loss amount is higher than a typical WTP, the plant does not recycle any of its process water.

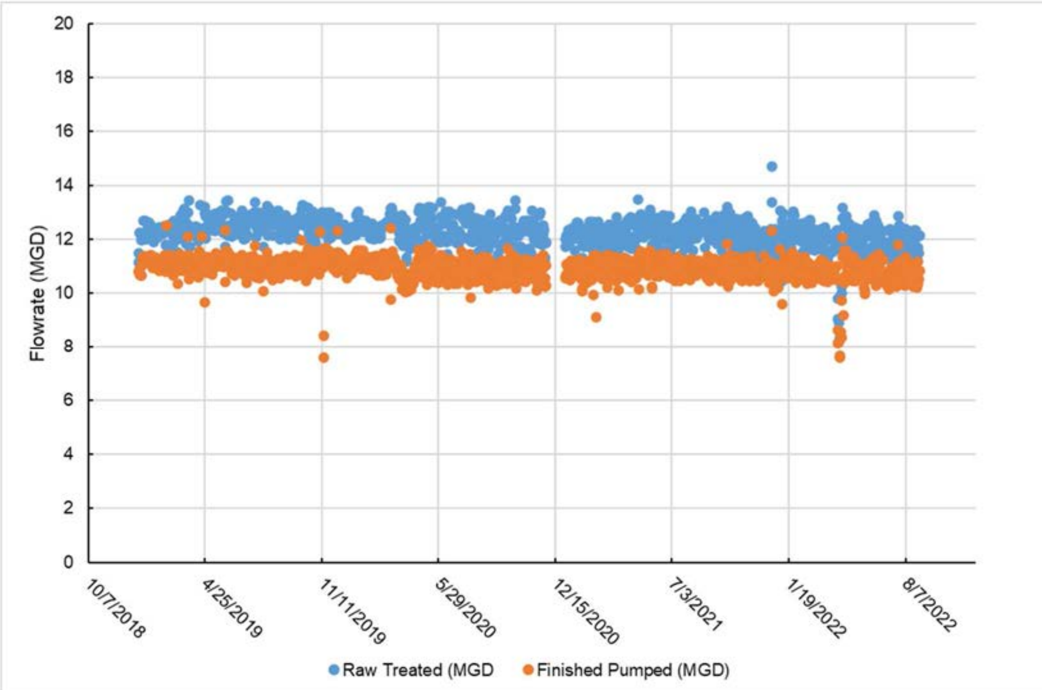

Figure 3-1. Raw and Finished Water Flow Rate (2018 to 2022)

Water losses due to internal use and waste flows are summarized in Table 3-1. Historical operation data and estimates were utilized to quantify water loss throughout the WTP. A unspecified loss correction factor was utilized to calibrate the water loss to correspond with the historical loss rate of 11.4%. This unspecified loss was subtracted from the flow stream at the clearwell, but does not indicate these losses occur at that location. The table also presents calculated flows for each process at the expanded capacity of 26.7 MGD.

Table 3-1. Current and Project Expansion Plant Flows and Losses

Unit Process	Total Flow, Current (MGD)	Losses, Current (gal/day)	Total Flow, Expansion (MGD)	Losses, Expansion (gal/day)	Notes
Raw Water Pumping	12.3	N/A	30.1	N/A	
Rapid Mix	12.3	1,800	30.1	4,000	Instruments/samples
SuperPulsators	12.3	75,000	30.1	183,000	Sludge blowdown and instruments/samples
Granular Media Filtration	12.2	22,600	14.7	25,000	Filter to waste and instruments/samples
Membrane Filtration	12.2	102,000	15.2	400,000	Includes membrane backwash, membrane backwash anticipated to increase due to split flow path
Granular Activated Carbon	12.1	15,700	14.7	18,000	Filter to waste and instruments/samples
Clearwell	12.1	1,181,000	29.5	2,793,000	Granular media filter backwash water supply, instruments/samples, and unspecified plant losses
Finished Water	10.9	N/A	26.7	N/A	
TOTAL	**10.9**	**1,398,000**	**26.7**	**3,429,000**	**Total losses may not add up to sum of losses due to rounding**

The JFK WTP is planned for an ultimate expanded capacity of 48 MGD. It is anticipated that the plant will be expanded in two subsequent phases.

3.2 Source and Finished Water Quality

A water quality review was conducted to understand current process performance and identify water quality goals. Data were provided to HDR, including:

- Monthly operating reports (MORs) from January 2019 through August 2022
- Emerging contaminant and disinfection byproduct data collected via grab samples on May 3, 2016, from the Raw Water Intake and Finished Water Tap
- Weekly manganese and iron data from January 2019 through August 2022
- Total organic carbon data from January 2020 through August 2022
- 1, 4-dioxane data taken intermittently from December 2014 through February 2022

Some of these data sets were reviewed by HDR and discussed with representatives from PTRWA, City of Greensboro, and HDR during Workshop 1 (Initial Workshop) on May 31, 2022, to better understand chemical use, seasonal impacts to plant operation, operational challenges, and chemical and water quality goals.

Here, the water quality review consists of the impact of chemical use and operating conditions on current finished water quality, regulated and unregulated water quality parameters, plant performance metrics, and finished water quality goals with a focus on iron, manganese, 1,4-dioxane, PFAS, and TOC.

3.2.1 Chemical Dosage Summary

Table 3-2 shows a summary of chemical doses applied at the WTP, based on MORs from January 2019 through August 2022. Outliers were removed from the data sets to avoid incorrectly skewing the data set and to provide a better understanding of chemical doses. Most variation in pretreatment chemical additions can be attributed to fluctuation in feed water quality; chemical doses required often depend on influent water quality.

Table 3-2. Chemical Application Points and Rates

Chemical	Application Point / Purpose	Units	Average	Range
Potassium Permanganate	Raw / Preoxidant	mg/L	0.33	0.10 – 1.55
Ferric Sulfate	Pretreatment / Coagulant	mg/L	74	51 – 103
Settling Polymer	Pretreatment / Coagulant Aid	mg/L	0.23	0.14 – 0.39
Sodium Hydroxide	Pretreatment / pH Adjustment	mg/L	13	4 – 39
Sodium Hypochlorite (Raw)	Pretreatment / Preoxidant	mg/L	5.4	2 – 11
Sodium Hypochlorite (Finished)	Finished Water / Disinfectant	mg/L	2.8	1.5 – 5.8
Ammonia	Finished Water / Disinfectant	mg/L	0.77	0.65 – 0.92
Lime	Finished Water / pH Adjustment	mg/L	8	2 – 40
Corrosion Inhibitor (Seaquest)	Finished Water / Corrosion Inhibitor	mg/L	2.1	0.6 – 5.4
Fluoride	Finished Water / Fluoridation	mg/L	0.64	0.00 – 1.60

Potassium permanganate is added at the Raw Water Pump Station to convert soluble iron and manganese into their insoluble form, so that they can be more easily removed in settling and filtration.

Ferric sulfate is added upstream of rapid mix, while **settling polymer** is added between rapid mix and the SuperPulsators. Ferric sulfate is added as the coagulant with settling polymer added to aid in the process. The addition of these chemicals depends on the influent water quality with the goal of removing particulates and TOC.

Sodium hydroxide acts as a basic solution and can be added to adjust the pH at different treatment steps, including pretreatment and finished water. The plant is currently transitioning from sodium hydroxide to lime addition for pH adjustment in the post filtration stages of the treatment process. pH adjustment is performed to improve treatment performance, increase corrosion resistance, and control alkalinity.

Sodium hypochlorite can be added ahead of the media filters to (1) increase disinfection contact time and (2) enhance iron and manganese oxidation. Chlorine can also be added before the rapid mix tank and both before and after the clearwells.

Ammonia is currently added following clearwell storage to form monochloramine as a secondary disinfectant prior to the transmission system.

Lime is currently added prior to the clearwells to raise the pH and improve corrosion stability; lime is also added after the clearwells to achieve the optimum pH for monochloramine formation.

Corrosion inhibitor (Seaquest) is currently added prior to the clearwells to provide corrosion stability within the transmission and distribution systems. An additional dose of corrosion inhibitor is added as water enters the North transmission system to meet the higher phosphate residual requirements that are currently required for compliance with water quality parameters of the Cities of High Point and Greensboro.

Fluoride is currently added prior to the clearwells to provide fluoridation on average at the Centers for Disease Control (CDC) recommended dose of 0.7 mg/L.

3.2.2 Regulated Water Quality Review

The following sections summarize regulated water quality data of concern:

- Manganese – the plant has historically been susceptible to high raw water manganese. A summary is presented here because as the plant is expanded and upgraded, consideration should be given to how changes in the treatment process can impact or enhance manganese removal.
- TOC – the removal of TOC has an impact on downstream treatment performance, which is not limited to the formation of DBPs. As treatment improvements are made, improvements to TOC removal should be considered since lower organics can improve the performance of downstream treatment process (e.g., granular activated carbon (GAC)).

3.2.3 Manganese

Figure 3-2 presents raw and finished water manganese concentrations compared to potassium permanganate doses from MORs ranging from January 2019 through August 2022. Manganese data in MORs are collected weekly, while potassium permanganate doses are recorded daily. Manganese samples are collected before the addition of potassium permanganate at the Raw Water Pump Station. Raw water manganese concentrations ranged from 0 to 0.53 mg/L with an average of 0.06 mg/L, while finished water concentrations ranged from 0 to 0.05 mg/L with an average of 0.01 mg/L. The average percent removal of manganese was 80.6%.

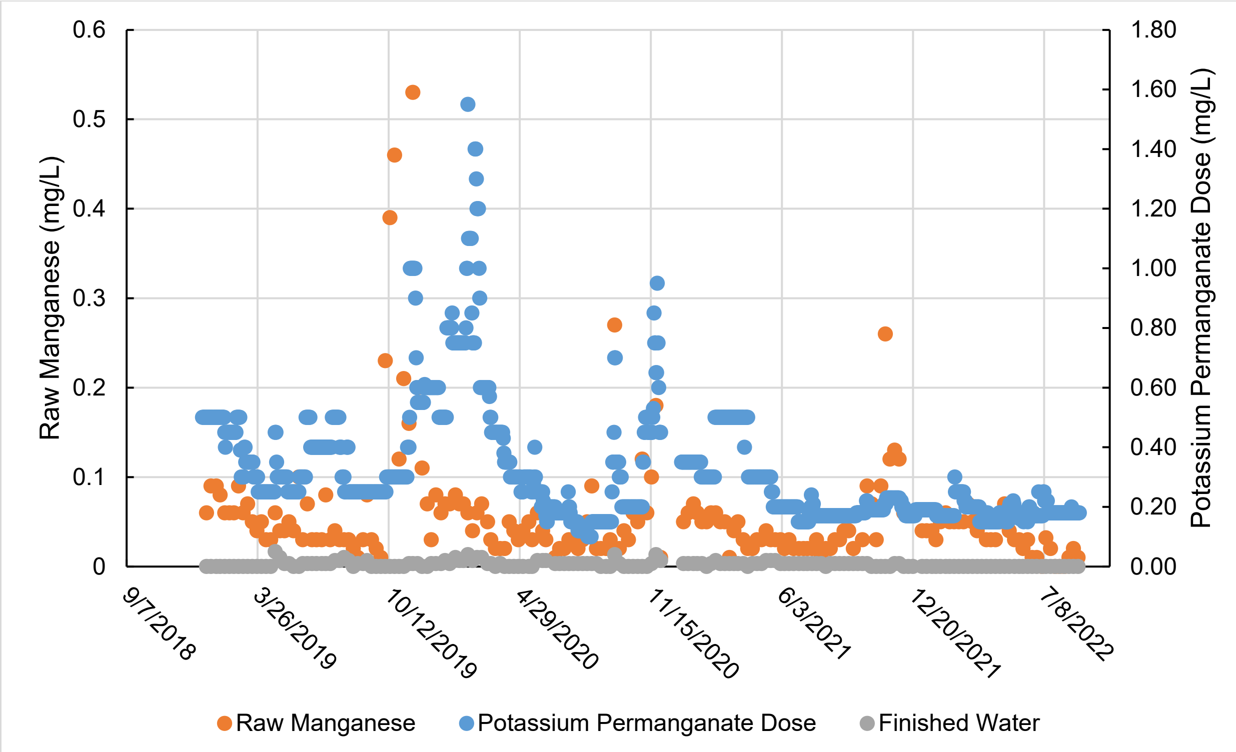

Figure 3-2. Manganese Concentrations versus Potassium Permanganate Dose

Figure 3-3 presents the ratio of potassium permanganate dose to raw water manganese. The theoretical ratio required for manganese oxidation is 1.92 based on stoichiometry. On average, the WTP applies potassium permanganate at a ratio of 8.16, well above the target ratio; however, permanganate application is also used to accomplish oxidation of iron. Permanganate application is also only effective at converting dissolved manganese or iron into particulate form so that it can be removed in pretreatment or filtration. Adding excessive amounts of permanganate will not result in improved manganese removal and may also result in higher manganese concentrations including dissolved manganese. It is recommended that the WTP collect additional data on the levels of dissolved manganese throughout the plant to evaluate the effectiveness of permanganate addition.

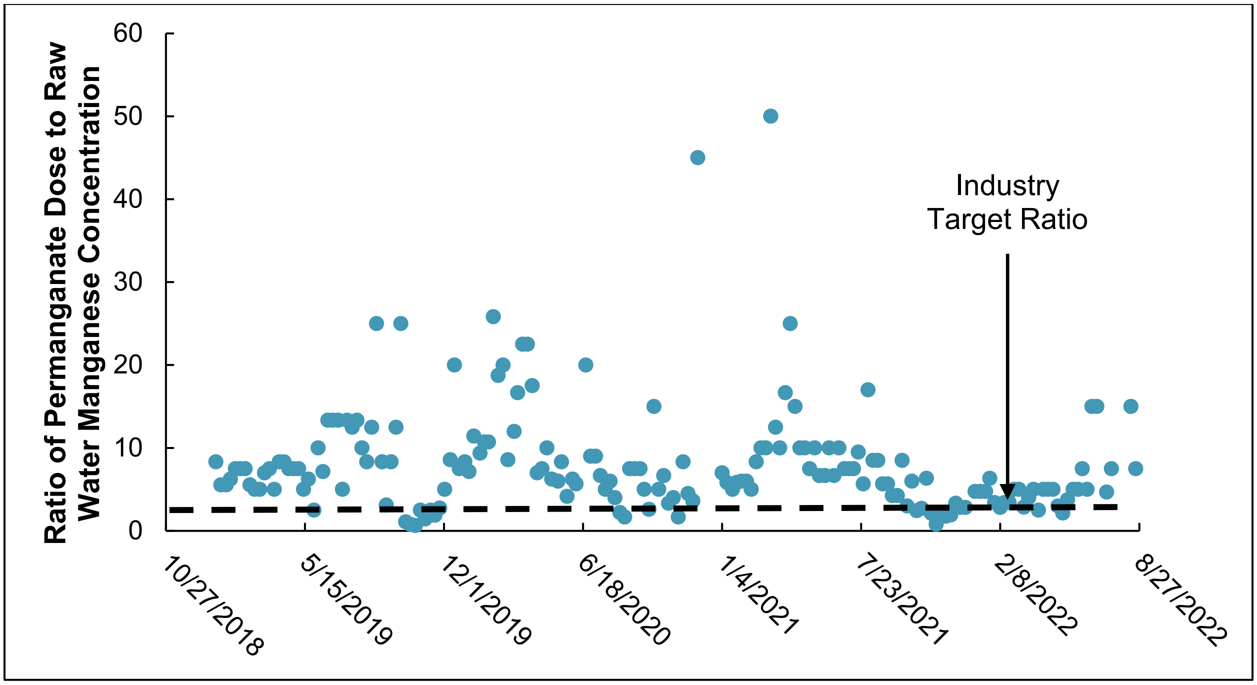

Figure 3-3. Raw Water Manganese to Potassium Permanganate Ratio

3.2.4 Total Organic Carbon

Figure 3-4 presents raw and settled total organic carbon (TOC) concentration and TOC removal effectiveness from January 2020 through May of 2022. The raw TOC values range from 3.75 to 8.4 ppm, with an average of 5.2 ppm. TOC removal ranges from 55% to 77%, with an average of 64%. As indicated on the figure, based on an average raw water TOC of 5.2 ppm and an average raw water alkalinity of 41 mg/L, the WTP is expected to remove at least 45% of TOC under DBP rules. The plant has historically been able to exceed the removal required through a combination of pretreatment steps and the use of granular activated carbon (GAC) contactors for additional TOC removal.

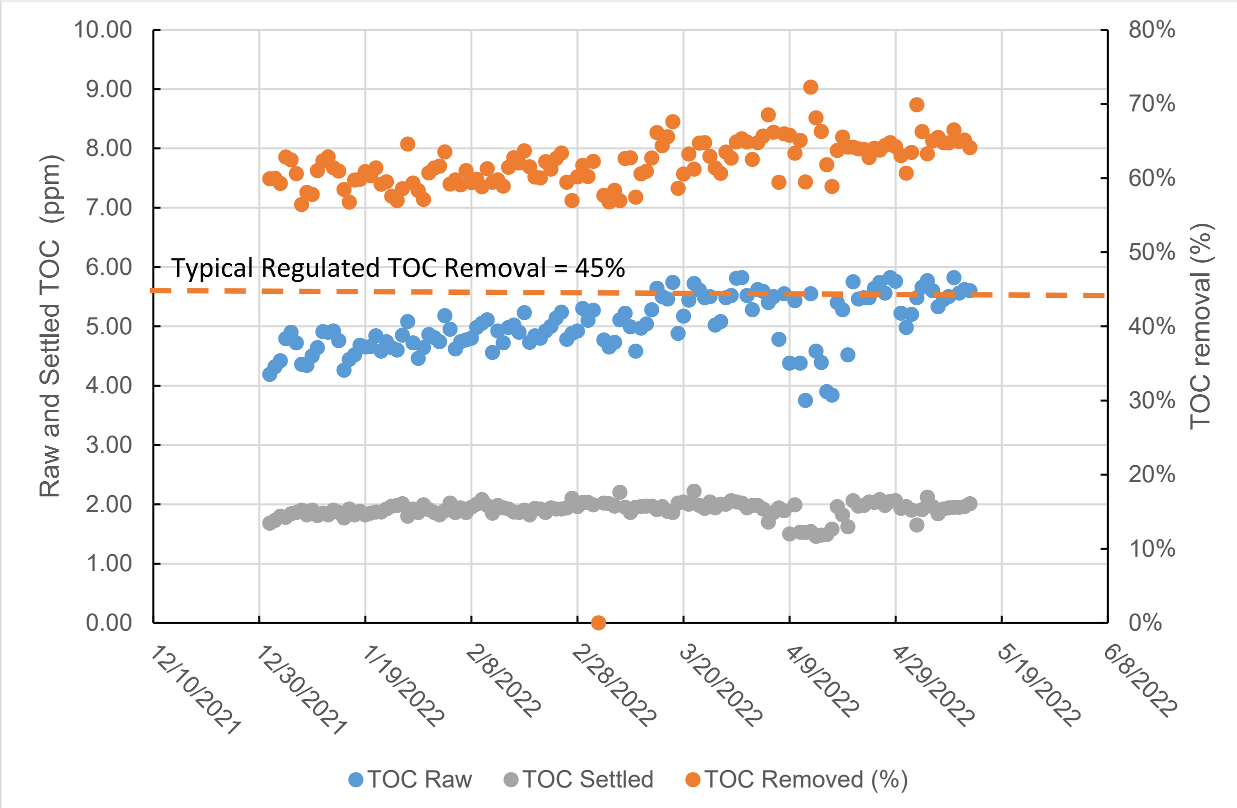

Figure 3-4. Raw and Settled Total Organic Carbon Concentration and TOC Removal Effectiveness

3.2.5 Unregulated Water Quality Review

An additional goal for PTRWA is to establish baseline concentrations of unregulated and emerging contaminants in the raw water supply and evaluate treatment options to add robustness for future regulation compliance. Intermittent samples were collected and analyzed for unregulated contaminants. The sample reports for this data are tabulated below in Table 3-3 through Table 3-5. The unregulated parameters that are discussed here include:

- 1,4-dioxane (29 samples taken from December 2014 through February 2022)
- PFAS (2 samples from April 2016, 1 sample from February 2018)
- Metals, VOCs, and other endocrine disrupting compounds (3 samples: 2 in April 2016, 1 February 2018)
- HAAs and THMs (1 sample from February 2018)

Table 3-3. Unregulated Contaminants – Raw Water Intake (April 19, 2016)

Analyte	MRL	Result (less than)	Result (actual)	Units
General Chemistry				
Chromium, hexavalent	0.03		0.33	µg/L
Chlorate	20	<	20	µg/L
Metals				

Analyte	MRL	Result (less than)	Result (actual)	Units
Chromium	0.2	<	0.2	µg/L
Cobalt	1	<	1	µg/L
Molybdenum	1	<	1	µg/L
Strontium	0.3		80	µg/L
Vanadium	0.2		1	µg/L
Volatile Organic Chemicals				
1,4-dioxane	0.07		2.1	µg/L
Bromochloromethane	0.06	<	0.06	µg/L
Bromomethane	0.2	<	0.2	µg/L
1,3-Butadiene	0.1	<	0.1	µg/L
Chlorodifluoromethane	0.08	<	0.08	µg/L
Chloromethane	0.2	<	0.2	µg/L
1,1-Dichloroethane	0.03	<	0.03	µg/L
1,2,3-Trichloropropane	0.03	<	0.03	µg/L
Eurofins Eaton Analytical (EEA) Methods				
Perfluorobutanesulfonic Acid	90	<	90	ng/L
Perfluoroheptanoic acid	10	<	10	ng/L
Perfluorohexanesulfonic acid	30	<	30	ng/L
Perfluorononanoic acid	20	<	20	ng/L
Perfluorooctane sulfonate	40	<	40	ng/L
Perfluorooctanoic acid	20	<	20	ng/L
4-Androstene-3, 17-dione	0.3	<	0.5	ng/L
Equilin	4	<	6	ng/L
17beta-Estradiol	0.4	<	0.6	ng/L
Estriol	0.8	<	1.3	ng/L
Estrone	2	<	3	ng/L
17alpha-Ethynyl estradiol	0.9	<	1.4	ng/L
Testosterone	0.1	<	0.2	ng/L

Table 3-4. Unregulated Contaminants – Finished Water Tap (April 19, 2016)

Analyte	MRL	Result (less than)	Result	Units
General Chemistry				
Chromium, hexavalent	0.03		0.06	µg/L

Analyte	MRL	Result (less than)	Result	Units
Chlorate	20		88	µg/L
Metals				
Chromium	0.2	<	0.2	µg/L
Cobalt	1	<	1	µg/L
Molybdenum	1	<	1	µg/L
Strontium	0.3		80	µg/L
Vanadium	0.2	<	0.2	µg/L
Volatile Organic Chemicals				
1,4-dioxane	0.07		2.2	µg/L
Bromochloromethane	0.06	<	0.06	µg/L
Bromomethane	0.2	<	0.2	µg/L
1,3-Butadiene	0.1	<	0.1	µg/L
Chlorodifluoromethane	0.08	<	0.08	µg/L
Chloromethane	0.2	<	0.2	µg/L
1,1-Dichloroethane	0.03	<	0.03	µg/L
1,2,3-Trichloropropane	0.03	<	0.03	µg/L
EEA Methods				
Perfluorobutanesulfonic Acid	90	<	90	ng/L
Perfluoroheptanoic acid	10	<	10	ng/L
Perfluorohexanesulfonic acid	30	<	30	ng/L
Perfluorononanoic acid	20	<	20	ng/L
Perfluorooctane sulfonate	40	<	40	ng/L
Perfluorooctanoic acid	20	<	20	ng/L
4-Androstene-3, 17-dione	0.3	<	0.3	ng/L
Equilin	4	<	4	ng/L
17beta-Estradiol	0.4	<	0.4	ng/L
Estriol	0.8	<	0.8	ng/L
Estrone	2	<	2	ng/L

Analyte	MRL	Result (less than)	Result	Units
17alpha-Ethynyl estradiol	0.9	<	0.9	ng/L
Testosterone	0.1	<	0.1	ng/L

Table 3-5. Unregulated Contaminants – Raw Water (February 12, 2018)

Analyte	MRL	Result (less than)	Result	Units
10:2 Fluorotelomer sulfonic acid	2	<	2	ng/L
4:2 Fluorotelomer sulfonic acid	2		5.4	ng/L
6:2 Fluorotelomer sulfonic acid	2	<	2	ng/L
8:2 Fluorotelomer sulfonic acid	2	<	2	ng/L
ADONA	2	<	2	ng/L
F-53B Major	2	<	2	ng/L
F-53B Minor	5	<	5	ng/L
GenX	2	<	2	ng/L
N-ethylperfluorooctane sulfonamide	2	<	2	ng/L
N-ethylperfluorooctane sulfnoamidoethanol	2	<	2	ng/L
N-methylperfluorooctane sulfonamide	2	<	2	ng/L
N-methylperflouorooctanesulfonamideoethanol	2	<	2	ng/L
Perfluorobutanesulfonic acid	2		4.3	ng/L
Perfluorobutanoic acid	5		9.3	ng/L
Perfluorocecanoic acid	2	<	2	ng/L
Perfluoroheptanoic acid	2		6.2	ng/L
Perfluorohexanesulfonic acid	2		8.6	ng/L
perfluorohexanoic acid	2		16	ng/L
Perfluorododecanoic acid	2	<	2	ng/L
Perfluorononanoic acid	2	<	2	ng/L
Perfluorooctanesulfonic acid	2		23	ng/L
N-ethyl Perfluorooctanesulfonamidoacetic acid	2	<	2	ng/L
N-methyl Perfluorooctanesulfonamidoacetic acid	2	<	2	ng/L

Analyte	MRL	Result (less than)	Result	Units
Perfluorooctanoic acid	2		9.8	ng/L
Perfluorotridecanoic acid	2	<	2	ng/L
Perfluoroundecanoic acid	2	<	2	ng/L
perfluorododecanesulfonic acid	2	<	2	ng/L
Perfluorodecanesulfonic acid	2	<	2	ng/L
Perfluoroheptanesulfonic acid	2	<	2	ng/L
Perfluorohexadecanoic acid	2	<	2	ng/L
Perfluoro-2-methoxyethoxyacetic acid	5	<	5	ng/L
Perfluoro-4-isopropoxybutanoic acid	5	<	5	ng/L
Perfluoro-4-methoxybutanoic acid	5	<	5	ng/L
Perfluoro-3-methoxypropanoic acid	5	<	5	ng/L
Perfluorononanesulfonic acid	2	<	2	ng/L
Perfluorooctane sulfonamide	2	<	2	ng/L
Perfluoropentanoic acid	2		17	ng/L
perfluoropenanesulfonic acid	2	<	2	ng/L
Perfluorotetradecanoic acid	2	<	2	ng/L

3.2.1 1,4-Dioxane

Table 3-6 shows the average concentrations of 1,4-dioxane at various sampling locations around Randleman Lake from December 2014 through February 2022.

Table 3-6. 1,4-Dioxane Sample Data from Various Sampling Locations

Sample Location	Average Concentration (µg/L)	Range (µg/L)	No. of Samples
High Point Effluent	7.0	0.15 – 56	29
Raw Water Intake	1.7	0.14 – 4	29
Muddy Creek Side	1.2	0.13 – 2.4	23
I-85	2.3	0.08 – 15	22
Dam	1.9	N/A	1
Seaboard Upstream	< 0.07	N/A	1
Finished Water Tap	2.15	2.1 – 2.2	2

These concentrations of 1,4-dioxane are plotted in Figure 3-5. The High Point effluent has the largest detected concentrations out of the sites that were tested; many of the samples show concentrations above the health advisory level of 0.35 µg/L.

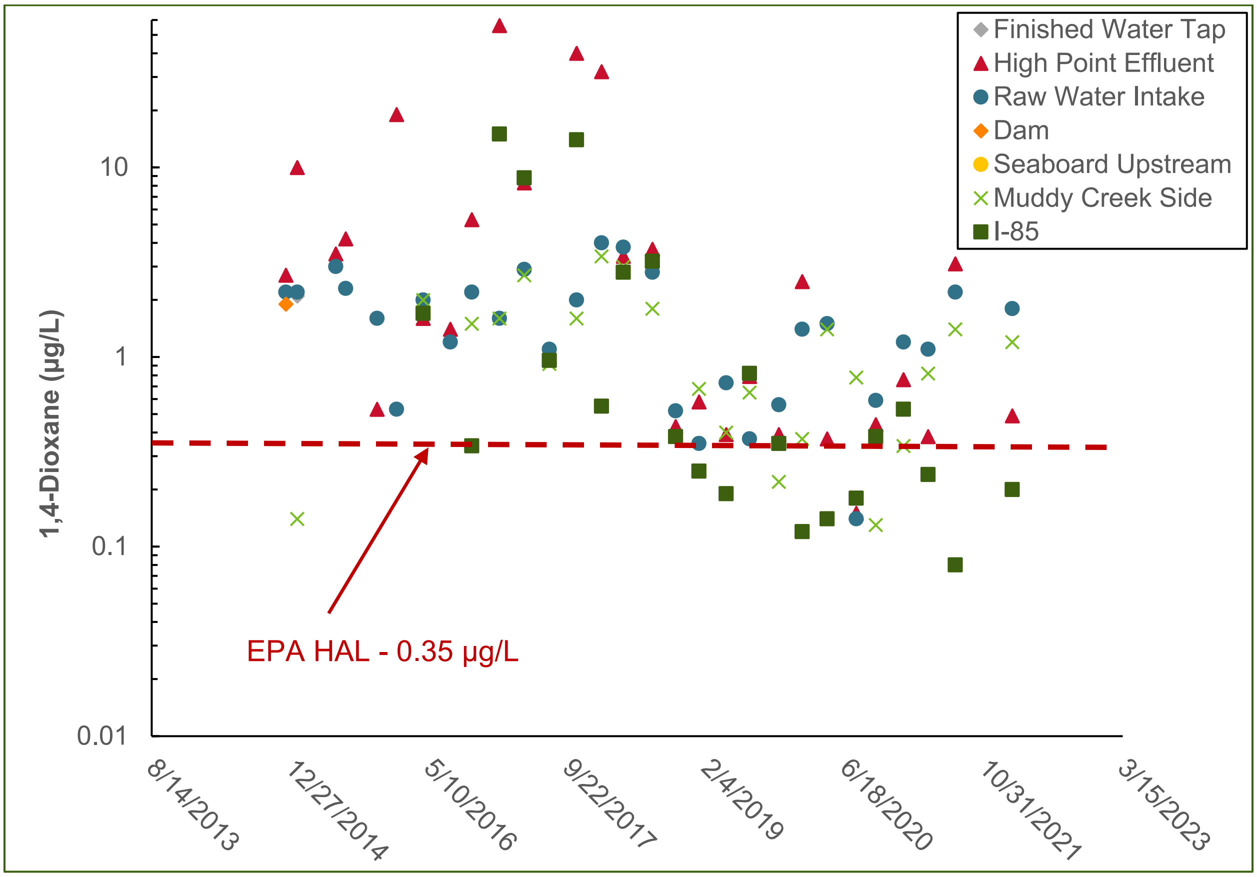

Figure 3-5. Concentration of 1,4 Dioxane from Various Sampling Locations (*Note that y-axis is a logarithmic scale)

3.2.2 Per- and Polyfluoroalkyl Substances

Table 3-7 shows the concentration of various PFAS in the raw water from Randleman Lake. As shown, the levels of PFOS and PFOA exceeded the draft MCLs. The hazard index for this sample was calculated as less than 1. However, it should be noted that PFHxS can contribute a significant amount of PFAS in Randleman Lake and higher levels could result in an exceedance of the hazard index.

Table 3-7. Raw Water PFAS Testing (ng/L)

PFAS	February 14, 2018 (Eurofins Method L402)	August 31, 2022 (EPA Method 533.1)	September 7, 2022 (EPA Method 533.1)	Draft MCL or Health-Based Water Concentration
6:2 FTS	5.4	Below detection	Below detection	N/A
PFBS	4.3	4.0	3.7	2,000
PFBA	9.3	7.1	6.9	N/A
PFHpA	6.2	4.4	4.2	N/A
PFHxS	8.6	6.4	6.0	9
PFHxA	16	11.0	11.0	N/A
PFOS	23	13.0	12.0	4
PFOA	9.8	6.2	5.8	4
GenX	Below detection	Below detection	Below detection	10
PFNA	Below detection	Below detection	Below detection	10
PFPeA	17	13.0	13.0	N/A

Figure 3-6 shows the normalized percentage of PFAS constituents in raw water from a sample that was taken from Randleman Lake. PFOS represents the largest percentage (55%), while PFHxS is the second largest (24%), and PFBS is the third largest (7%). While most compounds were below their respective MRLs, 6:2 FTS (occasionally), PFBS, PFBA, PFHpA, PFHxS, PFHxA, PFOS, PFOA, PFPeA were each above their respective MRLs. Similarly, PFOS and PFOA exceeded the draft MCL. However, it doesn't appear that the PFAS listed as part of the hazard index result in an exceedance.

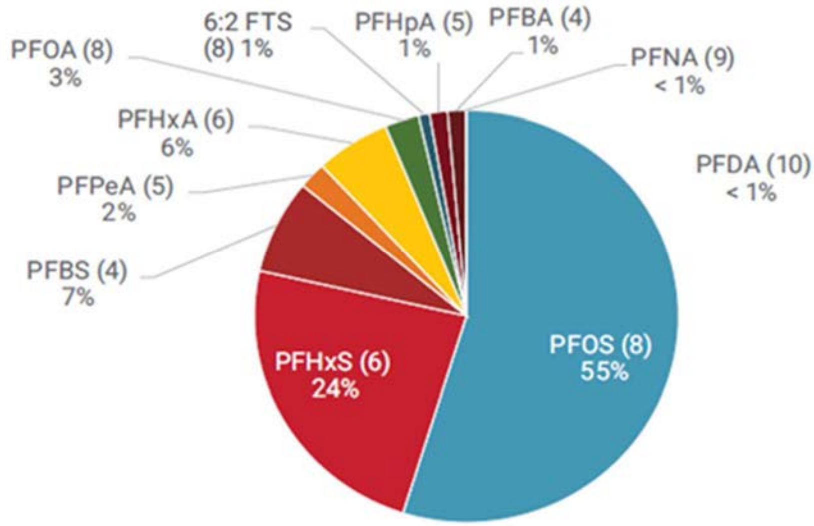

Figure 3-6. Raw Water PFAS Speciation (February 14, 2018)

3.2.3 UCMR 3 Remaining Trace Contaminants

Both raw and finished water samples were analyzed for various metals, volatile organic chemicals, and emerging contaminants of concern. Most constituents of emerging concern had concentrations that were below the MRL; however, both the raw and finished water samples had a couple of contaminants above the MRL. The Raw Water Intake concentrations of chromium (Hexavalent), Strontium, Vanadium, and 1,4-dioxane were all above the MRL. The Finished Water concentrations of Chromium (Hexavalent), Chlorate, Strontium, and 1,4-dioxane were all above the MRL.

3.2.4 Unregulated Water Quality Summary

PFAS and 1,4-dioxane are the unregulated contaminants of most concern in the PTRWA water supply. As noted in Table 3-7, the raw water PFOA and PFOS concentrations exceed the draft MCL. Based on these concentrations and the presence of other PFAS (such as PFHxS) in the raw water, PFAS treatment will be required to meet anticipated regulations.

1,4-Dioxane is not likely to receive a federal MCL in the next few years, but several utilities in North Carolina are evaluating methods to treat water for this chemical as a future state-level MCL is possible. Public concern over this contaminant is high in specific areas of the state (such as along the Haw River). The levels of 1,4-dioxane present in the water source warrant an analysis of treatment techniques, implementation costs, and level of service goals to determine if targeted treatment is required.

3.3 Treatment Goals, Challenges, and Solutions

Based on the regulatory review and historical water quality information, treatment goals are established in Table 3-8. It should be noted that the plant has additional treatment goals beyond those identified in the table; these goals are focused on current treatment challenges and were identified based on conversations with plant staff and the need to respond to forthcoming regulations. Considering current EPA direction, PTRWA and HDR worked together to establish the PFAS goal, which is based on draft EPA guidance; the 1,4-dioxane goal is set at current state guidelines. The goal for taste and odor is set at 10 ng/L since that level represents the threshold for detection.

Table 3-8. Finished Water Quality Goals

Parameter	Regulatory Standard	Water Quality Goal
Manganese	Secondary MCL – 0.05 mg/L	Meet secondary MCL at all times
Iron	Secondary MCL – 0.3 mg/L	Meet secondary MCL at all times
PFAS	Health advisory levels (see Table 2-6) and draft MCLs (see Table 2-7)	Meet regulatory limits
1,4-Dioxane	Health advisory level < 0.35 μg/L	Less than 0.35 μg/L
TOC	EPA TOC Matrix	More than 50% removal under all conditions
DBPs	TTHM MCL – 80 μg/L locational running annual average (LRAA) HAA5 MCL – 60 μg/L LRAA	Meet 80% of the MCL
Taste and odor (MIB/geosmin)	Secondary MCL for odor – 3 TON (threshold odor number)	Below 10 ng/L

3.4 Historical Water Quality Evaluations

3.4.1 Testing Summary

Over the history of plant operation, PTRWA has strived to improve operation by conducting water quality evaluations that addressed challenges identified by staff. Water quality investigations were originally focused on improving organics removal but have lately been more focused on manganese reduction and treatment of emerging contaminants (1,4-dioxane). Figure 3-8 presents a summary of testing done to date. Major pilot testing and evaluations that were successfully completed include the following:

1. Granular Activated Carbon Pilot Testing (2019)
2. Ozone and Advanced Oxidation Process (AOP) Bench-Scale Testing (2020)
3. Greensand Plus (Manganese contactor with greensand media) Pilot Testing (2021 – 2022)
4. Biologically Active Carbon Pilot Testing (2019 – 2022)
5. Ozone-Biologically Active Carbon Pilot Testing (2022)
6. Chlorine Dioxide Bench-Scale Testing (2022)

Figure 3-7. PTRWA Pilot Column Skid

7. Emerging Contaminants Pilot-Scale Testing (2023)
8. Ozone/UV/AOP Bench-Scale Testing (2023)

Many studies have operated in series based on results from previous testing, and other studies have been performed in parallel. Unless otherwise noted, PTRWA staff led the study efforts, including operating equipment and collecting data.

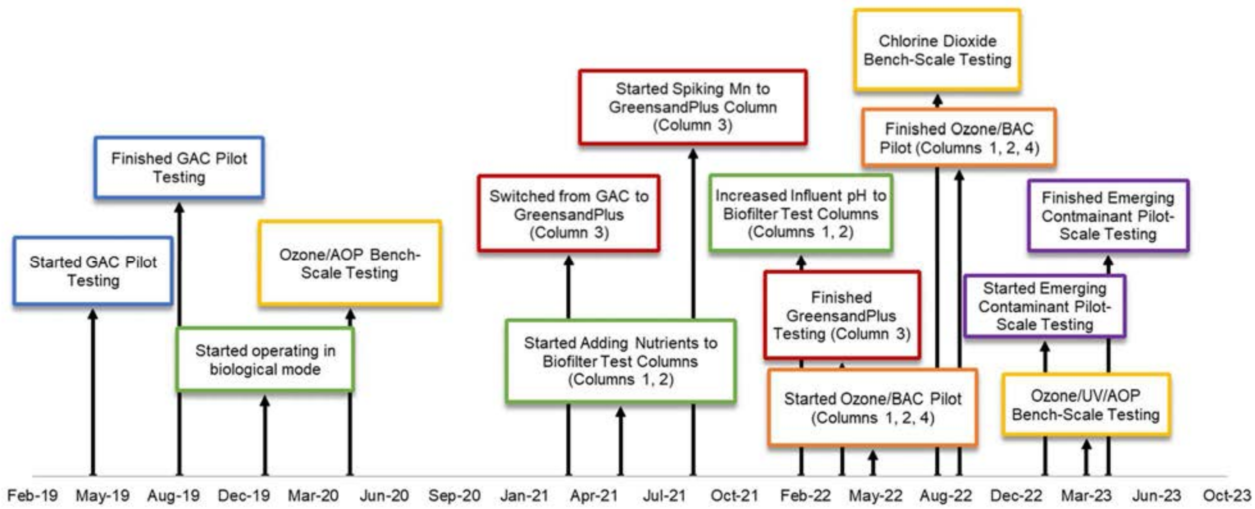

Figure 3-8. Bench-Scale and Pilot-Scale Studies Performed from 2019-Present

PTRWA currently owns and operates four 6” diameter pilot columns, which were utilized for testing. These filter columns are shown in Figure 3-7.

3.4.2 Granular Activated Carbon Pilot-Scale Testing

3.4.2.1 DURATION AND OBJECTIVES

GAC testing was conducted from May 2019 – September 2019. The goal was to compare the current GAC media (Calgon Filtrasorb 820) with alternative products to determine if TOC removal could be improved and whether GAC regeneration frequency could be reduced.

3.4.2.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Water tested: filtered water
- Number of medias evaluated: four
- Medias evaluated:
    - Calgon – Filtrasorb 820
    - Cabot – Hydrodarco 3000
    - Evoqua – UltraCarb 1240LD
    - Jacobi – AquaSorb F23
- Empty bed contact time simulated: 8 minutes
- Operational parameters monitored: headloss, bed volumes treated, flow rate.

- Water quality parameters monitored: pH, temperature, turbidity, chlorine, dissolved oxygen, TOC, UV254, alkalinity, color, iron, manganese, MIB, geosmin, 1,4-dioxane.
- Hydraulic parameters monitored: flow rate, headloss

3.4.2.3 MAJOR RESULTS AND IDENTIFIED NEXT STEPS

The Calgon Filtrasorb 820 provided the best TOC removal and was the least exhausted by the end of the study (35,000 BVs) relative to the other GAC media tested (see Figure 3-9).

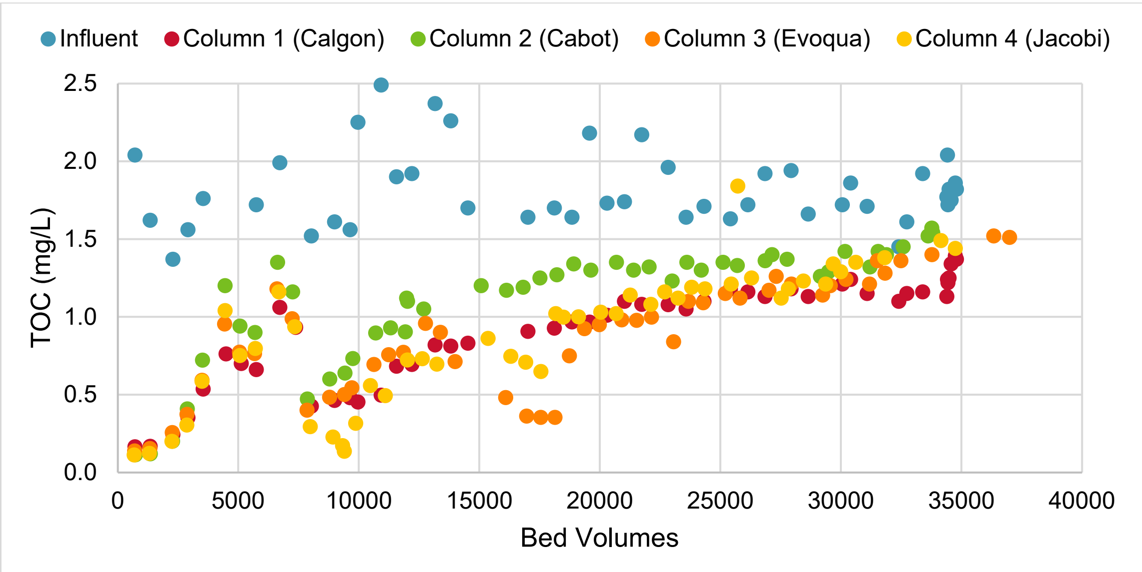

Figure 3-9. GAC Pilot Testing – TOC Removal

The results from the testing indicated that the Calgon Filtrasorb 820 was the highest performing GAC media for TOC reduction.

Following the conclusion of this study, PTRWA's column pilot was repacked with used Calgon Filtrasorb 820 from the full-scale contactors and work was continued with Biologically Active Carbon Testing.

3.4.3 Ozone and Advanced Oxidation Process Bench-Scale Testing

3.4.3.1 DURATION AND OBJECTIVES

Ozone, ozone/AOP with hydrogen peroxide, and UV/AOP with hydrogen peroxide were tested at the bench-scale level in May 2020. The purpose of this test was to determine the treatability of manganese and/or 1,4-dioxane, and to identify strategies to treat 1,4-dioxane to below the NCDEQ limit of 0.35 µg/L

3.4.3.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Waters tested: raw water, settled water, filtered water
- Treatment scenarios evaluated: four
- Processes evaluated:

  - Ozone (2 to 8 mg/L) treating raw water
  - Ozone (4 to 6 mg/L) and peroxide (2 to 3 mg/L) treating raw water
  - Ozone (2 to 6 mg/L) and peroxide (0 to 3 mg/L) treating settled water
  - UV (792 to 4,230 mJ/cm^2) and peroxide (2 mg/L) treating filtered water
- Water quality parameters monitored: pH, TOC, UV254, alkalinity, total and dissolved iron/manganese, 1,4-dioxane, bromide, bromate, assimilable organic carbon (AOC).

3.4.3.3 MAJOR RESULTS

Figure 3-10 summarizes the results from 1,4-dioxane testing, which indicated that that higher ozone doses and ozone/AOP with hydrogen peroxide were most effective at 1,4-dioxane removal. Low background bromide levels resulted in minimal bromate formation, confirming ozone as a potential treatment solution. However, UV/AOP with hydrogen peroxide was unsuccessful at removing 1,4-dioxane to below the stated test goal at the doses evaluated (see Figure 3-11).

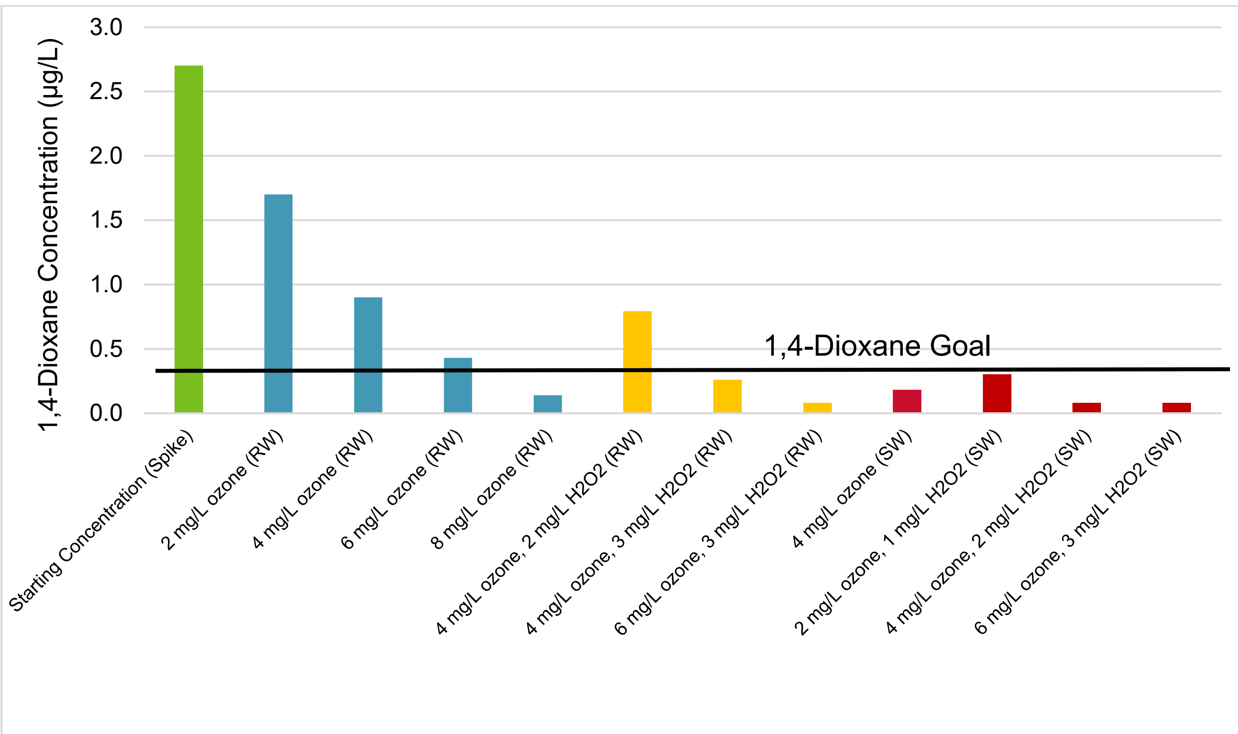

Figure 3-10. Ozone and Ozone/Peroxide Bench-Scale Testing Summary (10 Minutes Contact Time)

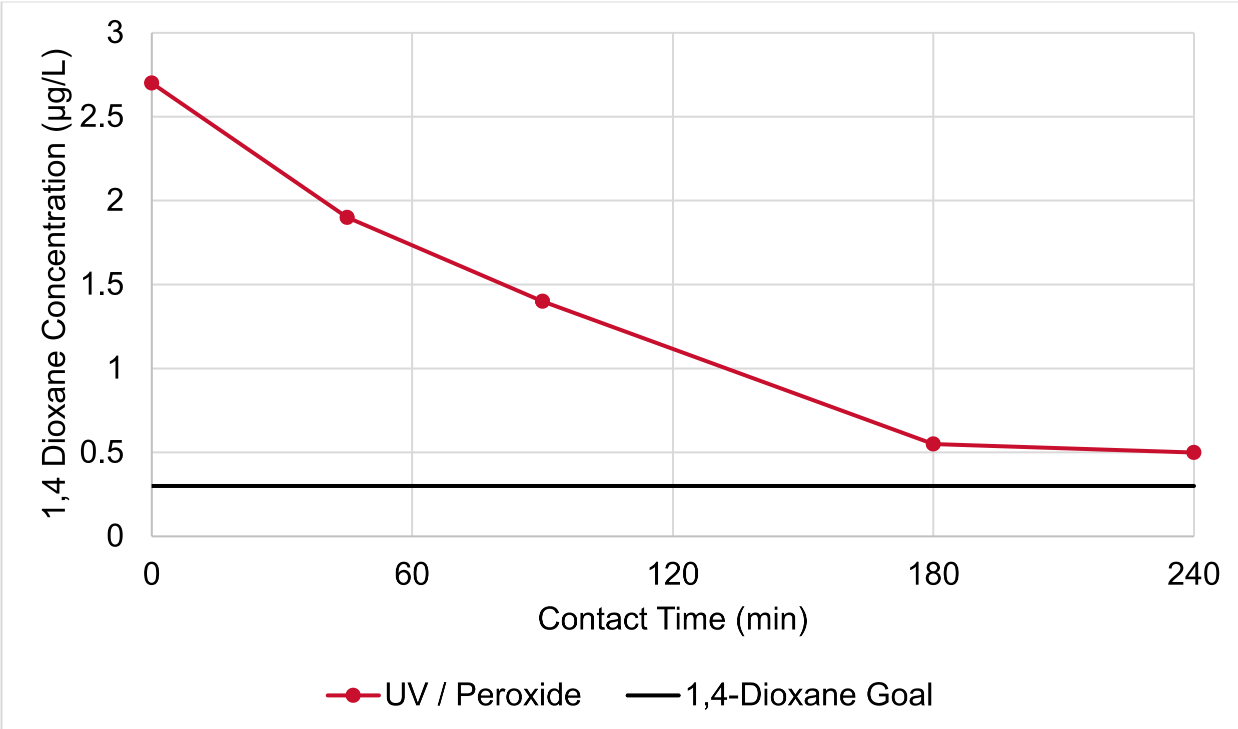

Figure 3-11. UV / Peroxide Bench-Scale Testing Summary

Due to the successful bench-scale results using ozone for 1,4-dioxane removal, it was recommended testing the ozone at the pilot-scale level. Pilot-scale testing was also recommended to assess the impact of ozone additional on biological process performance (such as biological filters).

3.4.4 GreensandPlus Pilot-Scale Testing

3.4.4.1 DURATION AND OBJECTIVES

GreensandPlus pilot testing was conducted from March 2021 through April 2022 to evaluate the effectiveness of a specially designed media for manganese removal in drinking water. It should be noted that this testing was conducted in conjunction with the Biologically Active Carbon Testing, with GreensandPlus media installed in Column 3. Although GreensandPlus performs a single treatment function (iron/manganese reduction), it was selected for study due to the high levels of raw water manganese and the ability to pilot it within an available pilot column.

3.4.4.2 TESTING SUMMARY

The following is a summary of the test plan:

- Waters tested: filtered water
- Treatment scenarios evaluated: one
- Processes evaluated: GreensandPlus treatment with and without manganese spiked (0.20 mg/L) into influent.
- Water quality parameters monitored: pH, TOC, UV254, alkalinity, total and dissolved iron/manganese, chlorine residual, dissolved oxygen.

- Media was not regenerated (either with permanganate or chlorine) as a part of this study.

3.4.4.3 MAJOR RESULTS

During the testing, higher levels of background dissolved manganese were found when the plant operated in split flow (May 3, 2021, through October 12, 2021). This was attributed to water that had only passed through the membranes without the advantage of additional manganese removal in the granular media filters.

Total manganese removal was found to be a function of the influent manganese concentration. Removal was greater at the start of the pilot run (approaching 100% in some samples) and gradually decreased over time as the ability for the GreensandPlus to remove manganese was exhausted. A similar trend was observed for the removal of dissolved manganese. At around 20,000 BVs, effluent dissolved manganese started to approach and occasionally exceed influent manganese. Dissolved manganese reached complete breakthrough at around 37,000 BVs.

The results of the study indicated that GreensandPlus media could be a solution for manganese removal after MF membranes but contact times and generation requirements would need to be revisited prior to full-scale operation.

3.4.5 Biologically Active Carbon Pilot-Scale Testing

3.4.5.1 DURATION AND OBJECTIVES:

Biologically active carbon (BAC) testing was conducted from January 2019 through May 2022. The objective of the testing was to evaluate the effectiveness of BAC to remove manganese and TOC with different optimization strategies.

3.4.5.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Waters tested: settled water, filtered water
- Strategies tested:
    - Column 1 and 2 – Nutrient (nitrogen and phosphorous) addition, pH adjustment
        - Targeted spike of 0.03 mg/L as N, 0.025 mg/L as P
        - Targeted pH adjustment to 7.5
    - Column 4 – Control (no intended nutrient addition or pH adjustment)
- Water quality parameters monitored: pH, temperature, total dissolved solids, dissolved oxygen, chlorine residual, turbidity, TOC/DOC, UV254, color, alkalinity, total and dissolved iron/manganese, adenosine triphosphate (ATP), nitrate, nitrite, ammonia, total ammonia, orthophosphate.
- Hydraulic parameters monitored: flow rate, headloss

3.4.5.3 MAJOR RESULTS

Results from the study indicated that ATP, an indicator of biological activity, slightly increased as nitrate and orthophosphate levels were increased. However, it doesn't appear that nutrient addition or pH adjustment impacted manganese or TOC removal.

- Manganese Results (Figure 3-12)
    - The effluent manganese concentrations were dependent on influent concentrations.
    - There was no significant difference in manganese removal in biofilters versus the control filter.
    - Manganese removal was most closely correlated to the free chlorine residual, indicating that chlorine oxidation was the primary driver for manganese removal.

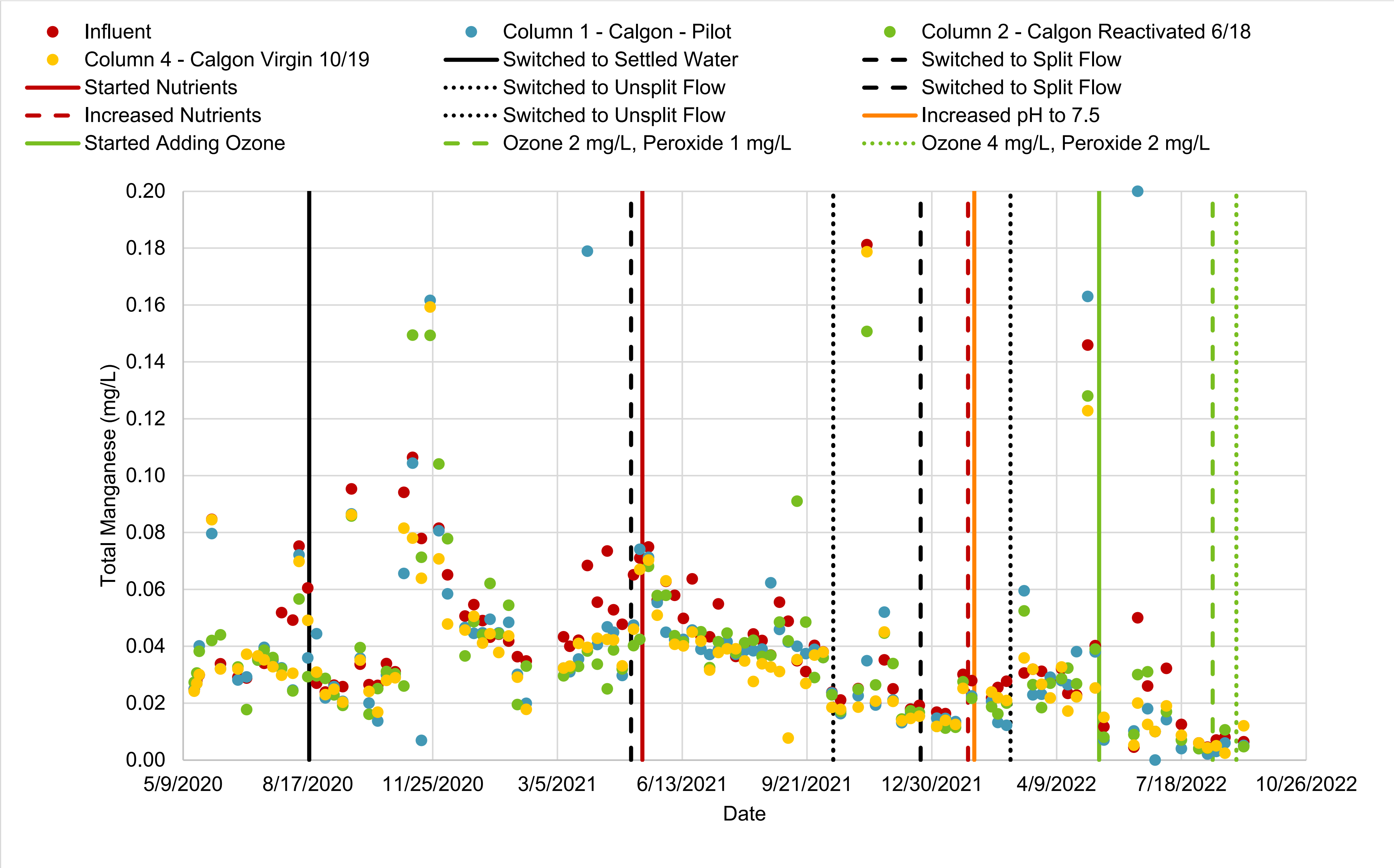

Figure 3-12. Biologically Active Carbon Testing – Manganese Removal

Based on the results of this study, it doesn't appear that biofilters alone are a viable treatment option for removing manganese. Additional studies may be needed to evaluate if TOC removal through a biofilter can be optimized with the addition of ozone (see next section).

3.4.6 Ozone – Biologically Active Carbon Pilot-Scale Testing

3.4.6.1 DURATION AND OBJECTIVES

BAC testing with ozone was conducted from May 2022 through September 2022 to evaluate the impact of ozone addition to the performance of the BAC to remove 1,4-dioxane and manganese. Figure 3-13 shows a picture of the ozone pilot skid, which also had the ability to dose peroxide.

3.4.6.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Waters tested: settled water
- Treatment scenarios evaluated: two
- Processes evaluated:
    - o Ozone (2 mg/L)
    - o Ozone (2 mg/L) and peroxide (1 mg/L)
- Water quality parameters monitored: pH, temperature, total dissolved solids, dissolved oxygen, chlorine residual, turbidity, TOC/DOC, UV254, color, alkalinity, total and dissolved iron/manganese, ATP, nitrate, nitrite, ammonia, total ammonia, orthophosphate, assimilable organic carbon, 1,4-dioxane, ozone residual.
- Hydraulic parameters monitored: flow rate, headloss

Figure 3-13. Ozone Pilot System

3.4.6.3 MAJOR RESULTS

As shown in Figure 3-14, the addition of ozone and ozone/peroxide resulted in a significant reduction in 1,4-dioxane concentrations. Ozone and ozone/peroxide were effective at treating 1,4-dioxane to below the NC 1,4-dioxane guideline of 0.35 µg/L.

Manganese

- Influent dissolved Manganese levels ranged from 0.006 mg/L to 0.03 mg/L, both are below the SMCL of 0.05 mg/L, so evaluation of manganese treatability using ozone is difficult. Ozone and ozone peroxide appear to have little impact on dissolved and total manganese removal. In general, it is challenging to remove very low concentrations of manganese.

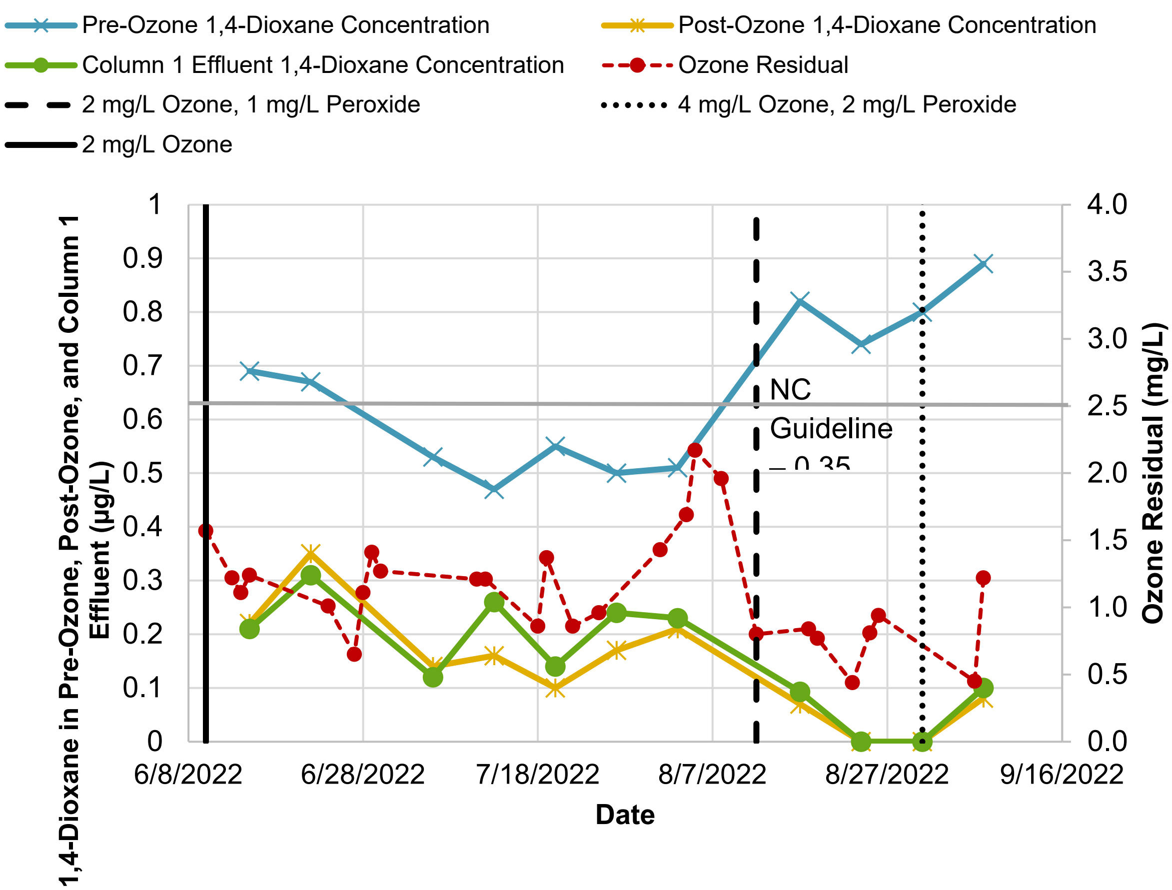

Figure 3-14. Ozone-BAC 1,4-Dioxane Pilot Results

Bromate/Bromide

- Bromate ranged from below detection limits of 1 µg/L up to 5.5 µg/L, which is below the MCL of 10 µg/L.
- Bromide ranged from 14 to 25 mg/L.
- If raw water bromide concentrations were to increase over time, bromate mitigation may be required with ozone addition.

3.4.6.4 STUDY RECOMMENDATION

Ozone and ozone/peroxide should be evaluated at the bench-scale to include manganese spiking. If results are favorable, then ozone or ozone/peroxide could be explored at the full-scale.

3.4.7 Chlorine Dioxide Bench-Scale Testing

3.4.7.1 DURATION AND OBJECTIVES

Chlorine dioxide bench-scale testing was conducted in August 2022 to evaluate chlorine dioxide as an alternative preoxidant to permanganate and pre-chlorine in treating iron and manganese.

The test also evaluated the formation of chlorite and chlorate at the different chlorine dioxide doses.

3.4.7.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Waters tested: raw water
- Treatment scenarios evaluated: 12
- Chlorine dioxide doses evaluated: 0.6 mg/L, 1.0 mg/L, 1.4 mg/L, 2.0 mg/L
- Contact Time: 30 minutes
- Total manganese spikes tested: 0.1 mg/L, 0.3 mg/L, 0.5 mg/L
- Water quality parameters monitored: pH, TOC, UV254, alkalinity, total and dissolved iron/manganese, chlorite, chlorate, 1,4-dioxane.

3.4.7.3 MAJOR RESULTS

The results from the testing indicated that the addition of chlorine dioxide had minimal impact on precipitating dissolved manganese. Figure 3-15 shows the percent of dissolved manganese to total manganese at various chlorine dioxide doses and manganese spikes.

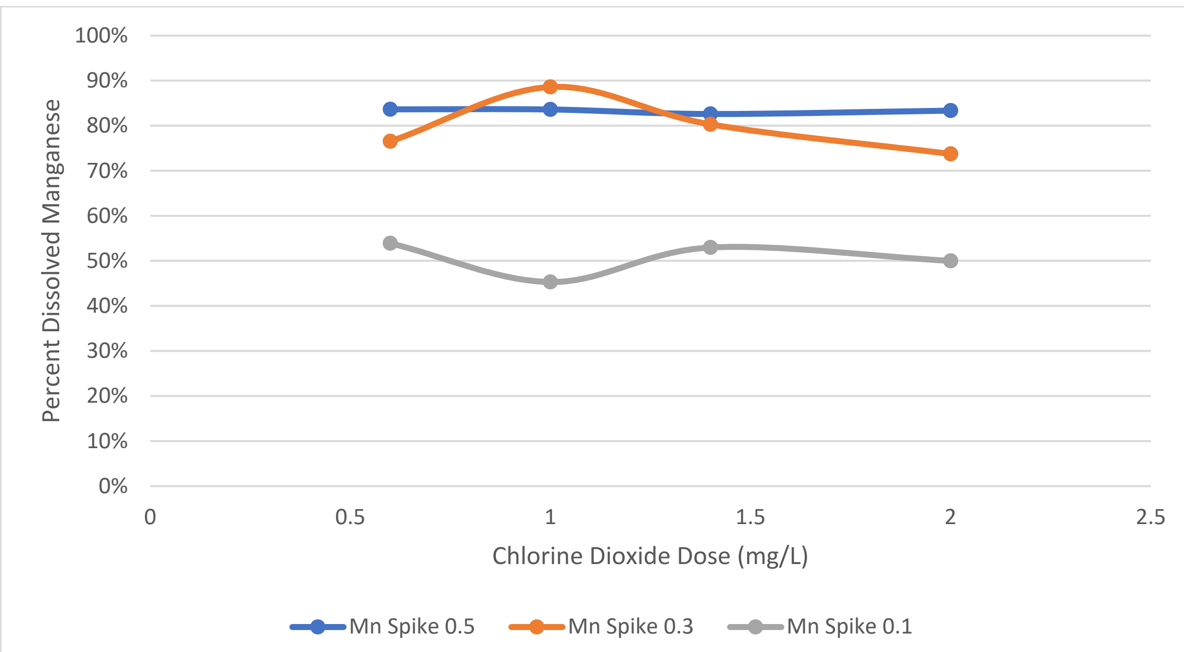

Figure 3-15. Total Manganese Oxidation at Various Chlorine Dioxide Doses and Manganese Spikes

The test plan also indicated that higher chlorine dioxide doses (i.e., greater than 0.6 mg/L) resulted in chlorite formation that exceeded the MCL.

The use of chlorine dioxide for manganese peroxidation is not recommended due to the minimal manganese oxidation and the potential to form chlorite.

3.4.8 Emerging Contaminants Pilot-Scale Testing

3.4.8.1 DURATION AND OBJECTIVES

Pilot-scale testing to evaluate advanced treatment technologies for PFAS and 1,4-dioxane was conducted from January 2023 through April 2023. The test included operation of a pilot-scale RO membrane system (provided by Harn RO, see Figure 3-16) to treat MF membrane effluent and GAC columns (see Figure 3-7) to treat MF membrane effluent and concentrate from the RO membrane system.

Figure 3-16. RO Membrane Pilot Unit

Although not conducted at the pilot-scale level, bench-scale testing was performed to test AOP technologies on the RO membrane concentrate to treat 1,4-dioxane; validation testing of using UV/AOP for 1,4-dioxane treatment of the MF membrane effluent was also conducted. The results of these bench-scale tests are presented in Section 3.4.8.4.

3.4.8.2 TESTING SUMMARY

The following is a summary of the testing plan:

- Waters tested: MF membrane effluent, concentrate from RO membrane system
- Treatment scenarios evaluated:
    - RO membrane system operated at 80% recovery. The pilot was operated while the plant was operating in series flow (water treated by dual media filtration followed by MF membrane treatment) and split-flow (water treated in parallel by dual media filtration and MF membrane treatment).
    - GAC Testing – tested GAC treatment on different streams and evaluated the impact of different loading rates. The loading rate of approximately 3.7 gallons per minute per square foot (gpm/sf) was selected to mimic a full-scale application. Column 3 was operated at a lower rate to determine the impact of kinetics on removal performance and head loss. Based on the loading rates, an EBCT of 10 minutes was selected due to media height limitations in the column pilot.

  - Column 1 – treated RO membrane concentrate at an EBCT of 10 minutes and a loading rate of 3.73 gpm/sf
  - Column 3 – treated MF membrane effluent at an EBCT of 10 minutes and a loading rate of 1.87 gpm/sf
  - Column 4 – treated MF membrane effluent at an EBCT of 10 minutes and a loading rate of 3.67 gpm/sf
- Water quality parameters monitoring: pH, chlorine, TOC, UV254, alkalinity, hardness, conductivity, total and dissolved iron/manganese, various anions, PFAS, 1,4-dioxane, RO membrane operational parameters, column operating pressures.

3.4.8.3 MAJOR RESULTS

Results from the pilot-scale study indicate that RO membranes provide excellent removal of PFAS and 1,4-dioxane. Table 3-9 present average PFAS results from the pilot as well as the calculated PFAS hazard index. PFAS levels below the lab's detection limit are listed as zero.

Table 3-9. RO Membrane Pilot – Average PFAS Values

PFAS	Feed	Permeate	Concentrate
PFOS (ng/L)	9.20	2.00	44.17
PFOA (ng/L)	4.67	0.00	21.50
GenX (ng/L)	0.00	0.00	0.00
PFBS (ng/L)	3.92	0.00	15.63
PFNA (ng/L)	0.00	0.00	4.13
PFHxS (ng/L)	4.90	0.37	23.50
Hazard Index	0.55	0.04	3.03

As shown in Table 3-10, the RO membranes also removed a wide range of other contaminants in the water, such as organics and manganese, and the resulting permeate had almost no alkalinity or hardness remaining in the water. However, the concentrate had high levels of hardness, alkalinity, and conductivity, which may impact the ability to recycle or discharge the waste.

Table 3-10. RO Membrane Pilot - Summary of Water Quality

Water Quality Parameter	Feed			Permeate			Concentrate		
	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
pH	5.5	6.3	5.8	5.2	5.6	5.3	5.6	6.8	6.2
TOC (mg/L)	2.0	3.0	2.3	0.2	0.6	0.4	7.4	12.5	9.2
Conductivity (μs/cm)	97.0	197.8	175.0	6.8	25.3	9.7	614.0	904.0	793.3
Turbidity (NTU)	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.6	0.1
Alkalinity (mg/L as $CaCO_3$)	4.0	25.0	11.8	3.0	15.0	5.9	8.0	58.0	27.2
Hardness (mg/L as $CaCO_3$)	35.0	48.0	39.3	0.0	20.0	1.0	151.0	205.0	180.7

Figure 3-17 and Figure 3-18 present a summary of PFOS and PFOA results collected during piloting. With the exception of a single outlier, all PFAS levels were below detection limits.

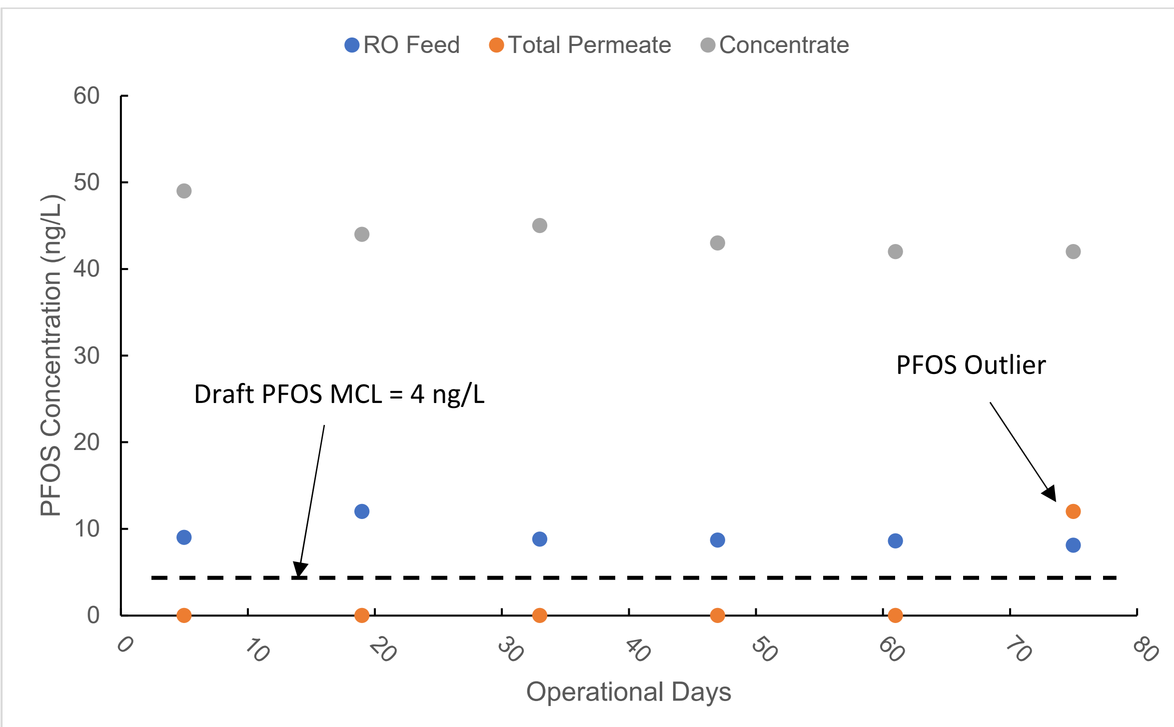

Figure 3-17. RO Membrane PFOS Pilot Results

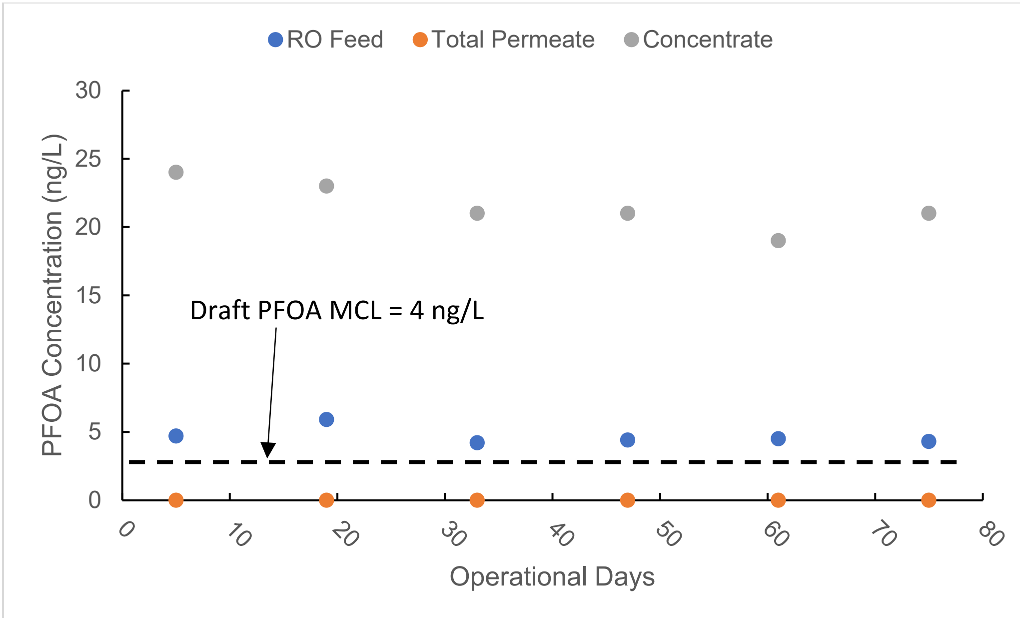

Figure 3-18. RO Membrane PFOA Pilot Results

On average, the RO membranes rejected over 95% of 1,4-dioxane with an average permeate level of 0.11 µg/L. Figure 3-19 presents the 1,4-dioxane results collected during piloting.

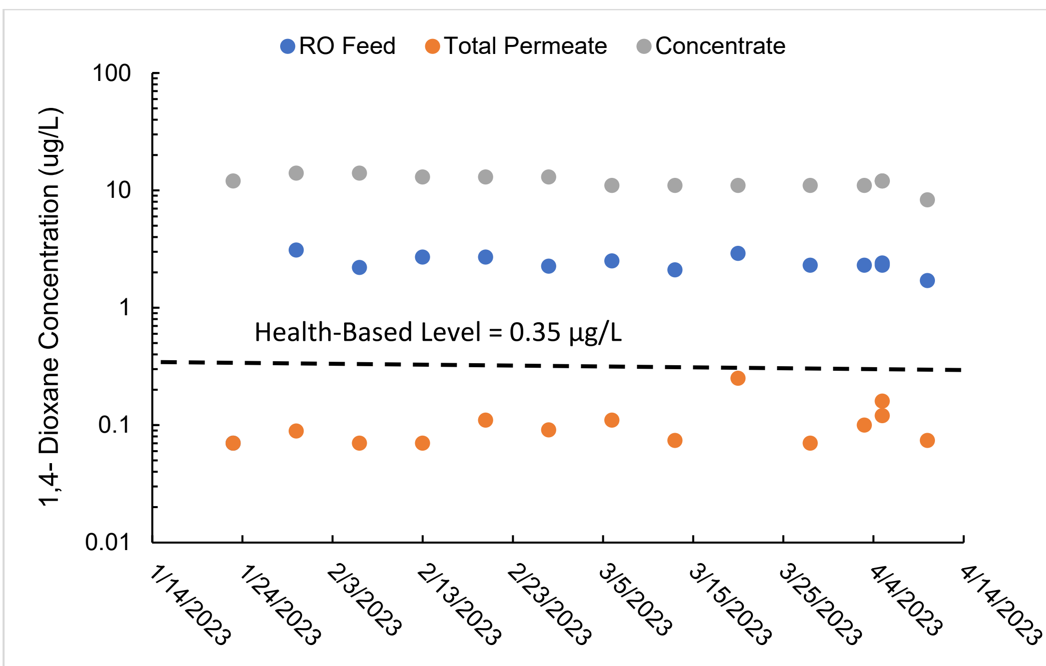

Figure 3-19. RO Membrane 1,4-Dioxane Pilot Results

Additional results from the pilot, such as conductivity, pressure, and flow, indicate that the RO membranes were able to operate consistently. Manganese was almost completely removed, and total iron levels averaged below 0.02 mg/L. Likewise, the results indicate that no obvious fouling was observed during the pilot run. Finally, no significant differences in performance were observed when the plant was transitioned to split-flow.

GAC effluent results also indicate that PFAS is being removed. Due to the higher levels of PFAS in the influent water, Column 1 experienced a faster breakthrough of PFAS. Figure 3-20 and Figure 3-21 present a summary of PFOS and PFOA results collected from Column 1 during piloting.

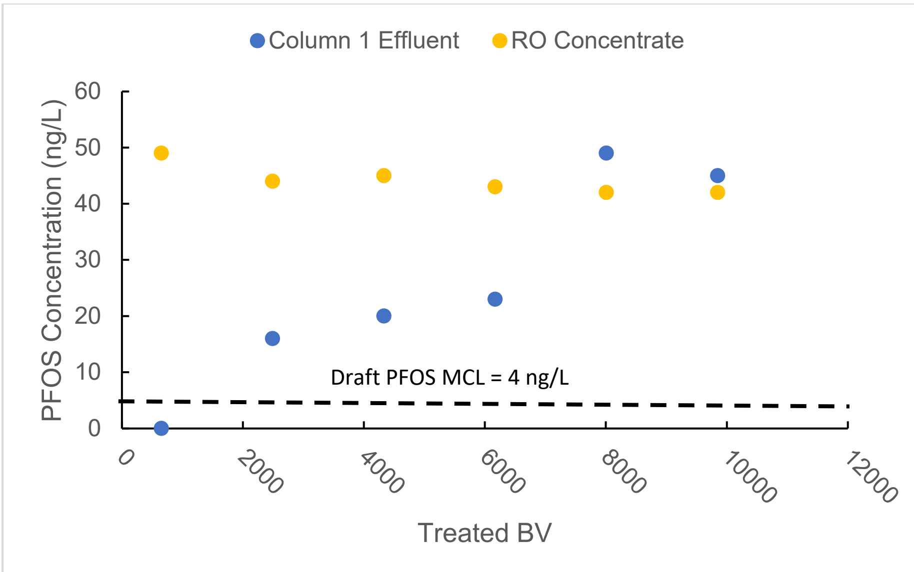

Figure 3-20. GAC Concentrate Pilot (Column 1) PFOS Pilot Results

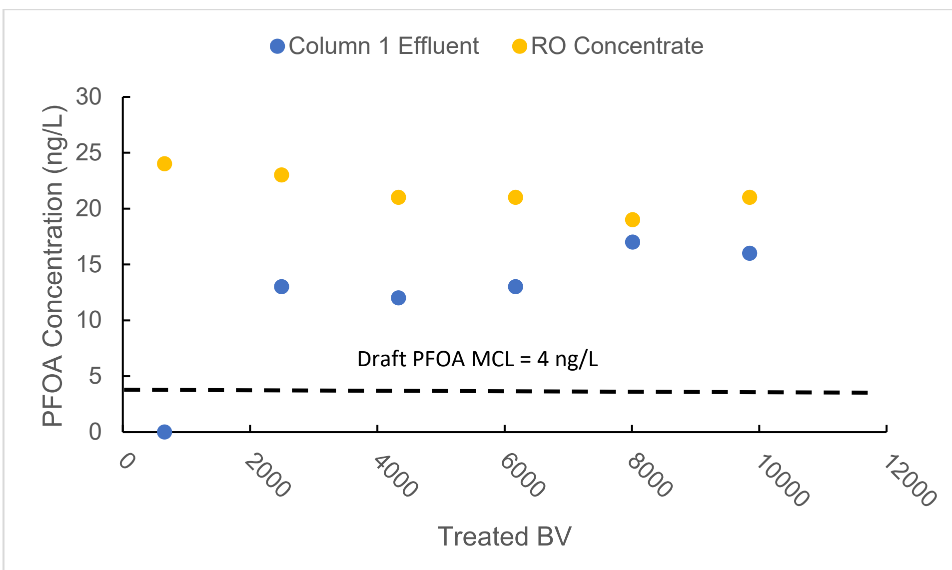

Figure 3-21. GAC Concentrate Pilot (Column 1) PFOA Pilot Results

Figure 3-22 and Figure 3-23 present a summary of PFOS and PFOA results collected from Column 4 during piloting.

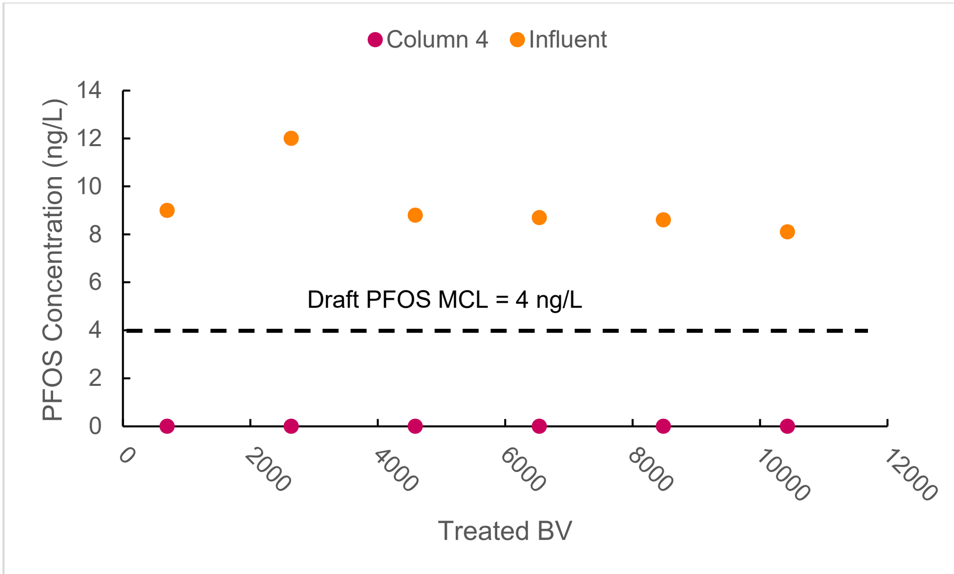

Figure 3-22. GAC MF Effluent Pilot (Column 4) PFOS Pilot Results

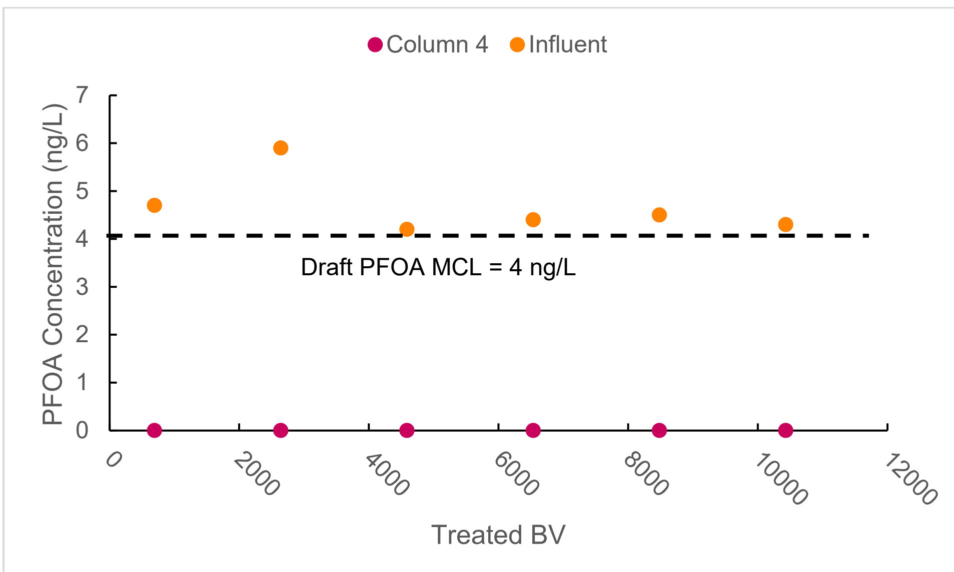

Figure 3-23. GAC MF Effluent Pilot (Column 4) PFOA Pilot Results

Table 3-11 summarizes water quality from the three GAC pilot columns. The data from the pilot study is presented in Appendix A.

Table 3-11. GAC Pilot – Summary of Water Quality

Parameter	Column 1			Column 3			Column 4		
	Min	Max	Average	Min	Max	Average	Min	Max	Average
pH	5.70	6.73	6.22	5.60	7.15	5.99	5.59	6.71	5.93
Conductivity	608.00	949.00	785.09	118.00	213.10	177.91	111.40	210.60	172.89
Turbidity (NTU)	0.04	0.53	0.17	0.03	3.26	0.23	0.03	0.15	0.08
Alkalinity	9.00	59.00	27.71	5.00	36.00	11.63	5.00	39.00	11.60
Hardness (mg/L as CaCO3)	141.00	225.00	193.31	34.00	59.00	40.40	32.00	54.00	38.71
TOC (mg/L)	0.70	11.10	6.56	0.28	1.83	1.02	0.36	2.90	1.37

3.4.8.4 STUDY RECOMMENDATION

It is recommended that another pilot-scale study of RO membranes and concentrate treatment (GAC) be conducted at a longer duration to better understand the potential for RO membrane fouling and receive additional data on PFAS breakthrough within a GAC system. Likewise, due to the high levels of PFAS in the concentrate, ion exchange resin (either independently or in combination with GAC) can be considered for concentration treatment, depending on recycling or discharge needs. Finally, additional studies should investigate alternative membrane recovery rates and EBCTs.

3.4.9 Ozone/UV/AOP Bench-Scale Testing

3.4.9.1 DURATION AND OBJECTIVES

Ozone/AOP and UV/AOP bench-scale testing was conducted by Xylem on a water sample collected on March 20, 2023 to evaluate the ability of the treatment processes to remove 1,4-dioxane.

3.4.9.2 TESTING SUMMARY

The following is summary of the testing plan:

- Waters tested: MF membrane effluent, RO membrane concentrate from the pilot-scale system
- Treatment scenarios evaluated: five
- Processes evaluated:
    - Ozone (6 to 15 mg/L) and peroxide (3 to 15 mg/L) on the RO membrane concentrate effluent
    - UV (500 to 3,000 mJ/cm^2) and peroxide (12 mg/L) on the RO membrane concentrate
    - UV (500 to 3,000 mJ/cm^2) and chlorine (4 mg/L) on the RO membrane concentrate
    - UV (500 to 2,500 mJ/cm^2) and peroxide (8 mg/L) on the MF membrane effluent
    - UV (500 to 2,500 mJ/cm^2) and chlorine (2 mg/L) on the MF membrane effluent
- Water quality parameters monitoring: 1,4-dioxane, total manganese, dissolved manganese, bromide, bromate, color, UVT.

3.4.9.3 MAJOR RESULTS

The full bench-scale test report prepared by Xylem is presented in Appendix B. Figure 3-24 summarizes the 1,4-dioxane results from the Ozone/AOP testing on RO membrane concentrate.

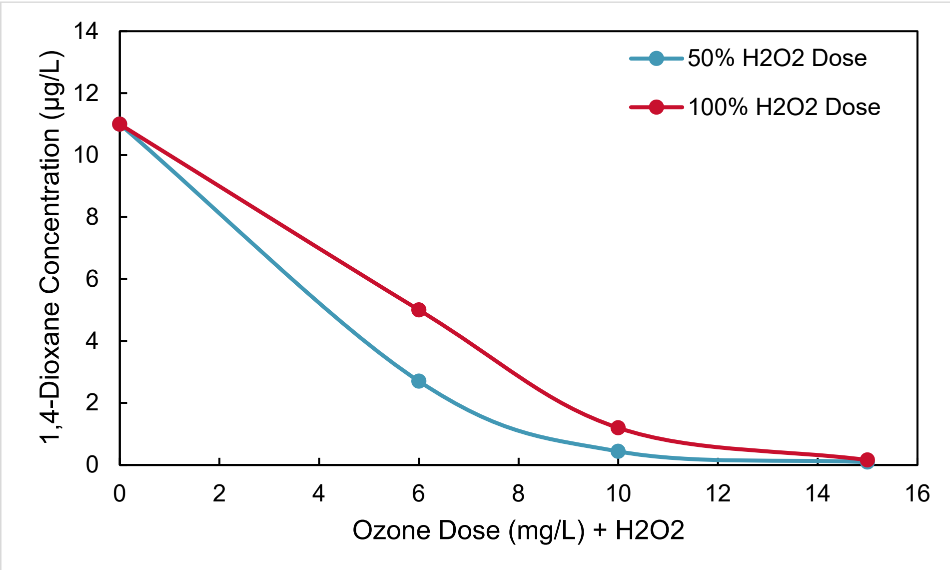

Figure 3-24. Ozone/AOP 1,4-Dioxane Results (RO Membrane Concentrate)

Additional results from the Ozone/AOP testing indicated:

- Ozone demand of approximately 2 mg/L of the RO membrane concentrate
- Ozone dose of around 15 mg/L (along with a peroxide dose at 50% or 100% of the ozone dose) resulted in 1,4-dioxane levels below the health advisory
- Bromate formation was less than 4 µg/L at all ozone doses; the bromate MCL is 10 µg/L
- Appling peroxide at 50% of the ozone dose resulted in improved performance.
- Applying peroxide doses at 100% of the ozone dose resulted in complete removal of color

Figure 3-25 summarizes the 1,4-dioxane results from the UV/AOP (peroxide) testing for both RO membrane concentrate and MF membrane effluent.

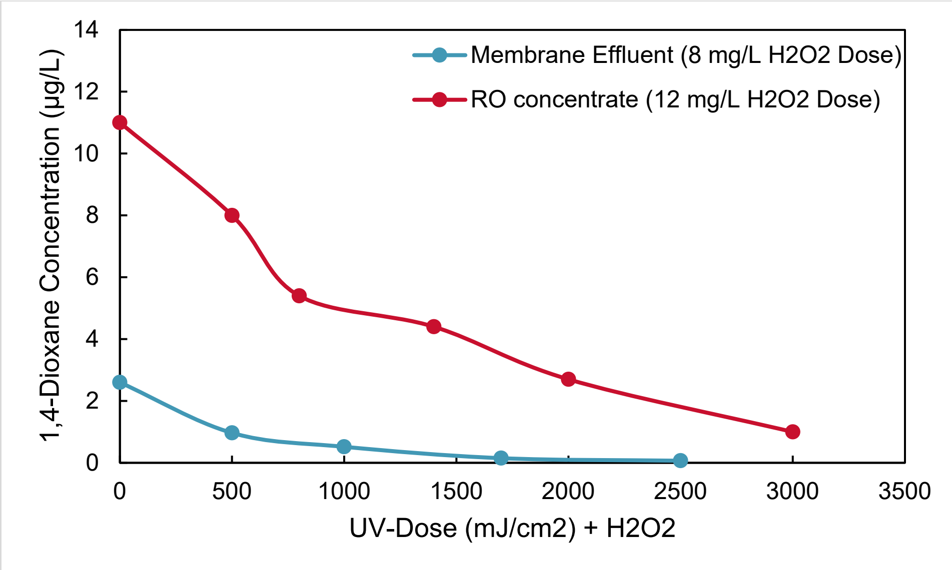

Figure 3-25. UV/AOP (Peroxide) 1,4-Dioxane Results

Additional results from the UV/AOP (peroxide) testing indicated:

- UV dose of 3,000 mJ/cm^2 with a peroxide dose of 12 mg/L did not reduce 1,4-dioxane concentrations in the RO membrane concentrate to below the health advisory
- UV dose of 1,700 mJ/cm^2 with a peroxide dose of 8 mg/L was effective at reducing 1,4-dioxane concentrations in the MF membrane effluent to below the health advisory

Figure 3-26 summarizes the 1,4-dioxane results from the UV/AOP (chlorine) testing for both RO membrane concentrate and MF membrane effluent.

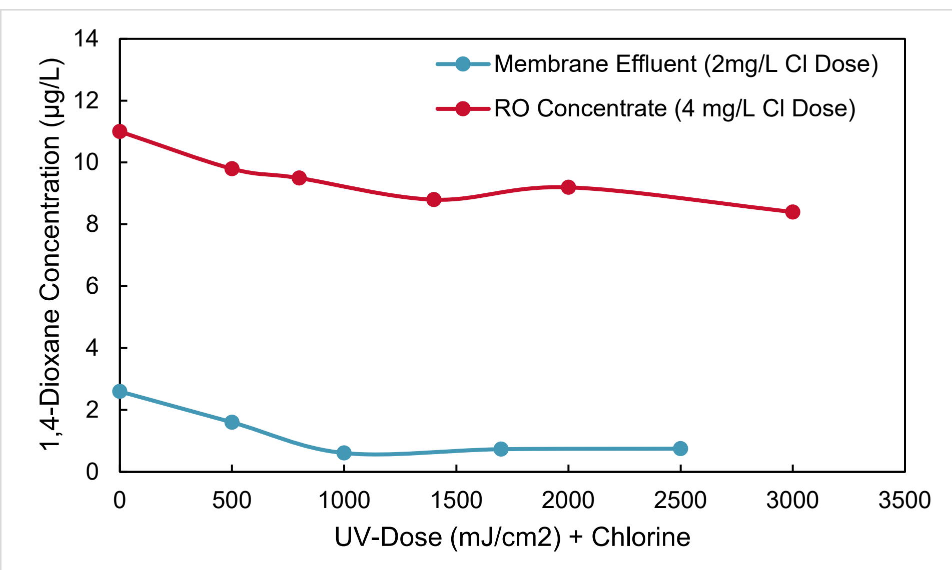

Figure 3-26. UV/AOP (Chlorine) 1,4-Dioxane Results

In general, UV/AOP with chlorine did not reduce 1,4-dioxane levels to below the health advisory in either water source.

3.4.9.4 STUDY RECOMMENDATION

It is recommended that UV/AOP or ozone/AOP be tested at the pilot-scale level in conjunction with additional RO membrane and GAC testing to determine the design doses for a full-scale system and to investigate the impact of an AOP on the life of GAC.

3.5 Water Quality Treatment Solutions

This section provides an evaluation on the various types of treatment technologies that can be used to address the several water quality challenges faced by PTWRA. These challenges are grouped into the following:

- Iron and manganese
- PFAS
- 1,4-Dioxane
- TOC, DBPs and algal-derived compounds (taste and odor compounds and algal toxins).

Treatment solutions consider existing treatment and previous water quality study information. The tables presented in this section are intentionally color-coded based on the following:

- Blue indicates that a treatment solution has minimal impact on the existing treatment process, has a low relative capital (CAPEX) or operating (OPEX) expense, and/or is effective at treating the identified challenge
- Yellow indicates that a treatment solution has moderate impact on the existing treatment process, has a moderate relative CAPEX or OPEX, and/or is moderately effective at treating the identified challenge
- Red indicates that a treatment solution has significant impact on the existing treatment process, has a significant relative CAPEX or OPEX, and/or is very effective at treating the identified challenge

3.5.1 Iron/Manganese Treatment

The WTP currently addresses iron and manganese by using chemical oxidation with permanganate or chlorine followed by removal through sedimentation and/or filtration. However, the treatment process is susceptible to raw water manganese spikes and dissolved manganese can pass through the MF membranes. While many plants in NC utilize the application of chlorine ahead of their filters to oxidize and remove dissolved manganese following sedimentation, only a portion of the WTP's flow can be treated using this process.

An overview of the treatment options considered in the removal of iron and manganese is shown in Table 3-12. This table considers previously conducted studies. Although not specifically noted within the table, GAC contactors, if installed for PFAS treatment, may remove manganese biologically; this should be evaluated during piloting.

Based on the information provided in the table, the following treatment options are considered for alternative treatment trains:

- In-Lake Aeration / Oxygenation. This option is considered for its minimal impact to the treatment process and low lifecycle cost. An additional advantage of this option is that it doesn't generate waste and doesn't manipulate water chemistry, allowing the continued use of membrane treatment.
- Raw Water Ozone. While ozonation requires significant cost to build and operate, raw water ozone addition provides added benefits beyond oxidation of iron and manganese and can be used to address multiple water quality challenges.
- Sodium Hypochlorite Addition Pre-Filters. Adding chlorine prior to granular media filters is a highly effective solution that has been tested full-scale at the plant. This would lead to forming DBPs, including HAAs, which are not easily removed with post-filter GAC. NF/RO Membranes. Similar to raw water ozone, NF/RO membranes provide multiple treatment advantages including the ability to remove PFAS and some 1,4-dioxane. To limit iron and manganese removal at the membranes, however, a pre-oxidant such as permanganate should continue to be used.
- NF/RO Membranes. Similar to raw water ozone, NF/RO membranes provide multiple treatment advantages including the ability to remove PFAS and some 1,4-dioxane. To limit iron and manganese removal at the membranes, however, a pre-oxidant such as permanganate should continue to be used or an alternative manganese treatment (such as lake aeration) be considered.

Biologically active roughing contactors (BARC) is a process involving the use of GAC for biological treatment on a raw water source. BARC was not considered for further evaluation due to the lack of testing. Greensand Filters were not considered for further evaluation since they address only a single water quality challenge.

Table 3-12. Iron and Manganese Treatment Options and Considerations

Treatment Option	Treatment Description	Deviation from Current Treatment	CAPEX/OPEX	Effectiveness	Waste Considerations	Other Considerations
In-lake Aeration/ Oxygenation	Injection of air or oxygen into Randleman Lake at the intake.	Low	Low/Low	Comparable installations have seen some success. Would require a full-scale demonstration to fully assess. Effectiveness is typically less than in-pipe or contactor-based systems.	No additional waste generated.	Has proven effective for other utilities.
BARC	GAC substrate contactor installed upstream of rapid mix. Biological growth within the contactor can reduce iron/manganese, TOC, and taste and odor compounds.	Medium	Medium/Medium	Effectiveness varies based on the influent manganese concentrations. Previous piloting indicated removal of 50% to over 90%	Limited backwashing is anticipated; potentially decrease residuals production.	Previous piloting indicated a potential reduction in coagulant need. Data also shows DOC/DBP removal of 10-20% and significant T&O reduction.
Raw Water Oxidation (Current Treatment)	Addition of chlorine dioxide, permanganate, or hypochlorite upstream of rapid mix.	Low	Low/Low	Effectiveness varies. Permanganate/hypochlorite have been used with varied effectiveness in oxidizing soluble manganese. Chlorine dioxide has shown ineffectiveness at bench-scale.	No additional waste generated (current treatment).	Chlorine Dioxide Formation of DBPs; sodium hypochlorite formation of DBPs; Permanganate can add Mn to water.
Raw Water Ozone	Addition of ozone upstream of rapid mix. Peroxide may be added with ozone to form hydroxyl radicals (AOP).	Medium	High/Medium	Generally effective, but dose should be optimized based on raw water iron and manganese levels. Dose would consider ozone demand, with metals being one part of the demand.	No additional waste generated.	Bench-scale testing conducted previously was inconclusive. Ozone has additional treatment impacts: 1,4-dioxane removal with AOP, T&O mitigation, and organics reduction.
Greensand Filters (i.e., manganese contactors with greensand media)	Reactive media filtration using manganese dioxide for its surface oxidation properties to remove iron and manganese.	Medium	High/ High	Greensand was piloted and was effective at removing iron and manganese from the settled water up until 20,000 bed volumes without regeneration of media.	Backwash/regeneration wastewater.	Greensand achieves a singular treatment objective at relatively high cost. Greensand only needed for membrane filtrate.
Sodium Hypochlorite Addition Pre-Filters	Hypochlorite is added to influent to oxidize any residual iron or manganese and inhibit biological growth	Low	Low/Low	Already effectively implemented.	No additional waste generated.	Potentially eliminating low pressure membrane system to add more granular media filters with chlorine addition.
NF/RO Membranes	High pressure membranes used for treatment of dissolved and undissolved constituents.	High	High/High	Highly effective.	Concentrate (reject) stream requires disposal or discharge, if permitted.	Would likely need to have a significant study looking at feasibility and effluent water quality if to be discharged via NPDES.

3.5.2 PFAS Treatment

The plant could potentially be removing some PFAS through the existing GAC contactors. However, as discussed later in this report, these contactors are not designed for PFAS removal and likely have inadequate contact time for cost-effective treatment.

An overview of the treatment options that were considered in the removal of PFAS is shown in Table 3-13. Due to the complexity of treating PFAS and limited data available, all treatment options are considered for alternative treatment trains.

Table 3-13. PFAS Treatment Options and Considerations

Treatment Option	Treatment Description	Deviation from Current Treatment	CAPEX/OPEX	Effectiveness	Waste Considerations	Other Considerations
GAC	Adsorption of PFAS with GAC contactors.	Low	High/Medium	Highly effective for long-chain PFAS removal.	Periodic GAC reactivation creates fines disposal and potential contaminant concentration issues	Proven effective in other studies. Plant already uses GAC at a low contact time (suboptimal for PFAS removal).
IX	Exchange of PFAS molecules on proprietary media.	Medium	Medium-High (depends on effectiveness)/High	Can be highly effective for PFAS removal.	Periodic resin changeout and potential contaminant concentration issues.	Will be discounted for primary treatment due to challenges with surface waters (high rates of fouling, impact of iron/manganese on operations).
NF/RO membranes	High pressure membranes used for treatment of dissolved and undissolved constituents.	High	High/High	Highly effective.	Concentrate (reject) stream requires, treatment and disposal or discharge, if permitted.	Would likely need to have a significant study looking at feasibility and effluent water quality if to be discharged via NPDES or recycled. 1,4-dioxane removal efficacy unknown.

3.5.3 1,4-Dioxane Treatment

The WTP does not currently have a treatment process that can address 1,4-dioxane.

An overview of the treatment options that were considered in the removal of 1,4-dioxane is shown in Table 3-14. All of these options are considered for alternative treatment trains. It should be noted that although UV/AOP was shown to be ineffective at the bench-scale level, it has been a proven treatment for other utilities. It is recommended that additional testing be conducted to confirm previous testing results and also to evaluate how UV/AOP treatment impacts the biological stability of the water.

Table 3-14. 1,4-Dioxane Treatment Options and Considerations

Treatment Option	Treatment Description	Deviation from Current Treatment	CAPEX/OPEX	Effectiveness	Waste Considerations	Other Considerations
Ozone/AOP	Addition of ozone and peroxide to form hydroxyl radicals for oxidation.	Medium	High/Medium	Ozone/AOP was effective at removing 1,4-dioxane.	No additional waste generated.	Provides added benefit of metals oxidation, 1,4-dioxane treatment, and the formation of assimilable organic carbon (AOC). Requires BAF downstream to maintain finished water biological stability. upstream biologically active filtration (BAF).
UV/AOP	Addition UV light and hydrogen peroxide or chlorine to form hydroxyl radicals for oxidation.	Medium	Medium/Medium	UV/AOP was ineffective at removing 1,4-dioxane, even at doses considered to be higher than 'typical'.	No additional waste generated.	Pilot Results contrary to many full-scale facilities. Need to evaluate the impact of AOC formation on finished water biological stability.
NF/RO membranes	High pressure membranes used for treatment of dissolved and undissolved constituents.	High	High/High	Highly effective.	Concentrate (reject) stream requires disposal or discharge, if permitted.	Would likely need to have a significant study looking at feasibility and effluent water quality if to be discharged via NPDES. Would need to pilot to see if 0.35 µg/L risk level can be attained.

3.5.4 Organics and Algae Impacts Treatment

The WTP has several processes that can help to address organics and the impact of algae (cyanotoxins and/or taste and odor). Organics are removed during sedimentation and filtration aided by the addition of permanganate and coagulant. The GAC contactors also remove a portion of the organics remaining downstream of filtration.

An overview of the treatment options that were considered to improve organics removal and reduce algae impacts is shown in Table 3-15. All of these treatment options are considered for the treatment trains with the exception of the following:

- In-lake Aeration/Oxygenation. Although this can be an effective treatment for manganese, it is less effective at providing organics or taste and odor reduction. This type of treatment could be considered in the future if significant harmful algal blooms occur.
- BARC. Similar to iron/manganese treatment, BARC is not considered due to the lack of testing.

Table 3-15. Organics and Algal Impacts Treatment Options and Considerations

Treatment Option	Treatment Description	Deviation from Current Treatment	CAPEX/OPEX	Effectiveness	Waste Considerations	Other Considerations
In-lake Aeration/ Oxygenation	Injection of air or oxygen into Randleman Lake at the intake.	Low	Low/Low	Difficult to determine without full-scale demonstration. Effectiveness is typically less than in-pipe or contactor-based systems.	No additional waste generated.	Has proven effective for other clients regarding metals oxidation. Mixed effectiveness for organics and algae.
BARC	GAC substrate contactor installed upstream of rapid mix. Biological growth within the contactor can reduce iron/manganese, TOC, and taste and odor compounds.	Medium	Medium/Medium	Previous pilot data indicated 10-20% DOC removal. Data also indicated removal of taste and odor compounds to below detectable limits, even at high concentrations.	No backwashing is anticipated.	Can reduce coagulant demand and residuals generation, which will reduce operating costs. Previous piloting indicated the ability to remove
BAF	Used in place of conventional media filtration to provide turbidity, TOC, and metals removal.	Low	High/Medium	Typical TOC removal can be between 10-20%	Filter backwash, but not likely exceeding current filtration wastes	GAC media is preferred over anthracite. Piloting data indicated that adjusting nutrients/pH results in increased biological activity but no improved performance.
GAC	Adsorption of TOC, taste and odor compounds, and algal toxins with GAC contactors	Low	High/Medium	Highly effective for PFAS and TOC removal. Effectiveness for taste & odor compounds and algal toxins is likely.	Periodic GAC changeout with occasional backwashing.	Proven effective in other studies. Plant already uses GAC at a low contact time (suboptimal for PFAS removal).
Ozone/AOP	Addition of ozone and peroxide to form hydroxyl radicals for oxidation on raw or settled water.	Medium	High/Medium	Ozone/AOP is effective for taste and odor and cyanotoxin removal. Ozone converts some organics to a more biodegradable format that can be removed with a BAF.	No additional waste generated.	Will provide added benefit of metals oxidation, 1,4-dioxane treatment, and the formation of AOC. Requires BAF downstream to maintain finished water biological stability. High raw water manganese will likely still require preoxidation
UV/AOP	Addition of hydrogen peroxide or hypochlorite in addition to high dose of UV light to form hydroxyl radicals, typically on finished water.	Medium	Medium/Medium	Ineffective TOC removal but is effective at reducing taste and odor compounds and treating some algal toxins.	No additional waste generated.	Need to evaluate the impact of AOC formation on finished water biological stability.
NF/RO Membranes	High pressure membranes used for treatment of dissolved and undissolved constituents.	High	High/High	Highly effective.	Brine concentrate (reject) stream requires disposal or discharge, if permitted.	Would likely need to have a significant study looking at effluent water quality if to be discharged via NPDES.

3.5.5 Water Quality Treatment Summary

Based on the results of previous studies, the recommended treatment options for addressing emerging contaminants include:

- RO Membranes with Concentrate Treatment – this option provides significant effectiveness at removing emerging contaminants
- Ozone/AOP with GAC Contactors – this option provides 1,4-dioxane treatment on the raw water following GAC treatment downstream of the filtration processes
- UV/AOP with GAC Contactors – this option provides 1,4-dioxane treatment on the filtered water followed by GAC treatment

Due to fouling challenges experienced during other studies and the lack of secondary benefits (such as organics removal), IX resins were not considered further.

Viable options are expanded in detail in Section 17.

3.6 Site Plan

A site plan is located in Appendix C.

3.7 Hydraulic Profile

The hydraulic profile is located in Appendix C.

3.8 Process Flow Diagrams

The process flow diagram is located in Appendix C.

4 Water Treatment Processes

4.1 Raw Water Intake, Pumping, and Conveyance

This section evaluates the Raw Water Intake structure for pumping capacity and the raw water tranmission line for hydraulic capacity.

4.1.1 Description of Existing Infrastructure

Figure 4-1 shows the plan view of the existing raw water intake structure, raw water pumps and potassium permangmate feed system. The raw water intake was designed as a three level structure with intakes based on the level of the Randleman Lake ranging between 640 and 675 feet (ft) MSL. This intake structure draws the raw water into a wetwell which has three vertical turbine pumps with a spot reserved for a future pump; these pumps are summarized in Table 4-1. The raw water pumps feed the flash mix system via a 42-inch raw water transmission main. This pipeline has two flow meters installed: one at the raw water pump station and second one at WTP site prior to the flash mix.

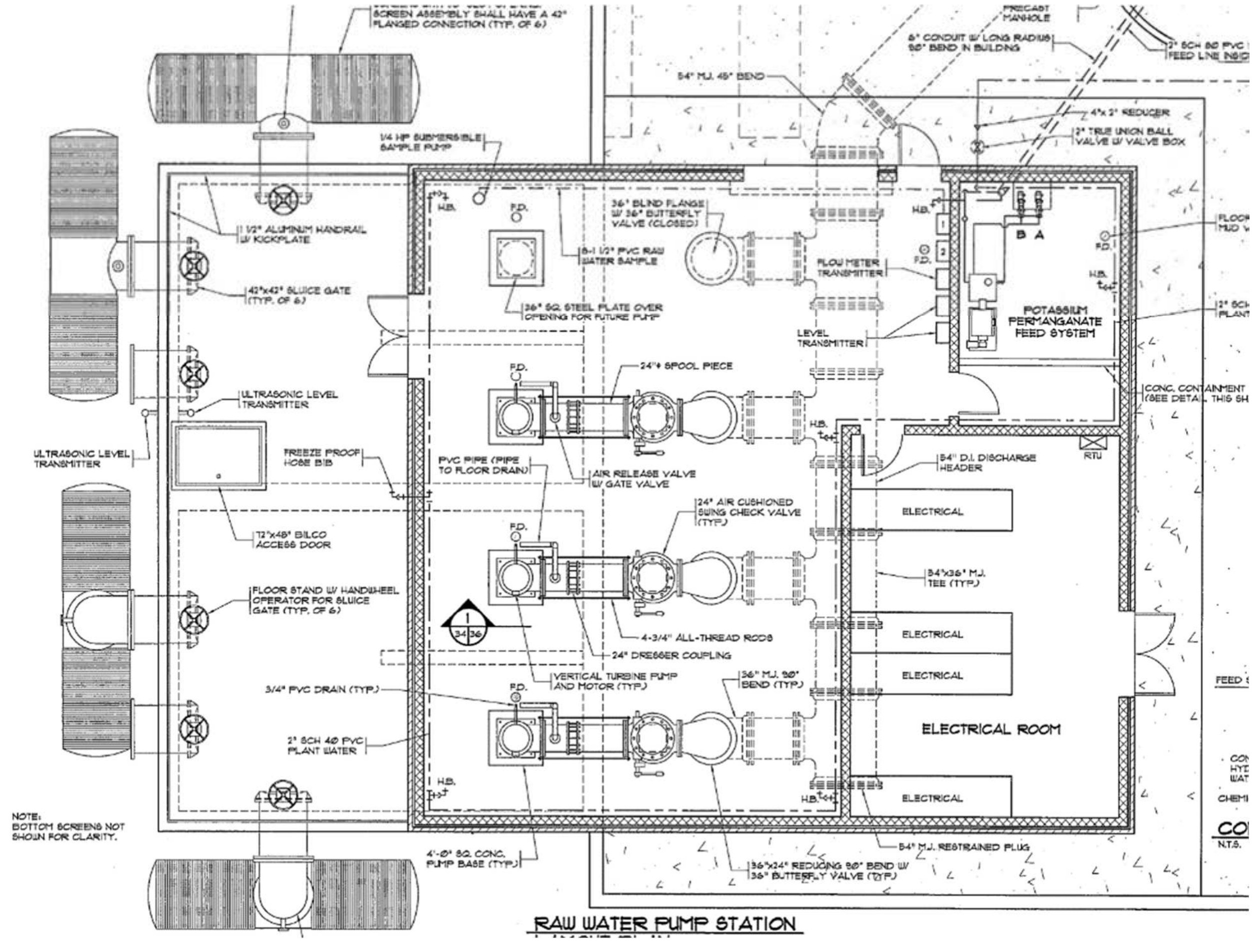

Figure 4-1. Intake Structure and Raw Water Pump Station

The raw water pump station was not initially designed with variable frequency drives (VFDs); instead, a flow control valve ahead of the flash mix was used to control the flow rate from the pumps. In 2016, a break occurred in the 42-inch raw water pipeline. It was determined that contributing factors to the break were likely the water hammer effect and the excess pressure in the line caused by the use of the flow control valve. To minimize this risk, VFDs were installed in 2016 as a more reliable means of controlling the pump rate and velocity transients. This installation also resulted in lower line pressure and allowed for a soft start and stop operation, reducing the water hammer. At the time of the line break and the initial VFD installation, only a 250 hp VFD was available and installed on Pump 2. As 200 hp VFDs became available, they were installed on the other two pumps.

Table 4-1. Existing Raw Water Pump Summary

Pumps	Flow (gpm)	Head (ft)	Motor Size (hp)
Raw Water Pumps 1 & 3	7,100	79	200
Raw Water Pump 2	7,100	79	250

A single 42-inch raw water pipeline conveys water approximately 3,000 linear feet from the pump station to the WTP. The transmission ranges in elevation from 682' invert at the Raw Water Pump Station, to a high point of 720' approximately halfway to the WTP, to about 712' elevation at the flow meter vault upstream of the flashmix.

The Raw Water Pump Station also houses a potassium permanganate feed system in a room adjacent to the pump room. This system will be discussed in Section 6 with other chemical feed systems.

4.1.2 Hydraulic Capacity

The existing pump station has three vertical turbine pumps each rated for 7,100 gpm (10.2 MGD) at 79 ft of head. The total installed capacity of the raw water pumps is 30.6 MGD with a firm capacity of 20.4 MGD with one pump out of service. The existing pumps will be able to handle the raw water flow for expansion to 27.9 MGD but will not have any spare pumps available in case of maintenance needs.

The pipeline conveying water from the pump station to the WTP has a diameter of 42-inches. At a duty pumping capacity of approximately 20.4 MGD (two pumps operating), the pipeline will have a velocity of 3.29 feet per second (fps). At the current operating capacity of 14.7 MGD, the velocity is 2.4 fps. This pipeline represents a single point of failure within the WTP.

4.1.3 Expansion Requirements

To provide standby pumping capacity and the ability to conduct routine maintenance, one additional pump must be installed at the same capacity and size as Raw Water Pumps 1 and 3 (see Table 4-2). The pump will be provided with a VFD.

Table 4-2. Proposed Raw Water Pump Key Design Criteria

Pumps	Flow (gpm)	Head (ft)	Motor Size (hp)
Raw Water Pump 4	7,100	79	200

As the WTP is expanded to 26.7 MGD finished water capacity, the velocity in the raw water transmission will rise to over 4.5 fps. While this increased velocity remains within the optimal range of a pipeline (2 to 5 fps), a second 42-inch raw water pipeline will be installed to ensure the velocity remains within optimal range while considering history of the transmission main and providing needed redundancy. The new pipeline will be connected to the existing pipeline by utilizing an existing tee downstream of the Raw Water Pump Station (see Figure 4-2). The existing flow meter that is located closer to the WTP will be replaced and/or relocated to where the new and existing raw water pipelines are connected.

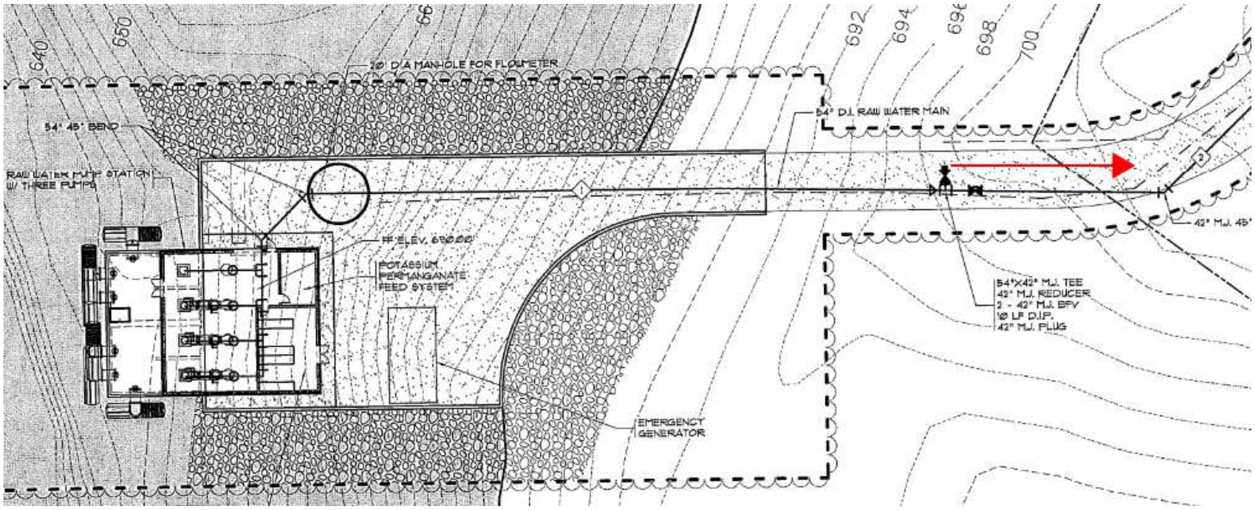

Figure 4-2. Connection to New Raw Water Pipeline

The new raw water pipeline will also be installed with tees near the Raw Water Pump Station so that the WTP can accommodate a backup diesel driven pump system in the future (see Appendix C).

4.2 Pretreatment

The pretreatment systems at the WTP currently include a flash mix step and SuperPulsators. The following sections describe the existing systems and the recommended expansion requirements.

4.2.1 Description of Existing Infrastructure

Figure 4-3 shows the unit processes included in the pretreatment train. The WTP was designed and constructed with a single flash mix chamber with a single vertically mounted flash mixer. Treatment chemicals including ferric sulfate for coagulation, caustic for optional pH adjustment, and sodium hypochlorite for oxidation are added in the flash mix chamber (refer to Section 6 for a full chemical description). Two weir gates split the flow into two parallel chambers. From these chambers, water flows under the SuperPulsator and discharges into the vacuum chamber of each SuperPulsator. The SuperPulsator is a solids contact (or sludge blanket) style clarifier sold by Suez Water Technologies (formerly Infilco Degremont) that utilizes air to create vacuum pulses to consolidate the sludge blanket below inclined plates and push sludge into the collection trough. The system is designed to allow flocculation and clarification in the same basin. The WTP was constructed with two parallel SuperPulsators. Effluent (settled water) from the two SuperPulsators is collected in a common flume and then flows into a settled water effluent pipe that conveys the water to filtration.

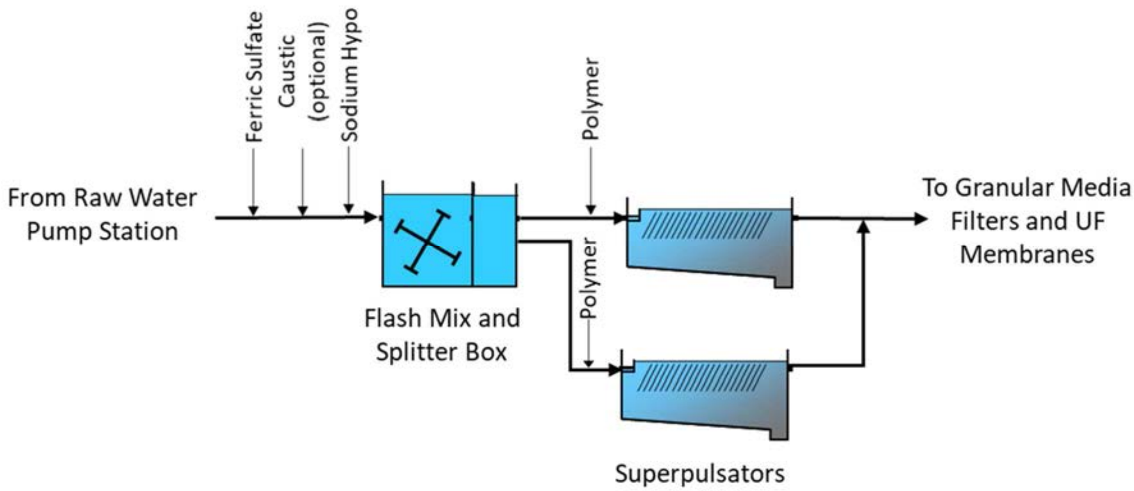

Figure 4-3. Pretreatment Unit Processes

4.2.2 Hydraulic and Treatment Capacity

The hydraulic capacity of the flash mix and SuperPulsators is approximately 17 MGD. Additional capacity is required as part of the plant expansion.

In 2012, HDR conducted a future capacity evaluation (HDR, 2012) that assessed the flash mix and SuperPulsators (at the time the WTP was rated for 12 MGD) for future expansion to 18 MGD finished water flow or 20 MGD flow to the flash mix.

Typical design standards for flash mix with a turbine mixer in a conventual chamber are provided in Table 4-3 compared to the values achieved in the current plant at 12.3 MGD (current average flows) and 16.2 MGD (rated maximum). Based on this comparison, the current flash mix chamber is adequately sized for up to 16.2 MGD.

Table 4-3. Flash Mix Design Standards (at 20°C)

Parameter	Units	Typical Design Value	Current System at 12.3 MGD	Current System at 16.2 MGD
Residence Time	s	30 to 60	170	129
Velocity Gradient, G	1/s	600 to 1000	348	348
G-t	s/s	18,000 to 60,000	59,000	45,000
Power	HP/MGD	0.85 to 1.0	1.2	0.93

In 2016, HDR conducted a re-rating assessment to understand the SuperPulsator performance at a loading rate of 2.75 gpm/sf. The result of the study was a re-rated capacity of the pretreatment system at 16.2 MGD with a loading rate to the SuperPulsators of 2.66 gpm/sf (HDR, 2016).

Settled water turbidity trends over the past three years are provided in Figure 4-4. Settled water turbidity has been at or below 1 NTU, with improved performance (down to 0.4 NTU) in warmer months. Based on this data, it is likely that the SuperPulsators can achieve less than 2 NTU settled water at 16.2 MGD (2.66 gpm/sf). However, the system has not been operated consistently at this capacity. Confidence in the system at this capacity is supported by other systems in North and South Carolina with similar surface water sources rated at loading rates equal to or higher than 2.66 gpm/sf.

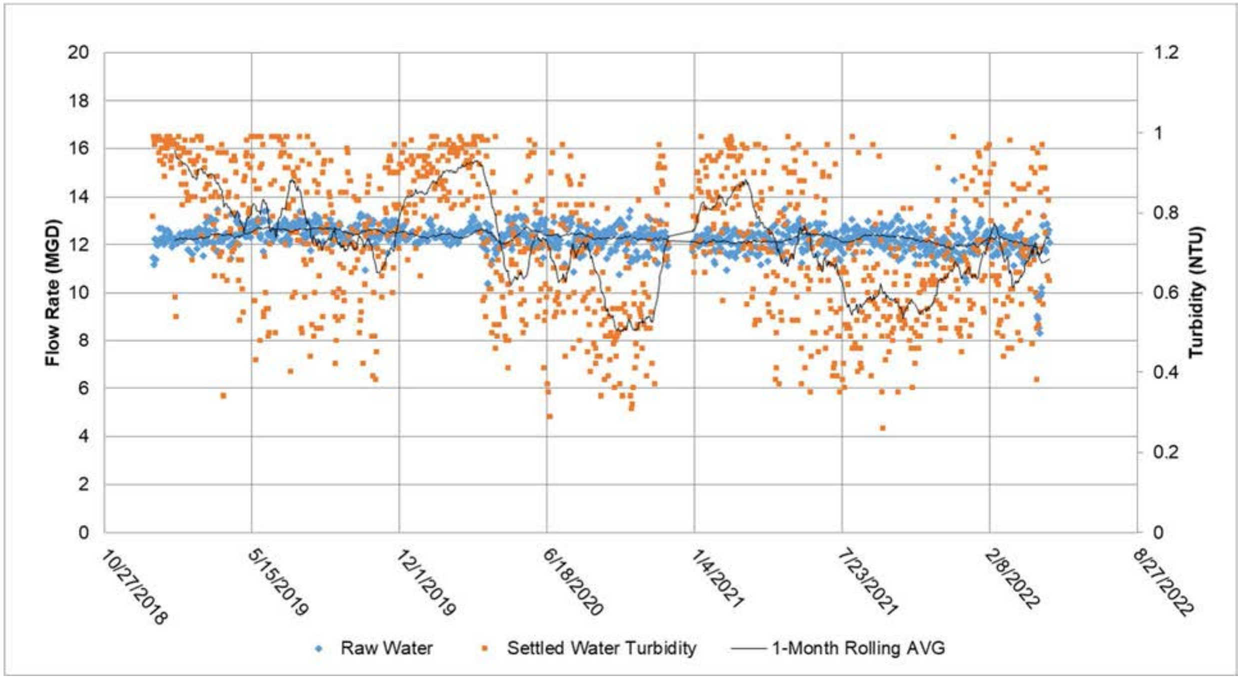

Figure 4-4. Raw Water Flow Rate and Settled Water Turbidity

Figure 4-5 shows there is not a trend with respect to turbidity removal and flow rate through the clarifiers, which perform well even at higher experienced flows. Based on this analysis, the flash mix and SuperPulsators are likely capable of treating up to 16.2 MGD in their current construction.

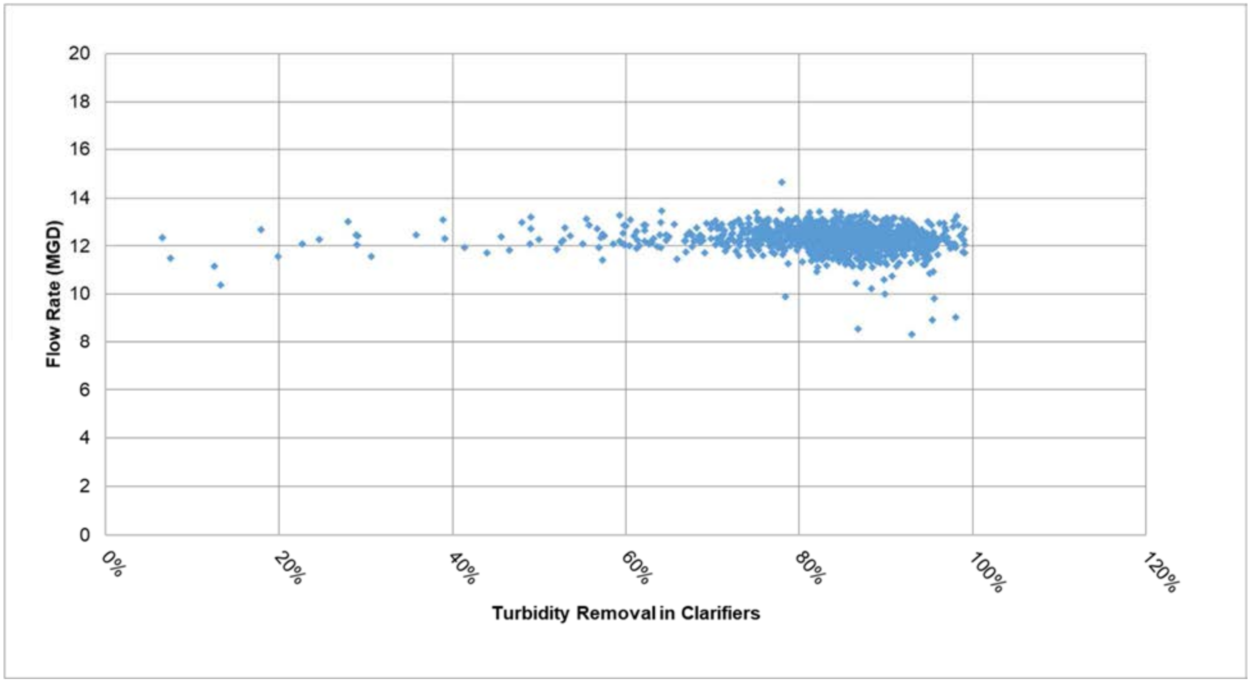

Figure 4-5. Raw Water Flow Rate versus Turbidity Removal

4.2.3 Expansion Requirements

As noted in Table 3-1, the pretreatment systems will need to handle up to 30.1 MGD to result in a finished water production of 26.7 MGD. From a hydraulic balancing standpoint, a new splitter box will need to be constructed to provide flow split between the existing and new pretreatment systems, while also providing flow split for future pretreatment systems. The box includes adjustable downward opening weir gates to send flow to the active pretreatment systems.

A second SuperPulsator, with the same dimensions as the existing SuperPulsator, will be constructed adjacent to the existing unit. Table 4-4 presents the design criteria for new components of the pretreatment system.

Table 4-4. Proposed Pretreatment Systems Key Design Criteria

Parameter	Units	Typical Design Value
Number of Units	N/A	2
Flowrate per Basin	gpm	5,556
Design Loading Rate	gpm/ft^2	2.66
Rapid Mixer Motor Size	HP	15
Number of Vacuum Pumps	N/A	3, 2 duty + 1 standby
Vacuum Pump Motor Size	HP	7.5
Air Compressor Size	gal	60
Air Compressor Motor Size	HP	2

As part of the final design, the following items will be considered:

- Airflow provided to the SuperPulsators. The configuration of the system providing airflow to the existing and new SuperPulsators should also be evaluated for system redundancy and reliability
- Improved access to and within the SuperPulsators for maintenance purposes
- Inclusion of a shade or cover over control areas
- Rehabilitation of the existing SuperPulsators

4.3 Filtration Systems

4.3.1 Description of Existing Infrastructure

The WTP was designed and constructed with two means for filtering water: 1) gravity granular media filters using anthracite and sand, and 2) submerged MF membranes. The original intended flow path was to filter water first with the granular media filters and then treat with membranes in series. Since 2016, when the WTP attained approval from the North Carolina Department of Natural Resources (now Department of Environment Quality, or NCDEQ), it has had the ability to run the two filtration systems parallel to one another in "split flow operation". This has been utilized more in the warmer months due to better settled water quality and improved membrane performance characteristics. When in split flow operation, the limiting process for capacity becomes the pretreatment system (16.2 MGD), as discussed above. PTRWA has expressed a desire to operate in split/parallel filtration year-round and to base the overall plant production capacity on the total filtration capacity attained during split operation.

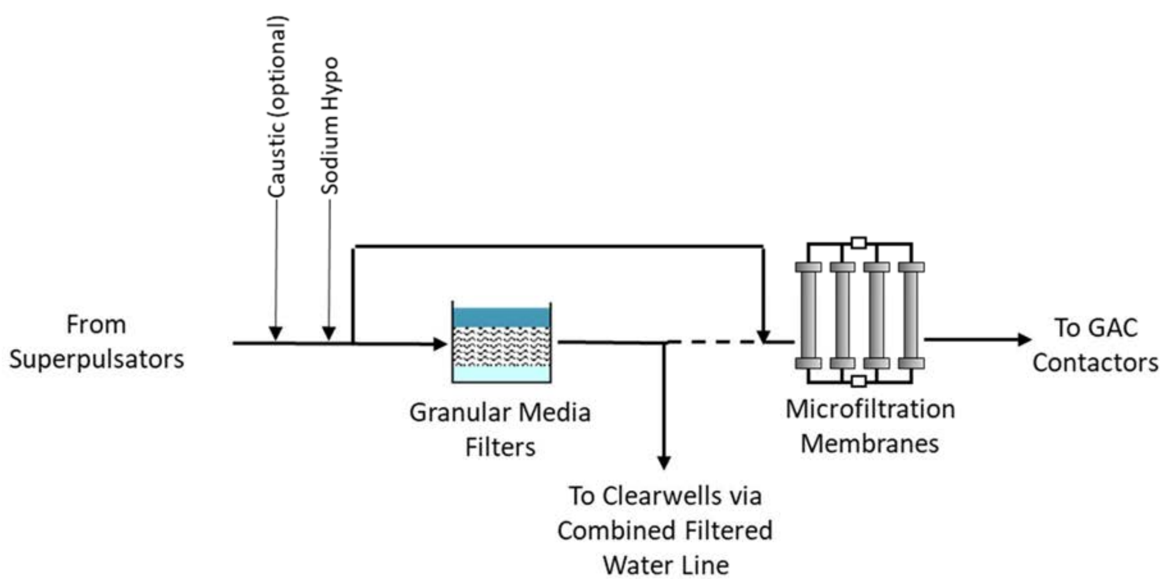

Figure 4-6. Filtration Unit Processes

4.3.1.1 GRANULAR MEDIA FILTERS

Granular media filters serve the function of filtering the water for compliance with the Surface Water Treatment Rule, which regulates pathogen reduction and effluent turbidity. The WTP has four granular media filters with design characteristics as summarized in Table 4-5.

Table 4-5. Existing Granular Media Filters

Parameter	Units	Value	Notes
Dimensions (L x W)	ft	24.5 x 26	
Surface Area	sf	637	
Media, Torpedo Sand	in	3	
Media, Sand	in	10	
Media, Anthracite	in	20	
Number of Cells	EA	4	
Filtration Rate	gpm/sf	4	
Capacity, Total	MGD	14.7	
Capacity, One Filter out of Service	MGD	11.0	
Backwash Pump Flow and Head	gpm / TDH in ft H_2O	11,300 / 70	Corresponds to ~18 gpm/sf backwash rate. Single speed.

4.3.1.2 SUBMERGED MEMBRANES

Microfiltration membranes also aid in filtering the water for compliance with regulations. The design characteristics for the submerged membranes are summarized in Table 4-6.

Table 4-6. Existing Membrane System

Parameter	Units	Value	Notes
Initial Flow Criteria, design	MGD	15	Net capacity of membranes
Number of Membrane Cells	EA	6	
Membrane Modules	EA per cell	432	
Membrane Module Surface Area	sf	250	
Minimum Recovery Rate, design	%	95	
Flux Rate, design	gallons per square foot per day (gfd)	29	

4.3.2 Hydraulic Capacity

4.3.2.1 GRANULAR MEDIA FILTERS

Previous assessments by HDR showed that the granular media filters are hydraulically limited to approximately 16.5 MGD based on an estimated dirty bed headloss of 85 to 87 inches across the media (HDR, 2012). Since no major modifications to media or underdrains have been performed, this is still a valid estimate.

4.3.2.2 SUBMERGED MEMBRANES

Based on the information provided in Table 4-6 and with one membrane cell out of service for cleaning or other operational need, the membrane system can produce 14.9 MGD of finished water. It should be noted that this production capacity does not take into account the "health of the membranes" and any irreversible fouling the membranes are experiencing, which would impact their ability to meet the specified flux rate.

4.3.3 Treatment Capacity

4.3.3.1 GRANULAR MEDIA FILTERS

The granular media filters are currently sized for 4.0 gpm/sf hydraulic loading, which is the typical maximum amount permitted in North Carolina. Other states in the U.S. have granted higher filtration rates in granular media filters, but individual cases vary with media type, depth, and grain size. Assuming a maximum permittable filtration rate of 4.0 gpm/sf, the filters can treat 14.7 MGD with all online and 11.0 MGD with three filters online and one in a backwash cycle. Combined filter effluent turbidity has always been under 0.1 NTU over the last year, based on monthly operating data.

The WTP has averaged 7.4 backwashes per 7-day period over the last three years, meaning that on a given operational day either one or two filters undergo one backwash on average. The maximum run time reported on monthly operating reports has averaged 94 hours over the same period, which is close to the filter benchmark of 96 hours. However, plant staff has indicated the filters can achieve longer run times. The design backwash rate is 11,300 gpm, or 18 gpm/sf and plant staff has not indicated challenges with achieving good backwashing performance, although the pump cannot achieve this rated capacity under typical operating conditions. Backwash wastewater accounts for approximately one percent of the raw water treated at the WTP. There is one backwash pump installed at the high service pump station and there are no spaces for additional backwash pumps.

4.3.3.2 SUBMERGED MEMBRANES

The membranes are able to effectively produce water that meets current regulations; the treatment capacity is limited by hydraulic capacity.

4.3.4 Expansion Requirements

The plant can produce up to 29.6 MGD of capacity when operating in split filtration mode with 14.7 MGD in granular media filtration and 14.9 MGD in membrane filtration. At this current WTP expansion, no additional filtration capacity will be necessary, but it will be necessary to operate the plant in split filtration mode to achieve the planned rated capacity of 26.7 MGD.

The single backwash pump is a resiliency concern because there is no backup. There is also not a dedicated slot to install a second backwash pump in the high service pump station. It is recommended that a second filter backwash pump or a separate and dedicated backwash pump station be installed to serve the granular media filters and GAC. As the plant is expanded and treats more flow, additional backwashing needs may be required. However, another backwash pump will not be installed as part of this expansion due to space limitations. A shelf spare could be considered to provide some resiliency to the system.

4.4 Granular Activated Carbon

4.4.1 Description of Existing Infrastructure

Membrane-filtered water polishing by GAC adsorption serves the purpose of removing organic molecules (such as those that compose the dissolved organic carbon (DOC) present in filter effluent), taste and odor compounds, and trace contaminants (such as PFAS and some heavy metals) that can be present in water in small amounts. The removal of organics decreases the DBP formation potential of the finished water. The WTP has four GAC contactors with design characteristics as summarized in Table 4-7. These contactors are at the same hydraulic grade and have the same footprint as the granular media filters.

Table 4-7. Existing GAC Contactors

Parameter	Units	Value	Notes
Dimensions (L x W)	ft	24.5 x 26	
Surface Area	sf	637	
Media, GAC	in	42	
No. of Cells	each	4	
Empty Bed Volume	cf	1911	Per cell
Empty Bed Contact Time	min	6.9	At 12 MGD total flow
Loading Rate	gpm/sf	3.3	At 12 MGD total flow
Backwash Pump Flow and Head	gpm / TDH in ft H_2O	11,300 / 70	Corresponds to ~18 gpm/sf backwash rate. Single speed.

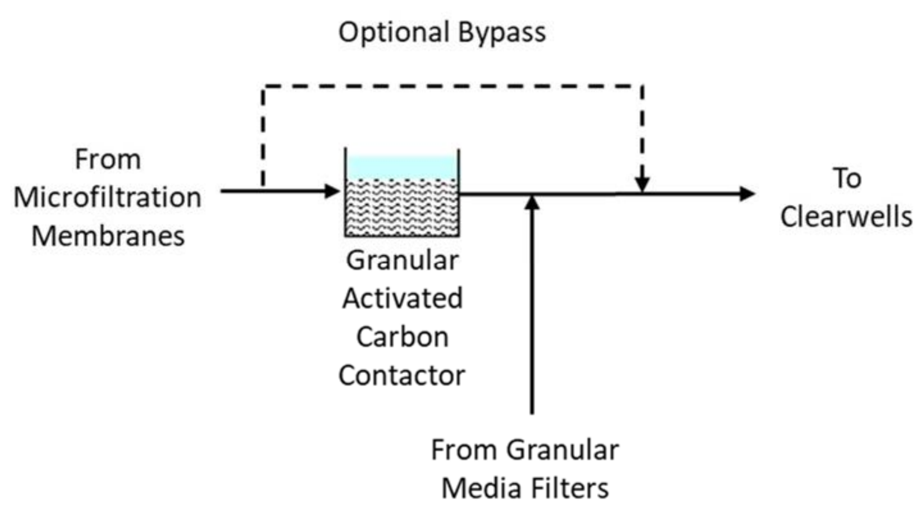

Figure 4-7. GAC Unit Process

4.4.2 Hydraulic Capacity

Due to the relatively low headloss through GAC media, these contactors do not present a hydraulic limitation at flows near the 12 MGD design flow. The design flow, around 12 MGD, is limited by empty bed contact time (EBCT), as discussed below.

4.4.3 Treatment Capacity

EBCT time in GAC contactors typically ranges from 5 to 20 minutes, depending on the treatment goal and the result of bench or pilot testing used to establish the design. At the lower end, 5 to 10 minute EBCT is generally effective at some degree of bulk DOC removal. Removal of trace organics, such as PFAS, may be more effective at longer EBCT; the degree to which longer EBCT improves removal of DOC or PFAS is water matrix dependent and is best determined by testing. It should be noted that effectiveness can also be defined as the frequency of media change-outs compared to finished water quality goals. A short EBCT typically requires more frequent media change-outs.

The current GAC contactors, which provide an EBCT of approximately 7 minutes (at 12 MGD flow) has been effective in removing some organics. From January to May 2022, the GAC contactors averaged 11% reduction of the total organic carbon (TOC) in the membrane effluent; since this water is filtered through the membranes, the TOC reduction value is effectively the equivalent of DOC reduction.

4.4.4 Expansion Requirements

Additional GAC treatment capacity was considered for several reasons:

1) The plant currently relies on approximately 7 minutes of EBCT in the GAC contactors to reduce organics and control DBPs prior to ammonia addition, but this would only be available to approximately half of the plant flow in the future split filtration configuration. To control DOC and DBP formation potential, it is likely that at least 10 minutes of EBCT will be needed for the full plant flow of 26.7 MGD.
2) PFAS may be effectively controlled with the current GAC media or a new media product. GAC media, such as Calgon Filtersorb 400, has been shown to be effective at removing several PFAS that will soon be regulated, such as PFOS and PFOA.
3) It may be costly to send combined filter/membrane effluent to the GAC in the currently configuration because it could involve rerouting and resizing large interior pipes.

However, based on the other treatment technologies available for emerging contaminant treatment and the limitations of the current GAC system to provide PFAS removal, expansion of the system is not considered.

Similar to the filtration expansion considerations, a revised pumping system should be considered to provide redundancy to this system.

4.5 Finished Water Storage

4.5.1 Description of Existing Infrastructure

The plant currently has two 3 million gallon (MG) above-ground, pre-stressed concrete clearwells, each with a diameter of 155 feet and a side water depth of 21 feet. The clearwells are fed by the combined filter effluent pipe and float together.

4.5.2 Hydraulic Capacity

At the current plant capacity of 14.7 MGD, the clearwells provide approximately 41% storage of finished water production, but were originally designed to provide 50%. It should be noted that the plant staff has indicated the High Service Pumps begin to experience pump cavitation below 10 feet of storage within the tanks.

4.5.3 Expansion Requirements

The tanks currently provide adequate storage to achieve disinfection especially due to the required need to maintain a minimum 10-foot water depth. Figure 4-8 summarizes the *Giardia* contact-time (CT) inactivation ratio. A ratio of greater than 1 indicates that proper disinfection is being achieved; on average, the WTP has an inactivation ratio of 2.3.

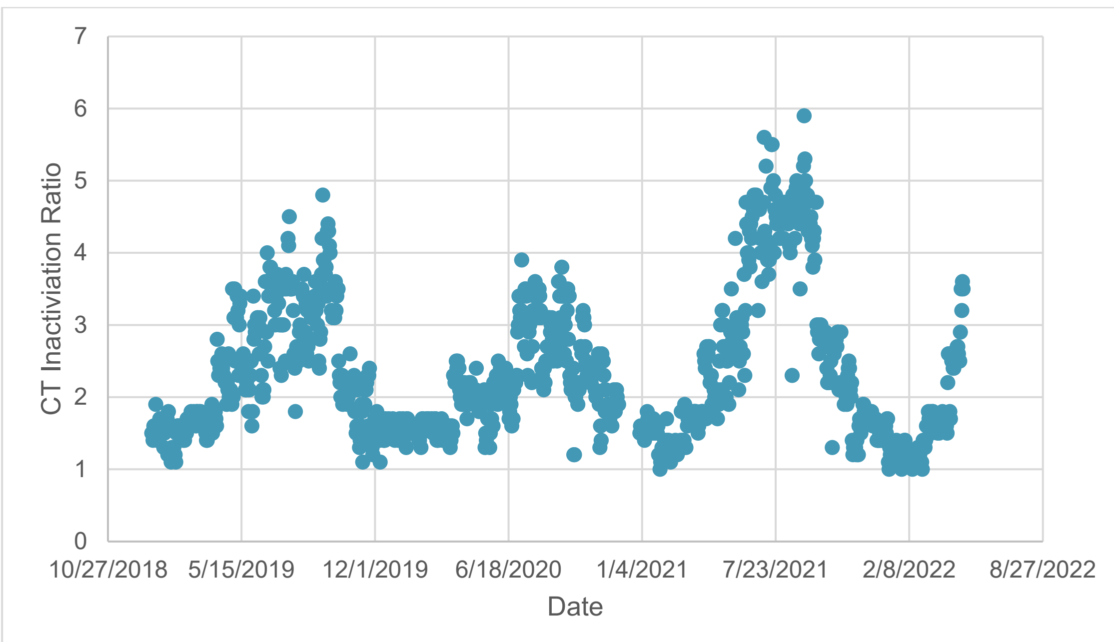

Figure 4-8. Summary of *Giardia* CT Inactivation Ratio

Based on the tank at a minimum operating level of 10 feet, and an assumed baffling factor of 0.5, the calculated T_{10} (the contact time at which 90% of the water has been in contact with the at least the minimum recorded free chlorine residual) is approximately 138 minutes.

At an expanded plant capacity of 26.7 MGD, the tanks will provide approximately 22% of finished water capacity. This capacity should provide adequate contact time for the plant to continue to meet disinfection requirements.

4.6 High Service Pumping

4.6.1 Description of Existing Infrastructure

Figure 4-9 shows the High Service Pump Station building which houses three north distribution pumps, three south distribution pumps, and one media filter/ GAC backwash pump. The building also has an electrical room servicing the pump station, a lime feed room and an ammonia feed room.

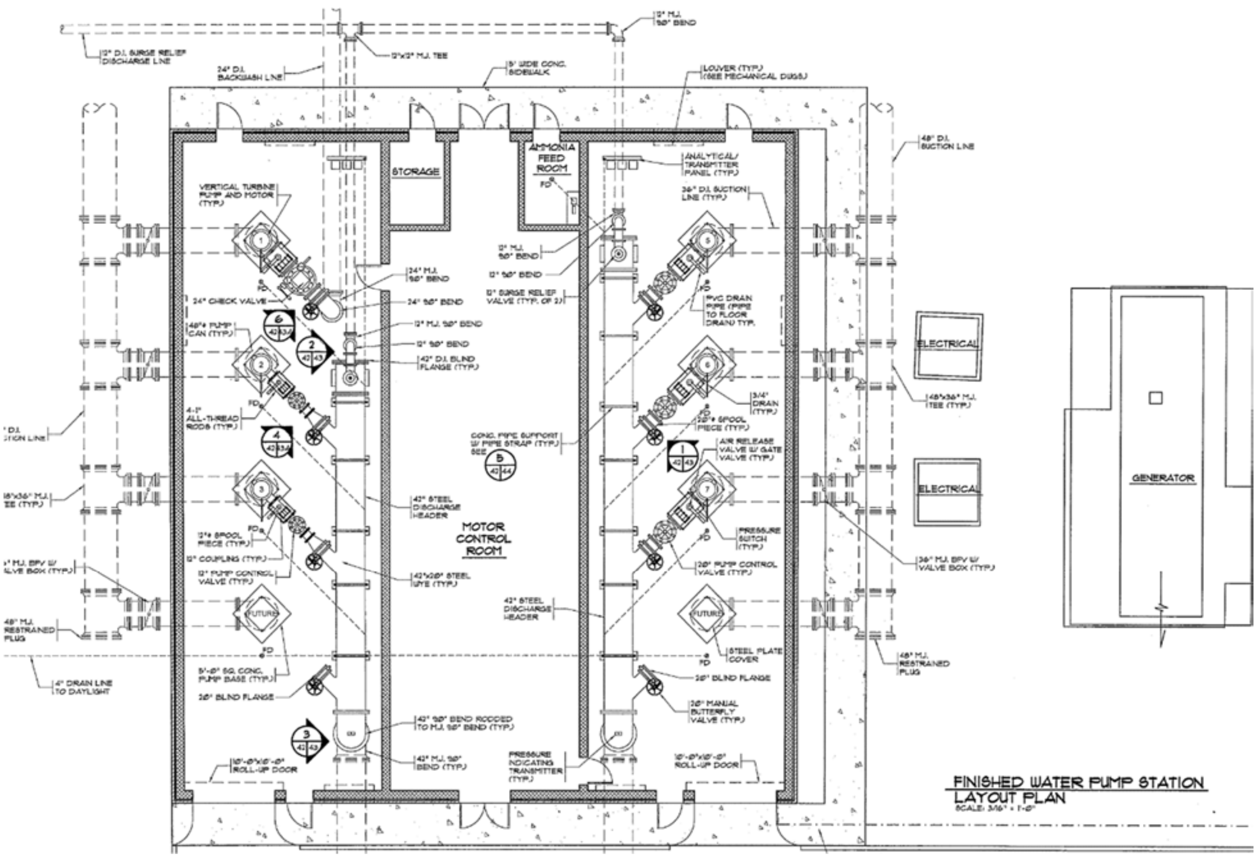

Figure 4-9. High Service Pump Station

4.6.2 Hydraulic Capacity

Table 4-8 summarizes the High Service Pump Station. The total capacity of the north system with one pump out of service is 33.0 MGD. The capacity for south system with one pump out of service is 6 MGD. The north and south pumps have VFDs while the backwash pump is constant speed.

Table 4-8. Existing High Service Pump Station Summary

Pumps	Number	Flow (MGD)	Head (ft)	Motor Size (hp)
North Pumps	3	16.5	133	500
South Pumps	2	3.0	338.5	300
Backwash Pump	1	16.2	72.2	250

4.6.3 Expansion Requirements

The installed firm capacity at the high service pump station exceeds the new expansion capacity of the WTP (26.7 MGD). Additional pumps are not required at this time.

5 Residuals Handling Processes

5.1 Description of Existing Infrastructure

5.1.1 Backwash Equalization Lagoon

The WTP has an equalization lagoon utilized for storage of backwash and filter-to-waste flows from the dual media filters, microfiltration membranes, and GAC contactors prior to gravity sludge thickening. The dimensions of the equalization lagoon are summarized in Table 5-1.

Table 5-1. Existing Backwash Equalization Lagoon

Parameter	Units	Value	Notes
Dimensions (L x W)	ft	132 x 100	
Maximum Side Water Depth	ft	9	
Storage Volume	MG	1.0	Includes floor slope.

5.1.2 Lagoon Sludge Lift Station

From the backwash equalization tank, water is drained from a pipe in the bottom to the Lagoon Sludge Lift Station. This lift station is a wet-pit submersible pump station with duplex pumps manufactured by Fairbanks Morse. The dimensions and design characteristics of the lagoon sludge lift station are summarized in Table 5-2.

Table 5-2. Existing Lagoon Sludge Lift Station

Parameter	Units	Value
Wet Well Diameter	ft	6
No. of Pumps	each	2
Design Flow Rate	gpm	220
Design TDH	ft	20

5.1.3 Membrane Lift Station

The clean-in-place (CIP) wash for the MF membranes is neutralized before being pumped directly to the gravity sludge thickener via the Membrane Lift Station. This lift station is a wet-pit submersible pump station with duplex pumps manufactured by Hydromatic. The dimensions and design characteristics of the lagoon sludge lift station are summarized in Table 5-3.

Table 5-3. Existing Membrane Lift Station

Parameter	Units	Value
Wet Well Diameter	ft	6
No. of Pumps	each	2
Design Flow Rate	gpm	200
Design TDH	ft	18

5.1.4 Gravity Sludge Thickener

The WTP has one 80-foot diameter gravity sludge thickener manufactured by Walker Process that receives flow from the SuperPulsators and the Sludge Storage Lift Station. The dimensions and design characteristics are summarized in Table 5-4.

Table 5-4. Existing Gravity Sludge Thickener

Parameter	Units	Value
Diameter	ft	80
Tank Depth	ft	12.83
Side Water Depth	ft	11
Design Flow Rate	gpm	400
Design Overflow Rate	gpd/ft^2	115

5.1.5 Thickened Sludge Lift Station

Sludge from the bottom of the Gravity Sludge Thickener is pumped to the Belt Filter Press via the Thickened Sludge Lift Station. The lift station was originally a dry pit pump station with duplex pumps manufactured by Fairbanks Morse. The lift station has been retrofitted with a Liberty Millennium Series F036G1L progressive cavity pump with a 7.5 hp motor. A Lenze variable frequency drive is located in the sludge press building and is used to control the pump speed. A 4-inch gasoline pump is currently used as a backup pump for transferring sludge to the filter press. The dimensions and design characteristics are presented in Table 5-5.

Table 5-5. Existing Thickened Sludge Pump Station

Parameter	Units	Value
No. of Pumps	each	1
Design Flow Rate	gpm	162
Design TDH	ft	27

5.1.6 Belt Filter Press

The belt filter press receives thickened residuals from the gravity sludge thickeners and removes water to approximately 22% dry solids. The press is manufactured by Charter Machine Company. The dimensions and design characteristics are presented in Table 5-6.

Table 5-6. Existing Belt Filter Press

Parameter	Units	Value
No. of Units	each	1
Design Solids Capacity	lb/hr	1400
Design Hydraulic Capacity	gpm	160
Belt Width	m	2.2
Wash Water Usage	gpm	80

5.1.7 Dewatered Sludge Transport and Storage

Dewatered solids are transported to a concrete storage area adjacent to the belt filter press building via a shaftless screw conveyor manufactured by Charter Machine Company. The sludge storage area is uncovered and has a drain and pump station to send permeate back to the gravity sludge thickener. The dimensions and design characteristics of the sludge transport and storage equipment are presented in Table 5-7.

Table 5-7. Existing Dewatered Sludge Transport and Storage

Parameter	Units	Value	Notes
Screw Conveyor Capacity	cf/hr	50	
Sludge Storage Area Dimensions (L x W)	ft	170 x 58	
Sludge Storage Capacity	cy	685	Assuming maximum depth of 2.5 feet and 75% usable area
No. of Pumps	each	2	
Design Flow Rate	gpm	220	
Design TDH	ft	15	
Wet Well Diameter	ft	6	

5.1.8 Effluent Discharge and Monitoring

Overflow from the Gravity Sludge Thickener flow by gravity to a decant lagoon, located adjacent to and sharing a common wall to the Backwash Equalization Lagoon. Caustic can be added to the decant lagoon via a chemical storage tote and chemical feed pump. A solids extruding decanter draws water out of the decant lagoon and into a dechlorination flume that is equipped with a measurement weir. Here, dechlorination (if necessary), sampling, and flow rate measurement occur before discharge into Randleman Lake. The decant lagoon is equipped with an overflow that will direct water to the dichlorination flume in the event that the decanter is valved off or the capacity it can process is exceeded. A bypass pipe is also located on the top of the decant lagoon that can be used to bypass the decant lagoon and send the water directly from the thickener to the overflow with the use of a portable bypass pump. The dimensions and design characteristics of the effluent discharge and monitoring system are presented in Table 5-8.

Table 5-8. Existing Effluent Discharge and Monitoring

Parameter	Units	Value	Notes
Decant Pond Dimensions (L x W)	ft	68 x 100	
Decant Pond Operating Depth	ft	8	
Decant Pond Capacity	gal	305,000	
Decanter Capacity	gpm	500 – 1,400	Assumed based on reported maximum discharge rate
Weir Width	ft	3	
Weir Capacity	gpm	7,420	Based on maximum flow rate for accurate measurement (Teledyne, 2017)
NPDES Permit Limit	MGD	NA	Monitor Only

5.2 Solids Production

To assess the adequacy of the existing residuals handling facilities, projections of the current solids waste production were calculated. The estimates were derived using the existing data and normalized to million gallons of water treated for projections. Solids mass balance laboratory data is not available, therefore an industry accepted empirical formula was used to estimate solids production. Solids estimates were calculated using data from the monthly monitoring reports and Equation 5-1 (Cornwall, 2011):

$$Solids\ (mg/L) = 2.9 * Fe + TOC + 1.5 * T + Polymer$$

Where,
Fe = Ferric Sulfate Dose (mg/L as Fe)
T = Turbidity (NTU)
TOC = Total Organic Carbon Removed (mg/L)
Polymer = Polymer Dose (mg/L)

Equation 5-1. Solids Estimation Calculation

The analysis was performed on data from January 2019 through April 2022. This calculation was utilized to calculate average, maximum, and 99% frequency solids production estimates. The system evaluation was conducted utilizing the 99% frequency solids production, which assumes the system will be capable of treating the solids 99% of the year or 361 out of 365 days. Designing solids handling facilities to meet the historical maximum production is neither practical nor cost effective. Table 5-9. presents the results of the solids production analysis.

Table 5-9. Solids Production Estimates

Solids Production	Concentration (mg/L)	Mass (lb/MG)
Average	40.8	340.4
Maximum	188.6	1572.8
99% Frequency	85.6	713.51

The results from the solids production model were compared to the sludge hauling data from January 2019 through July 2022. During this time period, PTRWA reported hauling 2,260 dry tons of solids. The model estimated that during this same time period, the plant would produce 2,493 dry tons of solids or an overestimate of 9.8%. Based on this result, the solids production model can be considered accurate while providing a slight factor of safety in design calculations.

5.3 Treatment Capacity

The solids thickening and dewatering treatment capacity is dictated by the gravity sludge thickener, belt filter press, and screw conveyor with the remaining unit processes dictating hydraulic capacity of the system.

5.3.1 Gravity Sludge Thickener

Typical design standards for the Gravity Sludge Thickener are compared to the values currently achieved at the existing WTP with the current maximum flow rate of 14.7 MGD and the proposed raw water flow rate of 31.2 MGD in Table 5-10.

Table 5-10. Gravity Sludge Thickener Design Standards

Parameter	Unit	Design	14.7 MGD	31.2 MGD	Notes
Peak Surface Overflow Rate	gpd/ft^2	600	292	406	Assumes SuperPulsators, BFP, and equalization basin are all using thickener. Equalization basin limited to 400 gpm. 31.2 MGD includes two SuperPulsators in blowdown.
Average Surface Overflow Rate	gpm/ft^2	250	109	206	Utilizes daily average flow rate for SuperPulsators, equalization basin limited to 400 gpm.
Solids Loading Rate	lb/day-ft^2	<4	2.10	4.45	Based on 99% solids generation

Based on the overflow rates and solids loading rate at the flow rates analyzed, there is some treatment capacity available in the gravity sludge thickener. However, it should be noted that the existing gravity sludge thickener was designed for a peak influent flow rate of 400 gpm, which is equivalent to a surface overflow rate of 155 gpd/ft^2. This is far below the current peak overflow rate and design overflow rates for the expansion. At increased flow rates, excessive headloss and floc shearing would be anticipated, lowering the effectiveness of the gravity thickener. A final point to note is that these values are based on an equalization lagoon effluent flow rate of 400 gpm. At this flow rate, the pump station cannot drain the lagoon in a 24-hour period and its hydraulic capacity becomes the limiting factor. This will be discussed in more detail within a later section.

5.3.2 Belt Filter Press and Screw Conveyor

The capacities of the Belt Filter Press and screw conveyor were previously presented in Table 5-6. Because of the intermittent operation, the treatment capacity of the Belt Filter Press and screw conveyor were evaluated based on shift hours per week of 36 hours, 48 hours, 72 hours, and 96 hours. For each quantity of shift hours, a corresponding raw water capacity was calculated based on the indicated equipment throughput capacities. This evaluation is presented in Table 5-11.

Table 5-11. Belt Filter Press and Screw Conveyor Capacity Evaluation

Shift Hours per Week	BFP Capacity (MGD)	Screw Conveyor Capacity (MGD)	Resulting Capacity (MGD)
36	10.0	7.2	7.2
48	13.4	9.6	9.6
72	20.1	14.3	14.3
96	26.8	19.1	19.1

With the screw conveyor limiting, the solids dewatering and transport system is limited to 19.1 MGD of raw water capacity with 96 shift hours per week. This equates to approximately five 20-hour days a week of operation. It should be noted that the plant staff operate the Belt Filter Press when the sludge thickener is full and continue operation until the thickener is close to empty.

5.3.3 Sludge Storage

The days of sludge storage at the existing facility were calculated at the existing WTP capacity of 14.7 MGD and the proposed capacity of 31.2 MGD. The sludge was assumed to be stored 2.5 feet deep with 75% of the surface area available for storage to allow access for equipment and personnel. Table 5-12 presents the results of the analysis.

Table 5-12. Sludge Storage Analysis

Parameter	Unit	14.7 MGD	31.2 MGD	Notes
Storage Available	days	144	68	99% solids production

Standards require a minimum of 30 days of dry sludge storage, which is met by the current facility. However, it is recommended that additional covered storage be constructed or allocated to increase operational flexibility during periods where land application of solids is not possible.

5.4 Hydraulic Capacity

5.4.1 Backwash Equalization Lagoon

The Backwash Equalization Lagoon receives backwash water from the different sources via a 36-inch ductile iron pipe. Due to the proposed split operation of the filtration facility, the instantaneous flow rate through the lagoon influent pipe is not anticipated to change, although membrane backwashes may occur more frequently. No problems have been reported by PTRWA regarding the hydraulic capacity of this pipe, therefore the capacity is assumed to be adequate. The total volume of backwash water produced by the filtration process is summarized in Table 5-13.

Table 5-13. Backwash Equalization Lagoon Hydraulic Summary

Unit Process	Typical Backwash Volume (gal)	Backwash Volume (gal)	Notes
Dual Media Filtration	172,000	344,000	Typical – 1 backwash, with 60 minute filter-to-waste period at 1200 gpm Maximum – 2 backwashes, with 60 minute filter-to-waste period at 1200 gpm
Membrane Filtration	700,000	700,000	Assumes a 700% increase in daily backwash volume due to split operation
GAC Backwash	0	150,000	GAC backwash is only performed periodically
TOTAL	**700,172**	**1,194,000**	

Based on this analysis, the existing lagoon has sufficient storage capacity to hold the typical daily backwash volume, but not the maximum expected backwash volume. However, as noted during the evaluation of the gravity thickener treatment capacity, the EQ basin is limited to an effluent flow rate of 400 gpm to maintain an acceptable surface overflow rate. This is not sufficient pumping capacity to process the backwash within the EQ basin within a 24-hour period. To maximize the operation of the lagoon, additional pumping is required. This additional pumping will also offset the storage deficiency during the maximum backwash event.

5.4.2 Gravity Thickening

The hydraulic treatment capacity of the gravity thickener was discussed within a previous section. With additional SuperPulsators anticipated, the hydraulic capacity of the gravity thickener influent pipe was also analyzed. SuperPulsator blowdown feeds into the gravity thickener via an 18-inch pipe. The proposed new SuperPulsators would connect to Manhole 8 shown in Figure 5-1.

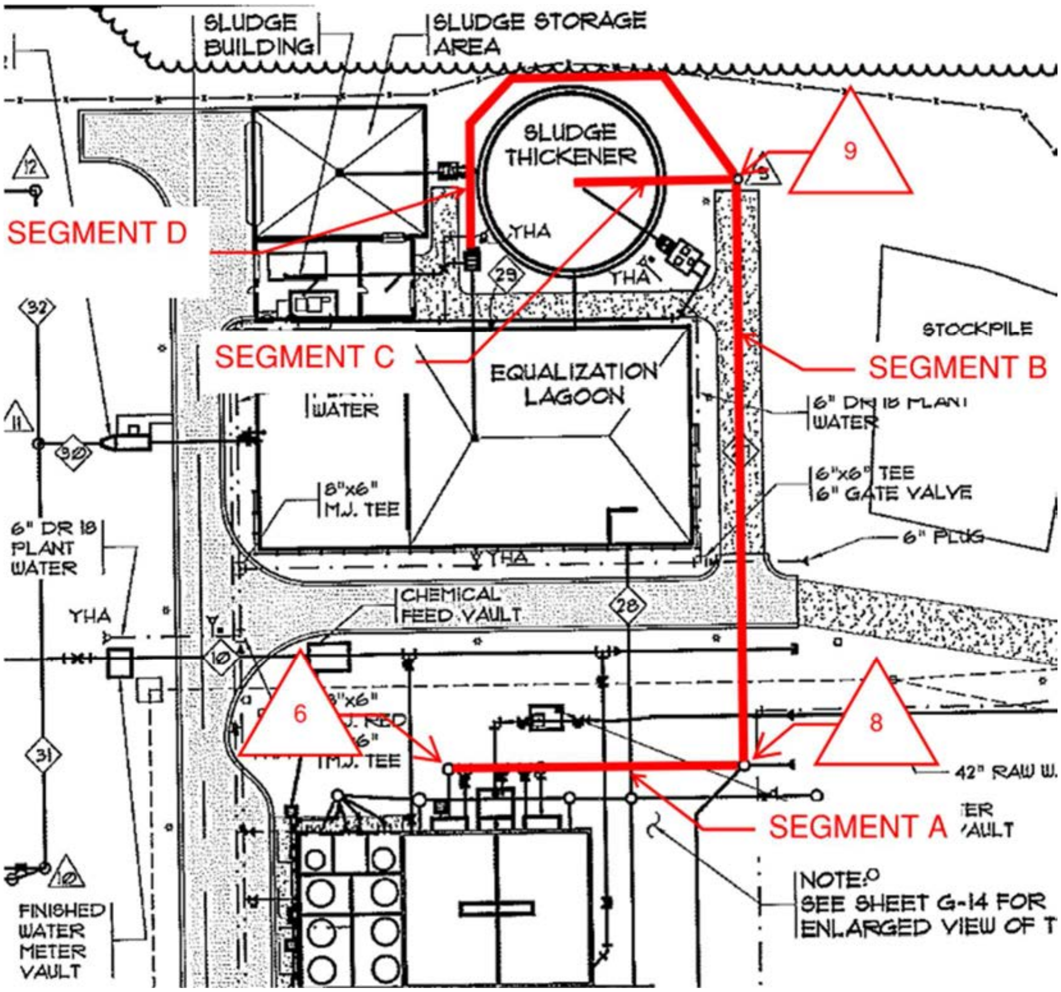

Figure 5-1. Proposed Connection for New SuperPulsators

The maximum flowrate the pipe could handle without surcharging the lowest manhole on the existing blowdown line, shown in Figure 5-1, was calculated. Surcharge is defined as 6-inches below the rim elevation of the manholes in Segments A, B, and C existing manhole. The anticipated flows at maximum buildout are summarized in Table 5-14.

Table 5-14. Summary of Sludge Blowdown Pipeline from SuperPulsators

Parameter	Unit	Value	Notes
SuperPulsator Blowdown Flow Rate	gpm	800	Assumes two SuperPulsators are in blowdown simultaneously, one from each facility
Membrane CIP Wash Flow Rate	gpm	200	
Total Gravity Thickener Influent Flow Rate	gpm	1000	

Although the hydraulic calculations indicate that sufficient capacity is available for the existing sludge thickener influent pipe, plant staff report manhole overflows during maintenance periods where the SuperPulsator drains are open. When the drains are opened the entire elevation difference between the SuperPulsators and the gravity thickeners is available to drive water through the drain pipe. It is believed that this large elevation gap is enough to exceed the hydraulic capacity of the influent pipe, causing overflows. This hydraulic constriction will need to be addressed in the new solids handling system layout.

5.4.3 Thickened Sludge Pumping Capacity

As discussed within a previous section, the existing thickened sludge pump station has a capacity of 160 gpm, which is insufficient for the 99% solids production at 31.2 MGD. As part of the expansion, a new pump station is recommended to provide redundancy for sludge feed to the belt filter press.

5.5 Expansion Requirements

To expand to a treated water capacity of 26.7 MGD, upgrades to the existing solids handling process are required. The following improvements are recommended:

- Additional pumping capacity at the Lagoon Sludge Lift Station
- A new Gravity Sludge Thickener
- Conversion of the existing gravity sludge thickener to a sludge holding tank or a thickened sludge holding tank
- Two new Belt Filter Presses in a new building with new polymer feed and cake solids loadout system
- A new thickened sludge pump station
- New covered sludge storage area and covering of existing sludge storage area

Figure 5-2 and Figure 5-3 present a process flow diagram of the solids thickening and dewatering improvements.

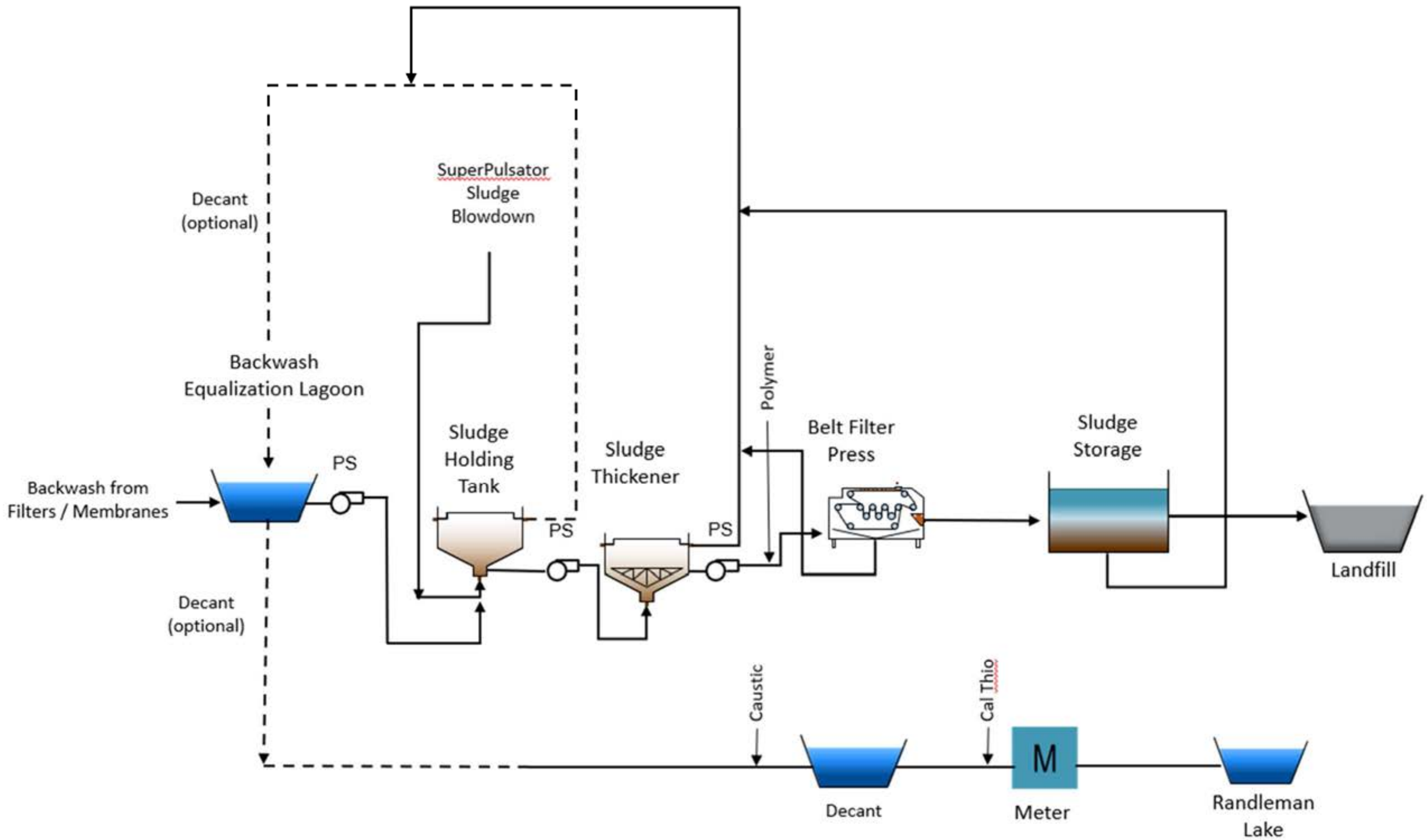

Figure 5-2. Solids Thickening and Dewatering Preliminary Expansion Concept A

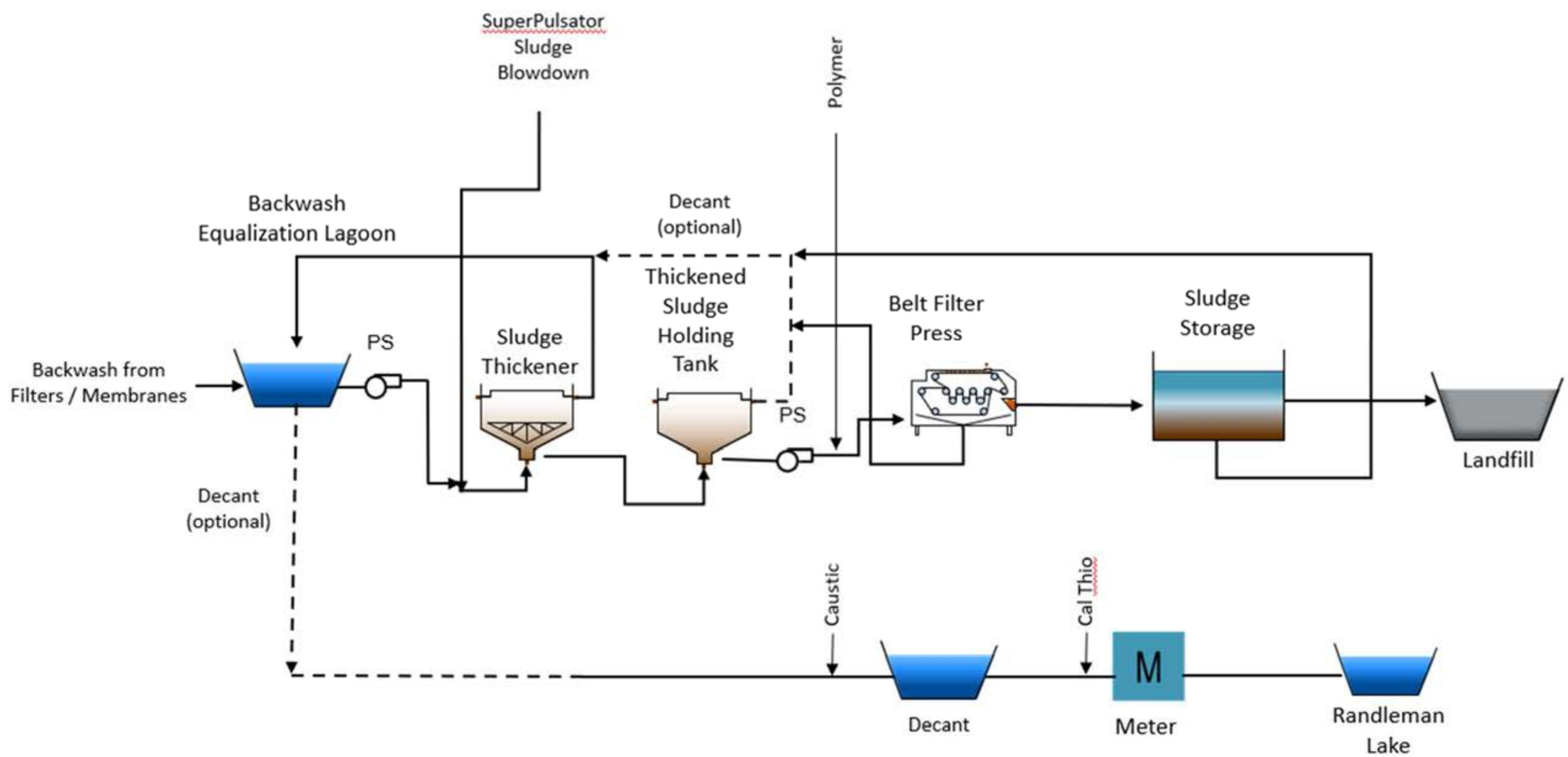

Figure 5-3. Solids Thickening and Dewatering Preliminary Expansion Concept B

5.5.1 Lagoon Sludge Lift Station

As discussed, the capacity of the lagoon sludge lift station is insufficient to drain the estimated backwash volume in a day. To maximize operation flexibility, more pumping capacity is required. For the purposes of this evaluation, a pumping capacity of 1000 gpm was analyzed which would allow the typical backwash volume to be processed in 14.5 hours. The entire basin could be drained in 16.67 hours.

5.5.2 Gravity Thickening

Although the existing gravity thickening unit has some remaining capacity, the shallow floor slope and low design flow rate contribute to inefficient and incomplete thickening. Additionally, because the unit sees flow directly from the SuperPulsators and equalization lagoon pump station, the flow rate into the thickener varies frequently further contributing to the incomplete thickening. Combined, these issues lower the percent of solids feeding the belt filter press, lowering the hourly solids throughput rate, and increasing operation time. This issue will be further compounded at higher flow rates.

Two concepts for rectifying the design deficiencies of the existing gravity thickener were developed and are discussed further within this section. Concept A recommends that the existing gravity thickener unit be converted to a mechanically mixed holding tank for sludge from the SuperPulsators. The existing sludge pump station would be utilized to convey sludge to the new gravity thickener at a consistent flow rate, increasing thickening efficiency. Based on the modelled solids production and anticipated flow rates, a new 100-foot diameter unit is recommended. Key design criteria are presented in Table 5-15. It should be noted that the intent of the sludge holding tank is to provide a buffer volume to allow more consistent feed of the gravity sludge thickener. The sludge transfer pump station will require operation daily, even during days when the dewatering system is offline. To account for this, the gravity thickeners will be sized to hold several days of sludge to allow downtime at the dewatering facility, therefore serving as gravity thickeners and a thickened sludge holding tank. In the event the gravity thickener was out of service, a decanting system would be installed to allow some thickening to occur prior to feeding the belt filter presses.

Concept B is similar; however, the existing gravity thickener would be converted to a holding tank for thickened sludge from the gravity thickeners. It is anticipated that the new gravity thickener could feed sludge into the proposed holding tank without the use of pumps, however this will need to be confirmed during final design. This concept would use a similarly sized 100-foot diameter gravity thickener with the inlet sized to accommodate the higher flow rates from the combined flows of the backwash equalization lagoon and SuperPulsators. The mixed thickened sludge holding tank would create a homogenous feed for the belt filter presses, increasing consistency of the cake product and decreasing the amount of tuning required during operation.

Concept A is presented in the Preliminary Drawings prepared as part of this PER. However, further evaluation of these two concepts should be completed during a final design phase. Likewise, an evaluation should be conducted to compare the cost of placing the gravity thickener at a lower grade to allow for gravity flow from the sludge holding tank versus the cost of a pump station.

Table 5-15. Proposed Sludge Holding Tank and Gravity Thickener Key Design Criteria

Parameter	Unit	Design	31.2 MGD	Notes
Peak Surface Overflow Rate	gpd/ft^2	600	248	
Average Surface Overflow Rate	gpm/ft^2	250	248	
Solids Loading Rate	lb/day-ft^2	<4	2.85	Based on 99% solids generation
Target Thickened Solids	%	2%	NA	
Sludge Holding Tank Volume	gal	NA	350,000	

Adding a pump connection on the sludge underflow pipe from the gravity thickener will be investigated further during the next design phase to allow for flexible operation.

5.5.3 Thickened Sludge Pumping

A new thickened sludge pump station to feed the dewatering system from the new gravity sludge thickener is recommended. It is recommended that progressive cavity pumps be utilized for the new station due to their turndown and metering capabilities. Additionally, sludge grinders are recommended to protect the pumps from any debris in the thickened solids flow stream. Key design criteria are presented in Table 5-16.

Table 5-16. Proposed Thickened Sludge Pumping Key Design Criteria

Parameter	Unit	Design	Notes
Pump Style	N/A	Progressive Cavity	
No. of Pumps	each	3	2 duty, 1 standby
Pumping Capacity	gpm	200	
Sludge Grinders	each	3	2 duty, 1 standby

5.5.4 Sludge Dewatering

The existing belt filter press does not have sufficient hydraulic or solids capacity to serve in a duty, standby scenario for the expanded treatment process. Additionally, the existing solids dewatering building does not have space for two larger units. Therefore, it is recommended that two new belt filter presses be installed in a new dewatering building. This building would also contain new polymer feed equipment, screw conveyors, and an operations area. Key design criteria are presented in Table 5-17.

Table 5-17. Proposed Sludge Dewatering Key Design Criteria

Parameter	Unit	Design	Notes
No. of BFP Units	each	2	1 duty, 1 standby with all equipment in service
Hydraulic Loading Rate	gpm	160	
Solids Loading Rate	lbs/hr	1800	
Screw Conveyor Loading Rate	cf/hr	100	
Polymer Feed System Rate	lb/hr	20	

5.5.5 Sludge Cake Storage and Loadout

Additional sludge cake storage is required to increase capacity and operational flexibility. It is recommended that the new area be covered to be prevent rainfall from seeping into the dried product, increasing hauling costs. Enclosing the building with three walls may also be considered during final design. Key design criteria are presented in Table 5-18.

Table 5-18. Proposed Sludge Cake Storage and Loadout Key Design Criteria

Parameter	Unit	Design	Notes
Storage Area	ft (L x W)	100 x 70	1 duty, 1 standby with all equipment in service
Maximum Storage Height	ft	6	
Storage Volume	CY	1167	75% usable volume
Days of Storage	Days	116	99% solids production

6 Chemical Facilities

6.1 Description of Existing Infrastructure

Table 6-1 lists the chemicals used at PTRWA, their purpose, and their feed points.

Table 6-1. Water Treatment Chemicals

Chemical	Purpose	Feed Points
Potassium Permanganate	Pre-oxidation	Raw Water Pump Station
Ferric Sulfate	Coagulant	Flash Mix
Caustic	Optional pH/alkalinity adjustment; membrane maintenance	Flash Mix; upstream of filtration; upstream and downstream of clearwells; upstream of decant lagoon, membrane neutralization tank
Sodium Hypochlorite	Oxidation, disinfection	Flash Mix; upstream of dual media granular filters; upstream and downstream of clearwells, membrane CIP process
Polymer, Settling	Improve sedimentation	Upstream of each SuperPulsator
Fluoride	Fluoridation	Upstream of clearwells
Lime	pH adjustment	Upstream and downstream of clearwells
Corrosion Inhibitor	Corrosion control	Upstream of clearwells; downstream of North High Service Pump Station

Chemical	Purpose	Feed Points
Ammonia	Secondary disinfection	Downstream of clearwells
Polymer, Dewatering	Aids in dewatering process	Upstream of Belt Filter Press
Calcium Thiosulfate	Dechlorination	Effluent of Decant Lagoon
Sulfuric Acid	Membrane maintenance	Membrane CIP process
Citric Acid	Membrane maintenance	Membrane CIP process
Sodium Bisulfite	Membrane maintenance	Membrane neutralization tank
Avista	Membrane maintenance	Membrane CIP Process

Table 6-2 lists the minimum, average, and maximum chemical application rates based on historical data between January 2019 and April 2022 collected. The rates for lime are based on data between May 2021 and April 2022 to reflect more current operation.

Table 6-2. Chemical Dosing Summary

Chemical	Concentration	Specific Gravity	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)
Potassium Permanganate	Dry chemical	2.7	0.1	0.33	1.55
Ferric Sulfate	50%	1.07	51	74	103
Caustic	25%	1.52	4	13	39
Sodium Hypochlorite, pre	12%	1.21	2	5.4	11
Sodium Hypochlorite, post	12%	1.21	1.5	2.8	5.8
Polymer, Settling	Dry Chemical	0.92	0.14	0.23	0.39
Fluoride	23%	1.8	0.00	0.64	1.6
Lime	30%	1.3	2	8	40
Corrosion Inhibitor	10%	1.4	0.6	2.1	5.4
Ammonia	19%	0.6	0.65	0.77	0.92

Table 6-3 summarizes the existing bulk chemical storage besides the chemicals specifically used for membrane maintenance. It should be noted that the potassium permanganate and polymer systems utilize dry chemical with solutions batched or mixed as needed. All day tanks for chemicals have a volume of 500 gallons; plant staff refills the day tanks during each shift.

Table 6-3. Existing Chemical Storage Tanks

Chemical	Number of Bulk Tanks	Storage per Tank (gal)	Total Available Storage (gal)
Ferric Sulfate	2	12,000	24,000
Sodium Hypochlorite	2	12,000	24,000
Caustic	1	12,000	12,000
Lime	2	10,000	20,000
Ammonia	1	9,000	9,000
Corrosion Inhibitor	1	12,000	12,000
Fluoride	2	6,000/4,000	10,000

6.2 Expansion Requirements

As the plant expands to 26.7 MGD and beyond, additional chemical storage will be needed to meet the staff's stated goal of thirty days of chemical storage. For the purposes of this evaluation, chemical use at the ultimate finished water plant capacity of 48 MGD was calculated. Table 6-4 summarizes the daily usage and thirty-day storage volume based on the average chemical application rates and chemical characteristics as shown in Table 6-2. The daily usage is based on the average application rate applied at the maximum plant production capacity: Current – 14.7 MGD; Expanded – 26.7 MGD; and Ultimate – 48 MGD.

Table 6-4. Calculated Chemical Usage and Volume

Chemical	Daily Usage (gal)			30-DayStorage Volume (gal)		
	Current	Expanded	Ultimate	Current	Expanded	Ultimate
Ferric Sulfate	2,264	4,113	7,394	67,928	123,380	221,807
Sodium Hypochlorite	892	1,620	2,913	26,765	48,615	87,397
Caustic	560	1,017	1,829	16,801	30,516	54,860
Lime	301	548	984	9,043	16,425	29,528
Ammonia	99	180	324	2,978	5,408	9,723
Corrosion Inhibitor	220	400	720	6,613	12,011	21,593
Fluoride	23	41	74	682	1,238	2,225

As shown in the table above, a 500 gallon day tank is appropriately sized for most chemicals during the initial expansion if plant staff refills the tank at least twice a day. However, the daily use of ferric sulfate, sodium hypochlorite, and caustic exceed 1,000 gallons. It should be noted that as the plant transitions to more lime use in lieu of caustic, the usage and storage requirements for caustic will decrease.

Based on the data in Table 6-4, the amount of excess or insufficient storage was calculated and is presented in Table 6-5.

Table 6-5. Evaluation of Existing Chemical Storage

Chemical	Storage Excess / (Storage Gap) (gal)		
	Current	Expanded	Ultimate
Ferric Sulfate	(43,928)	(99,380)	(197,807)
Sodium Hypochlorite	(2,765)	(24,615)	(63,397)
Caustic	(4,801)	(18,516)	(42,860)
Lime	10,957	3,575	(9,528)
Ammonia	6,022	3,592	(723)
Corrosion Inhibitor	5,387	(11)	(9,593)
Fluoride	9,318	8,762	7,775

Additional chemical storage will be required in the future for the following chemicals:

- Ferric Sulfate: a new bulk storage, day tank, and associated transfer and feed pumps will be installed outside. This facility will be located on the north side of the plant.

- Sodium Hypochlorite: since the existing ferric tanks will no longer be needed with the new system, the existing tanks (two 12,000 gallon tanks) can be converted to store sodium hypochlorite. The two tanks will provide close to the needed storage to accommodate 30-days of storage at the expanded plant flow.
- Lime: the WTP is already installing a second lime storage tank to account for future need for a total stored volume of 20,000 gallons, which provides the needed storage for 30-days at the expanded plant flow. Additional storage will be needed to accommodate the ultimate capacity.
- Caustic: although additional storage is identified as needed, the plant is shifting away from caustic to lime for pH adjustment. The plant does not anticipate needing additional caustic storage at this time.
- Corrosion Inhibitor: the existing corrosion inhibitor tank provides close to the 30-day storage requirement at the expanded plant capacity. Additional storage will be needed to accommodate the ultimate capacity.

Additional expansion considerations include:

- Extending the existing chemical chase from the day tank area through the filter building to the SuperPulsators
- Investigating a new feeder system for liquid sodium permanganate at the Raw Water Pump Station
- Evaluating the useful life of the existing chemical tanks

It should be noted that there are additional chemicals onsite used to perform cleaning cycles for the MF membrane system. Since the system is not being expanded, additional storage or dosing capabilities for those chemicals is not required.

6.2.1 Ferric Sulfate System

Table 6-6 summarizes the design criteria for the new ferric storage system. The ferric sulfate system will sit in a concrete containment area.

The location of emergency eyewash and shower stations will be determined during final design. Also, during final design the storage system will be modified to a more enclosed space with three walls and a roof with the pump building located adjacent to the contaminant area.

Table 6-6. Proposed Ferric Sulfate System Key Design Criteria

Parameter	Unit	Design
Number of Storage Tanks	each	4
Type	N/A	Single wall FRP
Volume of Storage Tank, each	gal	30,000
Day Tank Size	gal	2,500

6.2.2 Settling Polymer System

As part of the expansion, a new settling polymer system will be installed to match the polymer system at the Sludge Dewatering process. It is anticipated the settling polymer system will be sized to provide up to 100 pounds per day of polymer. Additional polymer feed pumps will be required to provide polymer to the new SuperPulsator; the need for replacing the existing feed pumps will be determined during final design. The new settling polymer system will likely be installed in the pump room adjacent to the new ferric sulfate system.

7 Highway 62 Pump Station

The Highway 62 Pump Station currently has an approximate capacity of 10 MGD with one duty and one standby pump. Depending on how the expanded plant capacity is distributed in the PTRWA transmission system, additional pumping may be required. Additional pumping could be achieved by either increasing the existing pump sizes or adding a third pump.

8 Geotechnical Investigation

The Geotechnical Report is presented in Appendix D.

9 Structural Basis of Design

This section presents the structural basis of design for the WTP including applicable codes, building and process enclosure concepts, design criteria, and geotechnical design assumptions.

9.1 Purpose

This section establishes design criteria to provide a uniform efficient, and effective approach to the structural design of the WTP project.

9.2 Applicable Codes and Standards

Design of structural engineering systems for the project will be in accordance with the laws and regulations for the State of North Carolina, Randolph County ordinances, and industry standards. The current issue or edition of the documents at the time of design commencement will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more conservative document will be used.

The strength, serviceability, and quality for materials and design procedures will meet the requirements of the 2018 North Carolina Building Code (NCBC) and its referenced standards, or the currently adopted version of the NCBC in effect during the development of the permit applications. The editions shown below are the standards referenced by the 2018 NCBC.

The following codes and standards have been identified as applicable, in whole or in part, to structural engineering design and construction of the WTP.

- NCBC 2018 / IBC 2015
- American Society of Civil Engineers (ASCE)/Structural Engineering Institute
- 7-10 Minimum Design Loads for Buildings and Other Structures
- American Concrete Institute (ACI) 318-14 Building Code Requirements for Structural Concrete
- ACI 350-06 Code Requirements for Environmental Engineering Concrete structures and Commentary

- ACI 350.3-06 Seismic Design of Liquid-Containing Concrete
- American Institute of Steel Construction (AISC) Steel Construction Manual, 14th Edition
- American National Standards Institute (ANSI)/AISC 360-10 Specification for Structural Steel Buildings
- AISC 341-10 Seismic Provisions for Structural Steel Buildings
- American Welding Society (AWS) Welding Codes D1.1-10, D1.3-08, and D1.4-11
- International Conference of Building Officials ES Reports for specific products
- ASTM A325 or A490 Bolts, Specification for Structural Joints
- Aluminum Design Manual 1-05
- American Iron and Steel Institute (AISI) D100-08, AISI S100-12, Light Gage Steel Framing

Structural design for project components shall also conform to current applicable industry standards. Societies, industry groups, organizations, institutes, and agencies issuing these standards include, but are not limited to, the following:

- ASCE
- International Code Council
- ACI
- AISC
- ANSI
- AISI
- NCDOT
- ASTM
- AWWA
- Metal Building Manufacturers Association

9.3 Building Concepts

9.3.1 Sludge Thickener Tank

The tanks will be cast in place concrete construction of a 100-foot diameter circular tank with side water depth of approximately 12 feet at the perimeter and 19 feet at the center.

9.3.2 Thickened Sludge Pump Station

The thickened sludge pump station will be load bearing concrete cast in place construction. Stair access to the station will be provided from grade with a railing at the perimeter of the vault. Structural steel sloping roof canopy to be provided. During final design, the access to the structure will be evaluated further to minimize the need for stairs and a high hazard designation.

9.3.3 Dewatering Building

The Dewatering building construction will be a single-story load bearing masonry structure with a precast double tee roof. Main building will have concrete mat foundations. There will be an interior elevated storage area on precast hollowcore planks and masonry bearing walls.

9.3.4 Sludge Storage

The sludge storage area will be a slab on grade with 8’-0” tall cast-in-place concrete walls on three sides. Pre-engineered fabric covered metal trusses are to be provided, spanning the full width of the area to cover the cake storage area and bear on the concrete walls. Roofing fabric requirements will be determined in final design.

9.3.5 Chemical Storage and Pumping

The Chemical Storage area will consist of an open concrete slab on grade with approximately 3’-6” tall concrete containment walls and tank pads for ferric chloride storage and day tanks. This area will include a fill station, emergency eyewash and shower, sump, pump pads and a pump enclosure. During final design, partially enclosing the storage area will be investigated along with the need for a drain pump station.

9.3.6 Splitter Box and Clarifier SuperPulsators

The SuperPulsator and splitter box will be open top cast in place concrete tanks. The rapid mix basin will have grating walkways.

9.3.7 Miscellaneous Vaults

Meter vaults and miscellaneous precast or cast-in-place concrete vaults are anticipated, and construction will be coordinated with required depth and geotechnical loading.

9.4 Design Criteria

This section presents structural design criteria for the WTP.

9.4.1 Risk Category

Risk Category IV per ASCE 7-10 table 1.5-1 as shown below will apply for the Structures part of the WTP.

Table 1.5-1 Risk Category of Buildings and Other Structures for Flood, Wind, Snow, Earthquake, and Ice Loads

Use or Occupancy of Buildings and Structures	Risk Category
Buildings and other structures that represent a low risk to human life in the event of failure	I
All buildings and other structures except those listed in Risk Categories I, III, and IV	II
Buildings and other structures, the failure of which could pose a substantial risk to human life. Buildings and other structures, not included in Risk Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure. Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where their quantity exceeds a threshold quantity established by the authority having jurisdiction and is sufficient to pose a threat to the public if released.	III
Buildings and other structures designated as essential facilities. Buildings and other structures, the failure of which could pose a substantial hazard to the community. Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity exceeds a threshold quantity established by the authority having jurisdiction to be dangerous to the public if released and is sufficient to pose a threat to the public if released.[a] Buildings and other structures required to maintain the functionality of other Risk Category IV structures.	IV

[a]Buildings and other structures containing toxic, highly toxic, or explosive substances shall be eligible for classification to a lower Risk Category if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the substances is commensurate with the risk associated with that Risk Category.

9.4.2 Structural Design Loads

Loads used in the structural design are noted in Table 9-1.

Table 9-1. Structural Design Loads

Load Case	Criteria
Dead	Self-Weight of all structures
Auxiliary Loads	Roofs: 15 psf Structural Slabs: 20 psf (Auxiliary loads account for electrical, mechanical, fire protection and other misc. loading conditions)
Floor Live Loads	Vehicle Loading HS20 Electrical Equipment Rooms = 250 psf Storage Rooms = 250 psf Process Equipment Rooms = 150 psf + Weight of Equipment Walkways, Stairs, and Grating = 100 psf All other areas = 150 psf
Dynamic Equipment Loads	Vibration characteristics as specified by manufacturers
Impact Loads	Cranes and Hoists: 25% of lifted load Crane Lateral Force: 20% of lifted load Crane Longitudinal Force: 10% of lifted load Rotating Equipment: 20% of total machine weight Reciprocating Equipment: 50% of total machine weights Forklifts: 25% of wheel loads
Lateral Earth Pressures	As recommended by geotechnical report

Load Case	Criteria
Liquid Densities and Hydrostatic Loads	Water = 62.4 pcf Thickened or dewatered sludge = 63-85 pcf Ferric Chloride = 106.6 pcf
Wind Loads	Wind Speed = 124 mph Exposure Category = C Importance Factor, Iw = 1.0
Seismic Loads	Site Class – D based on Geotechnical report Seismic Design Category – C based on Geotechnical report Short Design Spectral Acceleration Sds = 0.153 Long Design Spectral Acceleration Sd1= 0.108 Importance Factor Is = 1.5
Snow Loads	Ground Snow Pg = 15 psf Rain on Snow Surcharge 5 psf Minimum Roof Snow Loads = TBD Snow drift conditions to be checked as necessary Importance Factor Is = 1.2
Roof Live Load	20 psf or 300 lb concentrated, nonconcurrent

9.4.3 Materials

Structural materials will be as specified in Table 9-2.

Table 9-2. Specified Structural Material Properties (ksi = kips per square inch)

Material	Material Grade	Material Strength
Cast-in-place Concrete	-	f'c = 4,500 psi @ 28 days
Reinforcing Steel	ASTM A615	fy = 60 ksi
Rolled Steek Wide-flange Sections	ASTM A992	fy = 50 ksi
Steel angles, channels, and plates	ASTM A36	fy = 36 ksi
Hollow Structural Sections	ASTM A500-B	fy = 46 ksi
Structural Aluminum Alloy	6061-T6	fy = 32 ksi
Stainless Steel	Type 304 or 316	fy = 30 ksi

9.5 Geotechnical Engineering Design Assumptions

A Geotechnical Engineer Report No. 66A-0144 Rev. 1 dated June 5, 2023 has been provided by Froehling & Robertson, Inc (see Appendix D). They provided field testing and completed a total 17 borings ranging from 2.6 to 46.9 feet below ground surface and 7 ground water measurements.

9.5.1 Bearing Pressure

It is the opinion of the geotechnical engineer that ground improvements will be required to provide adequate bearing capacity and prevent excessive or differential deflection for some structures on mat foundations. This includes removal of plastic soils to be undercut and replaced with controlled fill at Clearwell 3, gravity sludge thickener, and Superpulsator. Additionally, removal of partially weathered rock and possible dewatering may be required at some locations. Shallow spread footings such as dewatering building and other lightly loaded structures are recommended net allowable soil bearing pressure of 2000 pounds per square foot.

9.5.2 Site Class

Site specific soil shear wave velocity testing was not included as part of the initial geotechnical scope. Based on procedures outlined in 2018 NCBC the geotechnical report was able to indicate a Seismic Site Class of D. However, with additional testing this may be able to be increased to C.

9.5.3 Lateral Earth Pressure and Sliding

Assumed in situ soil density of 120 pcf. Active Earth Pressure coefficient (Ka) of 0.33 to be used and active earth pressure of 60 pcf as well as passive earth pressure coefficient (Kp) of 1.5 and passive pressure of 150 pcf to be used at fill locations. Sliding to consider a friction factor of 0.3.

9.5.4 Safety Factor

In accordance with building codes, a safety factor of 1.5 shall be used to resist overturning and sliding. A safety factor of 1.2 shall be used to resist uplift. All safety factors are checked against unfactored soil loads.

Resistance to uplift includes dead weight of the structure and the column of soil above footing extensions. The buoyancy weight of the soils shall be used below the water table. Side friction should not be included in uplift resistance calculations unless there are significant cost implications.

9.5.5 Frost Depth

Frost depth for all enclosed project buildings will be 18” below grade.

9.5.6 Additional Borings

Based on phone and email conversations with Brian McCarthy of Froehling and Robertson, as well as a draft boring log provided there appears to be variations in bedrock elevation and site soils over the site. To provide an adequate geotechnical report additional borings are required at the chemical storage area, the covered sludge area, and along the existing access road in multiple locations between raw intake pumps and main site with respect to the force water piping. Additional boring locations need to be coordinated.

10 Architectural Basis of Design

10.1 Design Options

The Design project team shall evaluate options for the Dewatering Building project as listed below:

- Split Face concrete masonry unit (CMU) single wythe reddish color (physical color sample for owner approval)
- Split face CMU single wythe brownish color (physical color sample for owner approval)

10.2 Safety

All building structures will be designed to meet or exceed the minimum construction and life safety requirements as required by applicable codes and criteria. Appropriate access and egress provisions will be maintained, and emergency lighting, alarms, and signage will be provided as required. The appropriate type, size, and quantity of fire extinguishers will be provided in equipment rooms in compliance with all applicable fire and life safety codes and per process design criteria. Appropriate definition of all life safety provisions will be provided on the Drawings in accordance with local jurisdictional authority. This definition will include preparation of a Life Safety Analysis Plan and code compliance summary for each building floor area. Table 10-1 includes various codes and standards to govern the design of the facility.

Table 10-1. Building Codes and Standards

Criteria	Codes
Building Safety	2018 North Carolina Building Code
Building Fire Safety	2018 North Carolina Fire Code
Building Energy Compliance	2018 North Carolina Energy Code (Polymer Room, Electrical Room, Operator Room)
Building Fixture Count Compliance	2018 North Carolina Plumbing Code
Accessibility Standards	2017 ANSI A117.1 Accessibility Code
Local Context Requirements	Match Existing Bulk Chemical Storage Building

10.3 Life Cycle and Costs

The design life of the building structure will be 50 years. All buildings will be designed to withstand the required wind loadings in accordance with the Local codes.

Surfaces exposed to view shall have an aesthetic service life of 20 years, covering color fade, crazing, and delamination of applied coatings.

Roof coverings will be specified to provide a minimum 20-year weather- tightness warranty.

10.4 Building Design Materials and Finishes

Design documents shall be submitted that include material elevations and physical CMU sample colors for owner selection and approval. Schedules of doors, finishes, windows, and other criteria shall also be submitted during design submissions for owner. Table 10-2 and Table 10-3 includes recommended building materials and finishes that are to be considered in the design.

Table 10-2. Building Envelope Systems

Criteria	Roof System	Wall System	Doors/Frames	Natural Light
Type	SBS Modified Bitumen	Split Face CMU	Aluminum	Windows in Doors
Finish/Color	White	Integral Color	PVDF/White	Grey Tinted
Maintenance	Bi-annual Inspection	Clean Annually	Clean Annually	Clean Annually
Life Span	20 – 30 years	30 – 50 years	20 – 40 years	20 – 40 years
Benefits	Common Aesthetic	Durable/Low Cost	Corrosive Resistant	Corrosive Resistant
Notes	Requires Insulation	Requires Insulation	Requires Insulation	Maximizes Natural light

SBS = Styrene-Butadiene-Styrene; PVDF = Polyvinylidene Fluoride Coating;

Table 10-3. Building Interior Finishes

Criteria	Floor	Wall	Doors/Frames	Ceiling
Type	Concrete	CMU	Aluminum	None/ACT
Finish/Color	Sealed/HPIC	Paint/Gray	Anodized/Clear	Exposed Non-Painted/ ACT Cleanable
Maintenance	None	None	None	Clean Annually
Life Span	50 – 100 years	30 – 50 years	20 – 40 years	20 – 40 years
Benefits	Durable/Low Cost	Durable/Low Cost	Corrosive Resistant	Durable/Low Cost

HPIC = High Performance Industrial Coating; TBD = To be Determined; ACT = Acoustical Ceiling Tile

10.4.1 Exterior Walls

Exterior wall systems are recommended to be CMU back up with CMU veneer that is compatible with the existing façade of the Bulk Chemical Storage Building within the treatment plant campus. The walls are to be furred and insulated to meet local energy code requirements for the electrical room, polymer room, and operator room.

10.4.2 Interior Walls and Partitions

Interior walls systems are recommended to be CMU with a durable finish that prolongs the life of the wall and has low maintenance requirements.

10.4.3 Doors

Pedestrian doors will be a minimum 7 feet, 0 inch high and 3 feet, 0 inch wide, except for special purpose doors where an increased size may be appropriate. Door openings and hardware in accessible areas will be configured and specified to satisfy accessibility requirements. Doors sizes will be of adequate size to accommodate installation and removal of equipment and other items.

Door hardware will be selected from Builders Hardware Manufacturing Association (BHMA) and American National Standards Institute (ANSI) standards.

10.4.4 Windows

Exterior windows will be recommended to be fiber glass translucent wall panels that have dual capacity to be used as removable opening to allow for the installation or removal of large process equipment.

10.4.5 Roofing and Rainwater Conveyance

The minimum roof slope for nominally flat roofs will be ¼ inch per foot. Roof crickets will be minimum of ½" per foot. Roofing is recommended to be SBS modified bitumen with a modified bitumen granule cap sheet. Insulation will be furnished to meet applicable Energy Code requirements. Roofing attachments will satisfy wind uplift requirements.

External roof scuppers/downspouts and over flow thru wall scuppers are recommended means to convey water from the roof structure to sheet flow to site drainage collection system.

10.4.6 Interior Fixtures

Plumbing fixtures in accessible areas will comply with accessibility requirements.

10.4.7 Vertical Circulation

A single ladder interior to the building with roof hatch will be provided for roof access.

All stairways and stair guardrail/handrail will satisfy OSHA and building code requirements.

10.4.8 Building Finishes

Detailed coating systems and finishes shall be provided by the design team that are appropriate for water treatment plants. It is recommended that a NACE certified professional be used as a consultant to provide guidance for selecting the appropriate finishes in corrosive areas.

11 Mechanical Basis of Design

The mechanical basis of design includes applicable codes and standards, outdoor design conditions, and indoor design criteria for the heating, ventilation, and air conditioning (HVAC) systems.

11.1 Codes and Standards

The mechanical design of the Dewatering Facility will be governed by current building codes for North Carolina and other state and local jurisdiction. The following codes are specifically applicable to the mechanical design:

NORTH CAROLINA BUILDING CODE:

- 2018 North Carolina Building Code (w/ International Building Code 2015 Amendments)
- 2018 North Carolina Mechanical Code (w/ International Mechanical Code 2015 Amendments)

The following standards are specifically applicable to the mechanical design:

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEER (ASHRAE STANDARDS):

- 62.1 Ventilation for Acceptable Indoor Air Quality (ANSI Approved)
- 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings
- 189.1 Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential
- 55 Thermal Environmental Conditions for Human Occupancy

- Refrigeration Handbook
- HVAC Applications Handbook
- HVAC Systems and Equipment Handbook
- Fundamentals Handbook

11.2 Design Conditions

The following abbreviations are used:

- DB – Dry Bulb
- WB – Wet Bulb
- DP – Dewpoint

11.2.1 Outdoor Design

Mechanical cooling equipment will be sized based on the ASHRAE 0.4 percent design criteria and the heating system sized for the 50-year minimum temperature to maximize freeze protection in all conditions. Additional climatic information is provided for context.

- Summer Design Temperature: 91.5°F DB / 73.9°F WB
- Winter Design Temperature: 18.4°F DB

11.2.2 Indoor Design

Operator Room (conditioned):

- Summer Design Temperature: 72.0°F DB / 50% RH (controlled)
- Winter Design Temperature: 68°F DB

Electrical Room (conditioned):

- Summer Design Temperature: 75.0°F DB / 50% RH (controlled)
- Winter Design Temperature: 68°F DB

Polymer Feed Room (conditioned):

- Summer Design Temperature: 75.0°F DB / 50% RH (controlled)
- Winter Design Temperature: 68°F DB

Belt Filter Press Room (ventilated and heated):

- Summer Design Temperature: 10.0°F above
- Winter Design Temperature: 55.0°F DB

Humidification will not be provided.

11.3 Heating and Ventilation

11.3.1 Polymer and Belt Filter Press Room:

The system will encompass an outside air intake louver and an exhaust fan. The general ventilation rate will be 1 cfm/sf. While the unit heaters are initially assumed to be electric, alternative heating options will be considered during the next design phase.

11.3.2 Janitors Closet:
The system will encompass an exhaust fan. The general ventilation will approximately be 100 cfm. No electric heating will be provided.

11.4 Cooling

11.4.1 Electrical Room:
The system will encompass a heat pump split system.

11.4.2 Operator Room:
The system will encompass a heat pump split system with a ducted outside air connection to the indoor unit. The general ventilation rate will approximately be 5 cfm/person plus 0.06 cfm/sf. Additional make-up air of 300 cfm will be provided to compensate for the Restroom and Janitors Closet exhaust.

11.5 HVAC Components
Equipment will be located to allow for ease of access and operations.

Ductwork:

- All ductwork in wet or corrosive areas will be aluminum.
- Ductwork in administrative areas may be galvanized steel.
- All ductwork will be insulated.

The placement of ductwork in conditioned spaces will be investigated further during final design.

12 Electrical Basis of Design

12.1 Codes and Standards
The electrical design of the project shall be in accordance with the latest revision of the following applicable codes and standards:

- NFPA 70 National Electrical Code (NEC) - 2020
- North Carolina Building Code
- Underwriters Laboratories (UL)
- National Electrical Manufacturers Association (NEMA), NEMA-MG1, Motors and
- Generators
- Institute of Electrical and Electronics Engineers (IEEE), IEEE 519-2014, IEEE
- Recommended Practice and Requirements for Harmonic Control in Electric
- Power Systems.
- Insulated Cable Engineers Association (ICEA)
- National Electrical Testing Association (NETA)

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Illuminating Engineering Society (IES) of North America Lighting Handbook

12.2 General

12.2.1 Existing Electrical Utility Services

The electric utility provides the facility with 480/277V power at three service points, which are at the Raw Water Pump Station, the Operations Building, and the Finished Water Pump Station. One diesel generator is used to provide standby power to the facility at the three service points.

The existing main switchboards at the Raw Water Pump Station and the Operations Building have adequate capacity for supplying power to the proposed new structures and equipment. No new loads will be added to the existing switchgear at the Finished Water Pump Station.

12.3 Design Concepts

12.3.1 Raw Water Pump Station – Electrical Modifications

At the Raw Water Pump Station, an existing spare 400A breaker in the main switchboard will be used for powering the new variable frequency drive (VFD) and pump.

12.3.2 Operations Building – Electrical Modifications

At the Operations Building, the existing switchboard will provide power for the new SuperPulsator, the Rapid Mix system, and the new Dewatering Building.

12.3.3 New Dewatering Building and Outdoor Areas

The new Dewatering Building will have an electrical room with a 600A main panelboard. The panelboard will be fed by a new 600A breaker located in the Operations Building main switchboard. The Dewatering Building power distribution equipment will provide power for the new structures and equipment located to the north and west of the Dewatering Building.

Where feasible, electrical distribution equipment, motor controllers (VFDs, reduced voltage solid state (RVSS) starters, and full voltage starters) and control panels will be located in conditioned electrical rooms.

For structures without an electrical room in close proximity, the use of freestanding electrical buildings or covered equipment racks will be explored.

All outdoor mounted electrical equipment enclosures shall be NEMA 4X stainless steel. Above grade conduits shall be rigid aluminum, except PVC coated rigid aluminum conduit shall be used in extremely corrosive areas.

12.3.4 Lighting

New lighting will be 277V, single phase, to match the existing lighting. All new light fixtures will be LED type. Outdoor lighting mounted on a building will be controlled by a common photocell. Building, roadway and process area site lighting will be provided where desired by PTRWA. All outdoor lighting shall be full cutoff type and dark sky friendly.

12.3.5 Underground

All ductbanks shall be concrete encased unless otherwise noted and shall be provided with reinforcing where run below roadways. Direct buried PVC conduits shall be provided for site lighting circuits.

13 Instrumentation Basis of Design

13.1 Governing Codes and Standards

The Instrumentation and Control design of the project shall be in accordance with the latest revision of the following codes and standards as applicable:

- International Society of Automation (ISA)
- ISA S5.1 – Instrumentation Symbols and Identification.
- ISA 101 – Human-Machine Interfaces
- Underwriters Laboratories, Inc. (UL)
- UL 508A – Industrial Control Panels
- National Fire Protection Association (NFPA)
- NFPA 70 – National Electrical Code
- National Electrical Manufacturers Association (NEMA):
- NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

13.2 Design Philosophy

The SCADA system will be expanded to accommodate the additional process equipment, related local control panels, and instrumentation. In locations where there is an existing related SCADA control panel (e.g. Raw Water), the existing control panel will house the new I/O. An assessment will be made in the later design phases of the project to confirm available spare I/O or expansion options. New packaged equipment will be monitored by an Area Programmable Logic Controller (PLC).

- New instrumentation, equipment and vendor-supplied packaged systems associated with the plant upgrades will connect to an Area Programmable Logic Controller (PLC) or Remote I/O (RIO) panel located in each respective process area.
- New controls will be stand-alone and continue operation independent of communication status with the SCADA Control Room, using last known true values. An Operator Interface Terminal (OIT) will be located on each Area PLC panel. Control of connected equipment from the PLC Panel's OIT will be available if the PLC is unable to communicate with SCADA.
- Allen Bradley Logix family PLCs and Allen Bradley OITs shall be used for both Area PLCs and vendor-supplied PLCs. PLCs will support communications to SCADA via either Ethernet IP or Modbus TCP.

- Variable Frequency Drives (VFDs) associated with new systems will be capable of communicating via Modbus TCP and will provide kW data to the SCADA system.

14 Site Civil Basis of Design

14.1 General

Site civil work is anticipated to include earthwork, parking and drive areas, storm sewer improvements, ditches, fencing, and erosion control measures. The design complies with the recommendations from the geotechnical report, the North Carolina Department of Environmental Quality (NCDEQ) Stormwater Design Manual (SDM), and the Randolph County Unified Development Ordinance (UDO).

The preliminary site layout consists of several areas across the site to allow for the necessary upgrades to the plant.

- A new ferric storage building will be located across the road (north) from the location of future SuperPulsators. The road near this area will be improved as part of the expansion project.
- A new SuperPulsator will be located north of the existing SuperPulsator on the site. No new roads or parking are anticipated for this building.
- A new dewatering facility, covered sludge building, gravity sludge thickener, and thickened sludge pump station will occupy the northwest side of the site. A new perimeter access road will be developed to aid in site mobility for plant staff.
- As a part of the 30% design process, some future buildings and processes have been located and identified. These future buildings or structures include two SuperPulsators, one sludge holding tank, one thickened sludge pump station, one gravity thickener.
- A new raw water line will parallel the existing 42” DIP raw water line from the pump house. Impacts from this development will include modifications to the stormwater pipes under the access road.
- A visual representation of these site changes is available in the site plan.

14.2 Entry Roads, Drive Areas, and Parking

14.2.1 Offsite Roads

The local street (Adams Farm Rd) will continue to provide access to the site. No improvements or modifications to existing roads are anticipated.

14.2.2 Entry Roads

No changes to the entry roads are anticipated.

14.2.3 Drive Areas

The drive area improvements will be isolated to the northwest part of the property as noted in the Site Plan. A new asphalt road will extend the perimeter road around the covered sludge drying beds and the dewatering facility. Additionally, the road will improve site connectivity throughout the sludge holding tank, EQ lagoon, and the proposed buildings (covered sludge building, dewatering facility, gravity sludge thickener, and pump station).

Drive areas will be constructed in accordance with requirements and recommendations in the project geotechnical report once completed. The following preliminary design requirement apply to the drive areas:

- Drive paths where bulk deliveries are expected will be designed to accommodate the turning movements of a WB-62 truck.
- Modifications to the turn into the existing parking area will be modified to accommodate the turning movements of a WB-62 truck. This will improve traffic flow on the north side of the site where the new ferric sulfate storage area is located.

14.2.4 Parking

Parking areas will be added to the plant. While the expansion to the plant does not involve administrative buildings that would require staff, the need for additional parking has been identified by staff. It is anticipated that additional staff parking will be added on the north side of the administration building. A grade between 1% and 4% will be used for additional parking.

14.2.5 Site Grading, Retaining Walls, and Slope Protection

Geotechnical information is provided in Section 8. Additional investigation and analysis will need to be performed, but generally the site is comprised of loam and clay of hydrologic soil groups C and D.

The expansion of buildings required on the northwestern side of the site will result in significant grading in both the cut and fill condition. There is currently a large hill located centrally in the area of interest for expansion, which consists mostly of rock from the original plant construction. This will be cut to grade in the dewatering facility, sludge drying beds, and access road. On the western perimeter of the site expansion, the new gravity sludge thickener and the future proposed tanks will require a fill condition. The site will generally slope at 4% from east to west to sheet flow the stormwater off the site. In the preliminary design, a bench of soil will be created as a platform for the northwestern site to sit upon. Grading the site for future expansion in addition to the present requirements makes the most sense to reduce expenses. A new perimeter fence will be installed as shown on the plans. Minimal grading is needed for the ferric storage building and the SuperPulsators. Considering the one proposed SuperPulsator can be built without regrading of the site, the grading for future SuperPulsators will be done at the time of construction.

Railings, jersey barriers, barricades, or other types of barriers to protect vehicles and pedestrians along top of fill slopes will be evaluated.

14.3 ADA Site Accessibility

ADA accessible routes will not be needed as the site is an industrial use without visitor access.

14.4 Drainage

14.4.1 Design Criteria

Preliminary design of the stormwater management system for Piedmont Triad Regional Water Authority Water Treatment Plant is based on the Randolph County Unified Development Ordinance (UDO), July 2021 revision. On subjects not covered by the Randolph County UDO, the North Carolina Department of Environmental Quality Stormwater Design Manual (NCDEQ SDM) dated January 2017.

The site is anticipated to be a "Low Density Built Upon Area" as defined by NCDEQ (less than 24% developed). Additionally, the Randleman Lake Watershed Buffer of 50' will be applicable to the site. This buffer requirement is not expected to impede development. The site is classified as a WS-IV-CA watershed. This requirement only allows 6% impervious surface (low density).

14.4.1.1 WATER QUALITY

The Randolph County UDO does not identify Water Quality requirements. It is not expected that the site must meet Water Quality requirements, therefore the site will shed water in the westward direction and sheet flow offsite. Vegetates swales will be used to convey the water to the maximum extent possible.

14.4.1.2 CONVEYANCE

The North Carolina Department of Environmental Quality and the Randolph County UDO require that sites deemed Low Density Built Upon Area convey stormwater in vegetated swales to the maximum extent possible. Vegetated swales will be used in conjunction with the sheet flow condition to move stormwater to the western perimeter of the site.

It is noteworthy that since many of the buildings are open tanks with no roof, the increase in post construction stormwater will be marginal. Under NCDEQ regulations, open tanks do not count towards the impervious condition.

14.5 Erosion Control

The proposed project will disturb more than 1 acre of land and a National Pollutant Discharge Elimination system (NPDES) Erosion Control Permit (1200-C Permit) from NCDEQ will be required. The site civil team will develop the necessary Erosion and Sediment Control Plan (ESCP) to accompany the permit document and support Piedmont Triad Regional Water Authority with the permit request from NCDEQ. The ESCP will be developed in accordance with the NCDEQ Erosion and Sediment Control Planning and Design Manual.

15 Fire Protection and Life Safety Basis of Design

15.1 Overall Design Approach

A code analysis, including fire protection and life safety evaluations, has been developed in accordance with codes listed below. Code Analysis and Life Safety sheets are being developed as General (G) sheets.

The design is consistent with accepted engineering practices and complies with all applicable regulations, instructions, manuals, building codes, and life safety codes. The authorities having jurisdiction (AHJs) are Randolph County Building Inspections Department and the North Carolina Department of Insurance Office of the State Fire Marshal. The adopted publications applicable to this project include the following:

- North Carolina State Building Code: Building Code, 2018 edition
- North Carolina State Building Code: Existing Building Code, 2018 edition
- North Carolina State Building Code: Fire Prevention Code, 2018 edition
- National Electrical Code (NEC), NFPA 70, 2020 edition
- North Carolina State Building Code: Mechanical Code, 2018 edition
- North Carolina State Building Code: Plumbing Code, 2018 edition
- North Carolina State Building Code: Energy Conservation Code, 2018 edition
- North Carolina State Building Code: Fuel Gas Code, 2018 edition

15.2 Construction Type, Occupancy Classifications, Occupancy Separations, and Fire Separation Distance

The new Dewatering Building 72 and new Sludge Storage Canopy 73 are both designed to be buildings of noncombustible Type IIB construction. In alignment with the design intent of North Carolina State Building Code, occupancy classification has been used for construction type, allowable building height and area, building separation, etc. Please note that a canopy is classified as a building per the building code definitions.

The occupancy classifications for the new buildings on this project include the following:

- Dewatering Building 72: Moderate Hazard Group F-1
- Sludge Storage Canopy 73: Moderate Hazard Group F-1

Based on IBC Table 602, and both of the buildings listed below being Type IIB construction, the following fire separation distances (FSDs) are required for Type IIB construction to have a 0-hour rated exterior wall, where “X” represents the FSD for the structure:

- Dewatering Building 72 (Group F-1): X ≥ 10 feet
- Sludge Storage Canopy 73 (Group F-1): X ≥ 10 feet

The new Dewatering Building 72 and new Sludge Storage Canopy 73 will be provided with a combined fire separation distance of more than 20 feet between them. This combined FSD will provide sufficient fire separation distance to eliminate the need for exterior fire-rated walls for both buildings, per IBC Table 602.

This configuration also allows unlimited protected openings per IBC §705.8.1 Exception 2 “Buildings whose exterior bearing walls, exterior nonbearing walls and exterior primary structural frame are not required to be fire-resistance rated shall be permitted to have unlimited unprotected openings." Because the Dewatering Building 72 and Sludge Storage Canopy 73 both meet IBC Section 705.8.1, Exception 2, they do not have any restrictions on the openings in their exterior walls.

15.3 Automatic Sprinkler Systems and Hazardous Materials Assessment

The new Dewatering Building 72 has a fire area of approximately 4,895 square feet. The Dewatering Building has a single level. Since the fire area of this Group F-1 is less than 12,000 square feet, sprinklers are not required per §903.2.4.

The new Sludge Storage Canopy 73 has a fire area of approximately 7,000 square feet. The Sludge Storage Canopy has a single level. Since the fire area of this Group F-1 is less than 12,000 square feet, sprinklers are not required per §903.2.4.Fire Alarm and Detection Systems

A fire alarm system is not required for the Dewatering Building 72 or the Sludge Storage Canopy 73 per IBC §907.2.4 because both buildings are a Group F-1 Occupancy and only one story above grade in height.

15.4 Portable Fire Extinguishers

Per IBC 2015 Section 906, fire extinguishers shall be installed throughout the two new buildings. In accordance with the NCSBC and NCSFC, the exact location, weight, and type of the extinguishers shall meet the requirements of NFPA 10 for the hazard types, area coverage, and travel distances.

15.5 Fire-flow Requirements for Buildings and Fire Hydrants

Per Table B105.1(2), the required fire-flow for the new Dewatering Building 72 is 1,500 GPM for 2 hours and the required fire-flow for the new Sludge Storage Canopy 73 is 1,750 GPM for 2 hours.

Fire hydrants will be provided as needed for coverage of new buildings with locations and spacing in accordance with NCSFC 2018, Chapter 5 and Appendices C. Per Table C102.1, at least 1 hydrant is required for both the new Dewatering Building 72 and new Sludge Canopy 73. Per NCSFC §507.5.1, all exterior portions of these new buildings must have a fire hydrant within 400 feet measured by a route approved ty the fire code official (typically, "as the hose lies" along sidewalks and roads). Fire hydrants shall be painted, highly reflective, and durable in accordance with NFPA 291.

15.6 Fire Protection Water Supply

The fire hydrant system is supplied by the site underground water mains. Underground pipe shall be sized to provide the required fire flow to the site.

No hydrant flow test information is available at this time. Additional information on the available water supply is needed in order to verify that sufficient pressure and flow required to meet the expected fire flow requirements for all new building.

16 Expansion OPCC

The Opinion of Probable Construction (OPCC) for the expansion project is presented in Appendix E. It should be noted that there have been some changes to the design as presented in this PER that may not be fully captured in the OPCC, which was originally developed in April 2023.

17 Emerging Contaminant Treatment

As previously noted, PTRWA will need to meet the final PFAS regulations set by the EPA with advanced treatment. The primary objectives of the advanced treatment trains identified here are to remove PFAS and 1,4-dioxane.

Based on the bench- and pilot-scale studies conducted to date, current available space at the WTP, and conversations with plant staff, three treatment train alternatives were selected for further consideration and development. These alternatives include:

- Alternative 1 – RO Membranes with UV/AOP and GAC Concentrate Treatment
    - Alternative 1A – produces 26.7 MGD of finished water capacity
    - Alternative 1B – produces 21.4 MGD of finished water capacity
- Alternative 2 – Ozone/AOP with GAC
- Alternative 3 – UV/AOP with GAC

The site layouts and OPCC for each treatment alternative are presented in Appendix F and Appendix G, respectively.

17.1 Corrosion Parameters

Treating the water for PFAS and 1,4-dioxane removal with highly selective RO membranes will impact the corrosion stability of finished water due to the reduction of pH, alkalinity, and hardness levels. Typical water quality parameters evaluated to determine the potential for corrosion include:

- pH – pH impacts the solubility and reaction rates for corroding metals; lower levels typically increase corrosivity.
- Alkalinity – alkalinity is a measure of how resistant water is to pH changes. Higher levels of alkalinity typically result in greater buffering capacities but can result in the formation of calcium carbonate ($CaCO_3$), which scales pipes and fixtures.
- Dissolved inorganic carbon (DIC) – DIC is calculated as the sum of all carbonate species and is a factor for controlling corrosion. The level of DIC that can mitigate lead corrosion by promoting the formation of lead(II) carbonate scales is estimated in conjunction with pH to determine the calcium saturation of the water. A DIC level less than 10 mg/L as carbon is associated with waters that have lower buffering capacities; a DIC level greater than 15 mg/L as carbon is typically associated with waters that have a greater potential for calcium carbonate precipitation/scaling.
- Total dissolved solids (TDS) and conductivity – the TDS level is correlated with the conductivity of the water. Higher levels of TDS are associated with higher levels of conductivity, which can increase the ability of the water to conduct a corrosive current.

- Temperature – temperature can affect other water quality parameters that are critical to corrosion, including dissolved oxygen levels and biological activity.
- Major ion presence (e.g., calcium, sulfate, chloride, and bicarbonate) – sulfate and chloride are used to calculate the Chloride-Sulfate Mass Ratio (CSMR), which is a key parameter in explaining high lead corrosion rates when other water quality parameters indicate optimum corrosion treatment. High levels of chloride (greater than 100 mg/L) alone have been found to cause increased copper corrosion rates.
- Langelier Saturation Index (LSI) – LSI is calculated by subtracting pH at $CaCO_3$ saturation from the measured pH. A negative LSI indicates the dissolution of $CaCO_3$, whereas a positive LSI indicates the deposition/precipitation of $CaCO_3$. Typically, a slightly positive LSI is preferred because a small amount of controlled scale will help limit corrosion without causing excess buildup on pipes.
- Ryznar Stability Index (RSI) – the RSI is similar to the LSI, except that it includes empirical correlations between water chemistry and the corrosiveness of the water. An RSI greater than 8 indicates that the water is undersaturated (corrosive); an RSI between 6.5 and 8 indicates that the water is close to saturation (neither scale forming or corrosive); and an RSI below 6.5 indicates the water is oversaturated (scale forming).
- CSMR – CSMR is the ratio of chloride to sulfate (mass basis) in water. As CSMR increases, lead corrosion from lead pipes and lead solder may increase due to the galvanic corrosion with a dissimilar metal, such as copper. Hazen and Sawyer is currently conducting a study to determine the appropriate CSMR and corrosion inhibitor addition. The North Carolina Department of Environmental Quality (NCDEQ) typically recommends a CSMR below 0.5.

Table 17-1 summarizes the corrosion parameters for the finished water quality based on complete monthly operating reports (MORs) from 2017 through 2020, available pilot-scale data, and calculated parameters using the RTW Blending Model.

Table 17-1. JFK WTP Average Finished Water Corrosion Parameters

Parameter	Finished Water	Notes
pH	8.0	From MOR
Alkalinity	32.3 mg/L as $CaCO_3$	From MOR
Total Hardness	46.3 mg/L as $CaCO_3$	From MOR
Total Dissolved Solids (TDS)	89 mg/L	From pilot-scale study
Calcium	36.6 mg/L	From pilot-scale study
Chloride	16.3 mg/L	From pilot-scale study
Sulfate	45.0 mg/L	From pilot-scale study
LSI	-0.61	Calculated using RTW Model
Ryznar	9.22	Calculated using RTW Model
DIC (mg/L as carbon)	66	Calculated using RTW Model
CSMR	0.36	--

17.2 Common Components of the Treatment Alternatives

Common components of the treatment alternatives include the following:

- All PFAS treatment is assumed to be operated full-scale year-round with all water from the filtration systems routed through the treatment train.
- Chemical additions, such as chlorine and ammonia, for disinfection purposes are assumed to be similar and not included in this evaluation. However, some treatment technologies result in reduced organics levels, which can also reduce the chlorine demand. It is noted in the individual treatment alternative sections where effluent water quality from the alternative may result in a lower chlorine demand and therefore a lower chlorine and ammonia dose.
- The AOP portion of Ozone/AOP and UV/AOP is assumed to be hydrogen peroxide. Bench-scale testing indicated that chlorine addition was not as effective as hydrogen peroxide.
- Cartridge filters are included to prevent fouling in the membrane system. Cartridge filters are often required ahead of high-pressure membrane systems to provide an additional barrier against membrane damage; a membrane supplier may also require them from a warranty standpoint.
- Redundancy or additional treatment capacity is provided for each treatment alternative as appropriate for the system.
- It should be noted that existing waste streams at the JFK WTP, such as the filter backwash waste and blowdown from the sedimentation basins, may include PFAS. It is recommended that these streams be sampled to characterize the presence of the waste. Depending on the results, additional treatment or changes to the process flow may be required to prevent the release of PFAS through the NPDES permit.
- Building costs are based on a metal building without additional masonry, such as a brick veneer or concrete masonry unit walls.

17.3 OPCC Development

The OPCCs for the alternatives are considered Class 4 – feasibility level estimates as defined by the Association for the Advancement of Cost Engineering (AACE). The estimate ranges from +50 percent to -30 percent, which reflects the level of project definition provided. Cost opinions were developed using vendor quotes, previous project experience, and relevant cost factors and include CAPEX, OPEX, and NPV. Although the costs identified are based on recent equipment and material costs, special attention needs to be directed to the Consumer Price Index and the appropriate Producer Price Index for forecasting future trends. Estimates were not escalated to the projected mid-point of construction.

The cost opinion for each alternative was developed with the following:

- CAPEX: include the cost of equipment and construction for a treatment system that can produce 26.7 MGD of finished water except for the membrane options. Engineering fees are estimated to include services during final design and construction administration. CAPEX unit factors are shown in Table 17-2. Electrical, instrumentation, and SCADA markups are intended to cover the electrical upgrades in the individual sections; a CAPEX for the electrical requirements broken down by individual component was not prepared. Likewise, If a system requires a new electrical service, as is likely the case for the RO Membrane options, the CAPEX does not consider the cost of the new electrical service/feeds.

Table 17-2. CAPEX Unit Factors

Cost	Percentage Markup of Subtotal (%)	Notes
General Site Work and Restoration	2	Markup on Process Subtotal
Electrical, Instrumentation, and SCADA	20	Markup on Process Subtotal
Soil/Geotechnical Specialty Conditions	1	Markup on Process Subtotal
HVAC/Mechanical	2	Markup on Process Subtotal
Contractor Mobilization/Demobilization	4	Markup on Construction Subtotal
Contractor Overhead, Supervision, Support Staff	12	Markup on Construction Subtotal
Contractor Insurance and Bonds	3	Markup on Construction Subtotal
Miscellaneous Construction Elements	6	Markup on Construction Subtotal
Contractor Profit	9	Markup on Construction Subtotal
Escalation/Volatility Factor	15	Markup on Construction Total
Engineering Services (Final Design, Construction)	15	Markup on Construction Total
Contingency	30	Markup on Construction Total

- OPEX: assumes full-time operation at a finished water average production rate of 18 MGD. The unit cost factors assumed in the OPEX are provided in 2023 dollars (Table 17-3). OPEX does not consider in-house labor costs, additional staffing needs, or minor costs such as routine maintenance activities.
- Breakthrough, or exhaustion rates, are based on the data collected during piloting at the Mitchell WTP, and are dependent on the stream (i.e., treated MF membrane effluent versus RO concentrate). Although piloting data was collected for PTRWA, the duration was insufficient to achieve breakthrough in the MF membrane effluent. For the RO membrane concentrate exhaustion, piloting data from the Mitchell WTP was also used since piloting results from PTRWA indicate that an EBCT of 10 minutes is insufficient for PFAS treatment on the concentrate stream. Breakthrough from Mitchell WTP is defined as the first effluent concentration point above the draft MCL for PFOS or PFOA (4 ng/L). Breakthrough rates for GAC is based on the Calgon F400 for both the full treatment and concentrate treatment.
- NPV: based on the CAPEX plus the OPEX over 20 years assuming a 3 percent interest rate.

Table 17-3. OPEX Unit Factors

Cost	Value	Notes
Power	$0.11/kWh	Assumed pumping 24/7/365 operation
Interest Rate	3%	--
NPV Duration	20 years	--
Lime	$0.05/lb	Addition amounts vary based on stream; predicted with RTW blend.
Hydrogen Peroxide	$52/gal	Addition amounts vary based on stream; predicted with RTW blend.
Calcium Thiosulfate	$12.00/gal	Assume 0.3 mg/L dose to offset a CFE chlorine residual of 0.72 mg/L.
Antiscalant	$1.55/lb	Assume 2.45 mg/L dose (40.74 lb/day usage) based on vendor recommendation
Cartridge Filters	$3.81/box of 15	Cartridge filters changed out 4 times per year
Membrane Module	$550/module	Assumes complete replacement every 10 years.
CIP Chemical 1 (acidic)	$1.67/lb	Amount and price provided from vendor based on 3 cleanings per year.
CIP Chemical 2 (basic)	$2.83/lb	Amount and price provided from vendor based on 3 cleanings per year.
New GAC	$2.40/lb	Breakthrough varies with stream
Reactivated GAC	$1.80/lb	Breakthrough varies with stream. GAC refills were assumed to be 80% reactivated GAC and 20% new GAC.
Caustic	$0.12/lb	Addition amounts vary based on stream; predicted with RTW blend.
Solid Waste Disposal	$500/ton	Assumption of hazardous waste disposal of PFAS laden material
Liquid Waste Disposal	$10/gal	Assumption of hazardous waste disposal of PFAS laden liquid waste (e.g., membrane CIP waste)
Contingency	10%	Accounts for the volatility within the market

17.4 Treatment Alternative 1A – RO Membranes with UV/AOP and GAC Concentrate Treatment (26.7 MGD Production)

17.4.1 Process Flow Diagram and Design Criteria

In this alternative, the process train consists of CFE being pumped through RO membranes for removal of emerging contaminants. The process flow diagram for Alternative 1A is shown in Figure 17-1. Specific steps include:

- Dechlorination is assumed before cartridge filtration to protect the membranes from oxidative damage due to residual chlorine. Antiscalant may be added to minimize scaling

within the membrane system. Discussions with membrane vendors indicate that the low pH level present in the filtered water may require little to no antiscalant addition; however, the use of antiscalant is included in this evaluation. Likewise, depending on the effluent pH level, pH adjustment through an acid addition may be required in conjunction with the antiscalant to minimize scaling.
- Permeate from the RO membranes would be treated with caustic and lime utilizing existing application points and occur prior to disinfection.
- The concentrate stream would continue to the concentrate treatment system, with UV/AOP and GAC.

Whereas the GAC alternatives will treat the entire plant flow (minus installation and occasional backwashing), the RO alternative rejects a significant amount of flow (typically 10 to 20 percent) known as the concentrate stream. To provide adequate flow to overcome the system losses, the JFK WTP would need to produce approximately 33 MGD of CFE to produce 26.7 MGD of finished water out of the membrane systems. Additional capacity may be provided through the following venues:

- Blending the treated concentrate with the permeate. By removing PFAS and 1,4-dioxane in the concentrate stream, it could potentially be blended back with the permeate. This solution would take advantage of the alkalinity, hardness, and ions present in the concentrate stream to bring the finished water quality back into a more favorable range. The main challenge with this option is it is unclear if NCDEQ would view the treated concentrate stream as a finished water stream or a waste stream. If blending is acceptable to NCDEQ, the membrane systems presented in this report would result in approximately 26.7 MGD of finished water because the treated concentrate would be viewed as a finished water stream by NCDEQ. However, the treated concentrate would still contain pre-treatment chemicals, such as antiscalant, which could affect the overall finished water corrosion chemistry. Preliminary discussions with NCDEQ indicate that additional testing would be required to validate this option.
- Investigating recycling options. North Carolina currently does not have any permitted inland NF/RO membrane systems. Although it is dependent on NCDEQ approval, the treated concentrate stream could be recycled to the head of the plant or before the membrane system.
- Increase the loading rates of pretreatment processes to provide additional flow. Table 17-4 summarizes the needed flow rates to produce 26.7 MGD and 48 MGD (ultimate plant capacity). This evaluation assumes that the existing GAC contactors are converted to granular media filters, similar to the existing granular media filters. As noted in the table, the required filter loading rate is above the North Carolina standard of 4 gpm/sf. However, if a RO membrane system is installed, it is possible that NC would treat the filters as “pretreatment” and the RO membrane as “filtration”, potentially allowing for a variance. It should be noted that the plant staff has indicated challenges with trying to operate the SPs at more than 8.5 MGD each.

Table 17-4. Alternative 1A – Anticipated Plant Flows

Parameter	Expanded Plant Capacity	Ultimate Plant Capacity
Finished Water Flow	26.7 MGD	48 MGD
Membrane Recovery Rate	80%	80%
Membrane Influent Flow	33.4 MGD	60 MGD
MF Effluent	15 MGD	15 MGD
Needed Granular Media Effluent	18.4 MGD	45 MGD
Number of filters	4	8
Surface area per filter	637 sf	637 sf
Required Filter Loading Rate	5.0 gpm/sf	6.1 gpm/sf
Assumed Loss from Raw Water to Filtered Water	10%	10%
Raw Water Flow	37.1 MGD	66.7 MGD
Number of SPs	4	8
Flow per SP	9.3 MGD	8.3 MGD

It should be noted that this option may allow the plant to be easily expanded in the future at a lower cost by utilizing the existing GAC contactors for pre-filtration prior to the membranes. To expand plant capacity for Alternatives 2 and 3, additional filtration capacity will be required in the future.

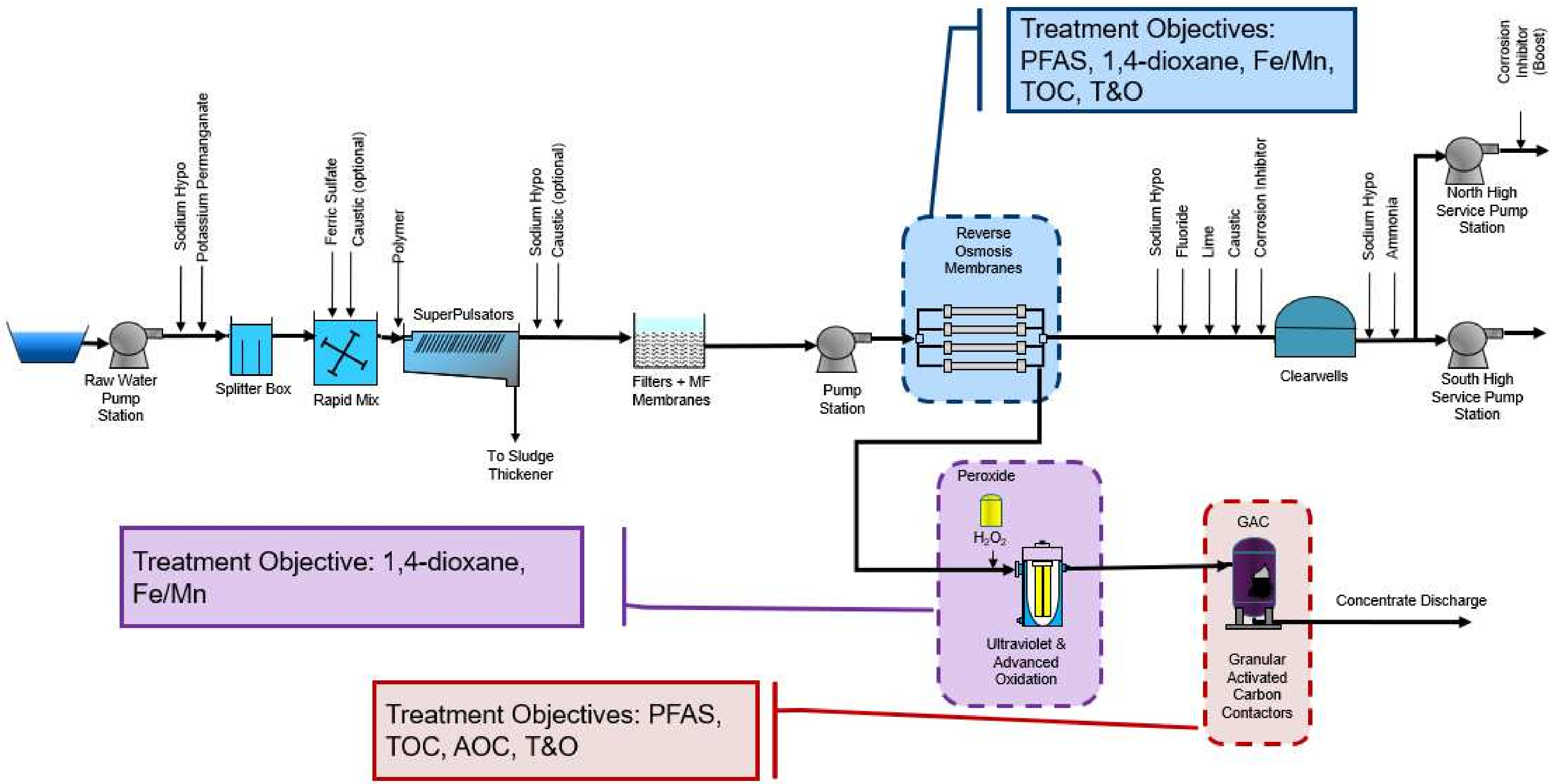

Figure 17-1. Alternative 1A/1B – Process Flow Diagram

The design criteria for the RO membrane system are provided in Table 17-5. The main design criterion for the membrane system is the recovery rate, which is selected as 80 percent. Expected membrane performance was calculated based on feedback from membrane vendors.

Table 17-5. Alternative 1A – RO Membrane System Design Criteria

Criteria	Value
Influent flowrate	33.4 MGD
Influent cartridge filter size	5 micron
Number of membrane feed pumps	10+1
Membrane feed pump design (per pump)	4,167 gpm at 278 TDH
Membrane feed pump motor (per pump)	400 HP
RO Operational Recovery	80 %
Membrane type	CR100
Number of trains	10+1
Number of pressure vessels per train	693
Total number of stages	2
Modules per pressure vessel	7
Influent pressure	165 psi
Permeate flowrate	26.7 MGD
Concentrate flowrate	6.7 MGD
Frequency of CIP cleaning	4 months
Assumed membrane flux decline per year	7 %
Fouling factor	1
Volume of acidic cleaning agent	21,000 gal/year
Volume of basic cleaning agent	21,000 gal/year

The design criteria for GAC to treat RO membrane concentrate is provided in Table 17-6.

Table 17-6. Alternative 1A – GAC Concentrate Treatment System Design Criteria

Criteria	Units	Value
RO operational recovery	%	80
Influent flowrate	MGD	6.7
EBCT	min	19
Vessel number	each	14
Loading rate	gpm/ft^2	2.9
Vessel diameter	ft	12
Redundant vessels	each	0
Frequency of backwashing	months	2
Volume of media per vessel	ft^3	835
Footprint	ft^2	79
Media depth	ft	10.6
Exhaustion rate	days	362

The UV design criteria for this system is shown in Table 17-7. Two redundant reactors will be provided, for a total of fourteen reactors. Other UV appurtenances not shown include power cabinets, UV transmitter monitors, UV intensity sensors, lamp wipers, lamp sleeves, ballasts, and control panels. It should be noted that this UV design criteria is based on the maximum dose evaluated as part of bench-scale testing but it was unable to achieve a 1,4-dioxane below the health advisory (see Section 3.4.9). Additional bench-scale or pilot-scale testing should be conducted to determine the most appropriate dose if this option is selected, or if there are fouling concerns.

Table 17-7. Alternative 1A – UV/AOP Concentrate Treatment Design Criteria

Criteria	Units	Value and Notes
Reactor quantity	each	12+2
Lamp pressure	N/A	Low Pressure, High Output
Flow rate per reactor	MGD	0.5
Reactor diameter	in.	24
Lamps per reactor	each	30
Lamp power	Watts	800
Design UV Dose	mJ/cm^2	3,000
Hydrogen Peroxide Dose	mg/L	12

A new electrical service will be needed to provide the significant power demands of an RO membrane system with large pumps, as well as the concentrate treatment processes.

17.4.2 Site Layout and Hydraulic Impacts

Water would be pumped from the transfer pump station to the membrane building. To overcome losses through the membrane system, the water must be supplied at a pressure of 165 psi. It should be noted that the size of the RO membrane feed pumps is much larger than that required for the GAC system. Residual pressure from the membrane system would be used to return water to the existing CFE line. Residual pressure would also supply adequate pressure to send water through the concentrate treatment before being returned to the head of the plant.

17.4.3 Water Quality Impacts

17.4.3.1 FINISHED WATER QUALITY

A wide range of contaminants is expected to be rejected by the RO membrane system including PFAS and 1,4-dioxane. Based on pilot-scale results, it is expected that RO membranes can treat PFAS to below the draft MCLs, assuming no oxidative damage occurs to the membrane surface. Oxidative damage can be reduced or avoided by installing a chlorine residual or oxidation/reduction potential (ORP) feedback loop that automatically adjusts the dechlorination dose upstream of the membranes. RO membranes also remove organics, iron, manganese, taste and odor compounds, and algal toxins. The reduction in organics would likely result in a lower chlorine demand and DBP formation, and reduce nitrification potential.

17.4.3.2 CORROSION STABILITY

RO membranes significantly change the corrosion potential of finished water because the membranes typically remove 93 to 97 percent of the RO feedwater TDS. Table 17-8 compares the current finished water quality to RO membrane permeate water quality at the JFK WTP. The RTW Model was again used to project the required chemical applications to raise RO membrane finished water quality parameters to be similar to existing finished water quality.

Additional lime and caustic are needed to bring corrosion parameters into an appropriate range.

Table 17-8. Alternative 1A – Corrosion Model Results

Water Quality Parameter	Unit	Finished Water	Reverse Osmosis Permeate	
			Pre	Post
pH	SU	8.0	5.30	7.99
Alkalinity	mg/L as $CaCO_3$	32.0	5.8	69
Total hardness	mg/L as $CaCO_3$	39.0	0	38
Chloride	mg/L	16.3	0.1	
Sulfate	mg/L	45.0	1.1	
Calcium	mg/L	36.6	0.0	15.1
Calcium hardness	mg/L as $CaCO_3$	91.5	0.1	37.9
TDS	mg/L	89	85.5	--
Temperature	Deg-C	22.0	22.0	
LSI	N/A	-0.61	--	-0.27
Ryznar	N/A	9.22	--	8.54
DIC	mg/L as carbon	66	--	17
CSMR	N/A	0.36	--	0.08
Lime addition	mg/L	0.0	--	28.0
Caustic addition	mg/L	0	--	20.5

Significant amounts of lime and caustic are needed to raise the pH, alkalinity, and hardness. It should be noted that the corrosion chemistry will be further investigated if the RO membrane system is selected.

In general, blending the treated concentrate with the permeate would result in a finished water quality similar to the existing plant.

17.4.4 Operational and Residuals Handling Requirements

The staff at the JFK WTP have experience in operating a low pressure membrane system. It should be noted an RO membrane system operation has similar operating requirements, including:

- Membrane operation requires close attention to water quality entering the membrane system as well as operating pressures, fluxes, and permeate quality. For example, proper dechlorination is critical to maintaining membrane integrity.
- Membrane operation also requires a much higher-pressure pumping system than full GAC, which affects the power supply required. A membrane system also has high performance valves and significant instrumentation to control and monitor the system.
- Membrane systems also require cleaning systems to maintain and recover system performance. Unlike a backwashing system for a filter, membrane systems often require a multi-stage cleaning process with different chemical solutions, requiring maintenance and operation of additional chemical systems.
- Operational staff would need to monitor membrane performance closely to ensure that the membranes function appropriately, and that mechanical integrity is maintained. While each membrane system has its own monitoring and testing protocol, typical practices include conductivity testing and pressure trending. This may require additional staffing needs, such as another instrumentation technician.
- From a residuals standpoint, the RO membrane system would produce cleaning waste during the cleaning cycles. Data from other pilot studies indicate that cleaning waste may contain PFAS. In a typical cleaning cycle, approximately 15,000 gallons of cleaning waste is produced, and it is anticipated that cleaning cycles would take place three times per year. Cleaning waste includes chemicals used during the cleaning process and additional rinse water. Therefore, the cleaning waste would need to be stored until an independent contractor could remove the waste for proper disposal. In OPEX estimations here, all liquid waste was assumed and costed as hazardous waste.
- It is estimated that membrane modules would need to be replaced approximately once every 10 years, while cartridge filters would need to be replaced four times per year. It is possible that the membrane modules would capture PFAS and be considered hazardous waste under pending Resource Conservation and Recovery Act/CERCLA regulations.

The concentrate system would have the following operational requirements:

- The UV/AOP system will potentially require periodic cleaning of the UV lamps. The lamps will also need to be replaced over time.
- GAC media will need to be regularly replaced. Studies show that GAC can be regenerated using thermal reactivation, similar to the process currently employed to regenerate the WTP's GAC for organics removal. With potential Resource Conservation and Recovery Act/CERCLA designation of PFAS, the transportation, storage, or disposal of GAC also could be more challenging.
- GAC likely requires some backwashing equipment be installed.

- Dewatering residuals from a membrane concentrate stream is often difficult and typically requires several treatment processes that are not normally installed at a more conventional WTP. For this reason, the residuals handling options presented in this report are focused on disposing of, recycling, or treating the liquid waste stream.
- Figure 17-2 presents the baseline option for residuals handling if membrane treatment is installed. Following treatment of the concentrate through GAC for PFAS removal, the treated concentrate could be discharged through the NPDES permit, recycled to the head of the plant, or blended with the permeate stream. The GAC concentrate system may need to be backwashed infrequently but regularly to fluff the media and maintain system performance.

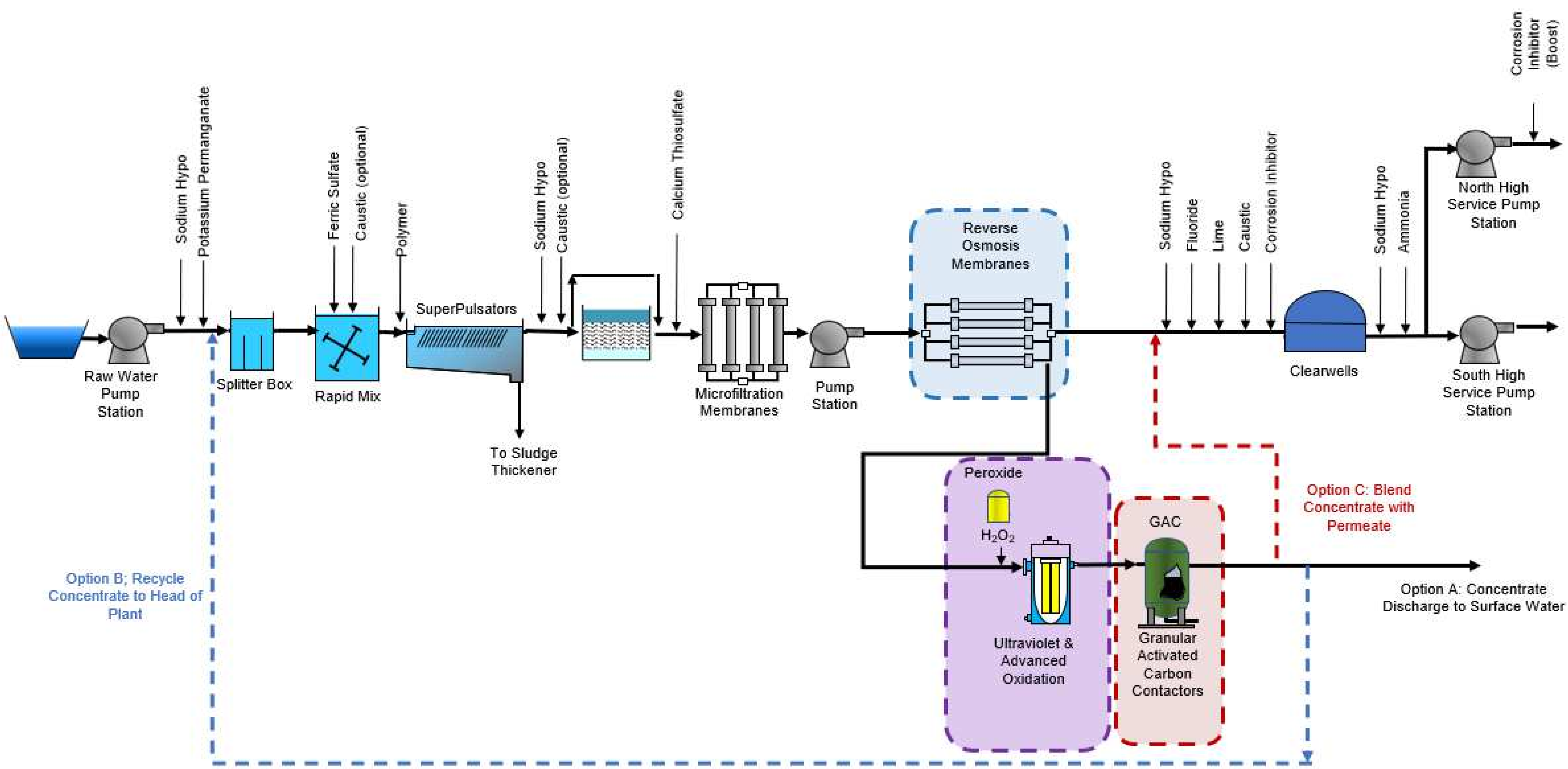

Figure 17-2. Alternative 1A/1B – Blending Options

17.4.5 Cost Analysis

17.4.5.1 CAPEX

Table 17-9 presents the CAPEX of various components of the RO and GAC concentrate treatment system. The RO equipment includes pumps, cartridge filters, membrane skids, membranes, a clean-in-place (CIP) system, piping, valves, and chemical systems. The GAC equipment includes GAC vessels and media, piping, and valves. UV/AOP equipment includes UV reactors, ballasts, lamps, lamp sleeves, lamp wipers, control panels, power cabinets, UV transmitter monitors, UV intensity sensors, and a hydrogen peroxide feed system. The CAPEX also includes the cost to slightly upgrade raw water pumps to provide the additional capacity needed to supply the needed plant flow to produce 26.7 MGD finished water capacity.

Table 17-9. Alternative 1A – CAPEX

Component		CAPEX
Process Equipment		$54,717,000
Building and Site Services		$13,682,000
Contractor Costs and Fees		$23,256,000
Escalation/Volatility		$13,749,000
Engineering Services		$13,749,000
Contingency		$27,497,000
	Total CAPEX:	**$146,650,000**
	Cost/MGD:	**$5.49**

17.4.5.2 OPEX

Annual OPEX in Table 17-10 includes estimates for the membrane and UV/AOP OPEX costs. Major OPEX costs for the RO system include energy use and chemical use. Membrane replacement will ultimately be determined based on feedwater quality and cleaning regime. Major OPEX costs for the UV/AOP system include energy use, lamp/sensor replacement, and chemical use.

The GAC facility OPEX includes media replacement every 362 days for PFOS and PFOA to remain below the draft MCLs. A majority of the GAC OPEX cost is media replacement, and the rest is for the dechlorination chemical.

Table 17-10. Alternative 1A – OPEX

Component		Annual OPEX
Membrane Facility		$3,457,000
UV/AOP Facility		$361,000
GAC Facility		$290,000
Operational Contingency		$411,000
	Total OPEX:	**$4,519,000**
	Cost/MGD:	**$0.25**

17.4.5.3 NET PRESENT VALUE

The NPV is presented in Table 17-11.

Table 17-11. Alternative 1A – NPV

Component	NPV
RO Membranes with UV/AOP and GAC Concentrate Treatment (26.7 MGD Production)	$213,882,000

17.5 Treatment Alternative 1B – RO Membranes with UV/AOP and GAC Concentrate Treatment (21.4 MGD Production)

17.5.1 Process Flow Diagram and Design Criteria

Alternative 1B is the same as Alternative 1A except 26.7 MGD is received and 21.4 MGD is produced, meaning that the quantity of equipment is reduced from Alternative 1A. This alternative does not require the WTP to produce additional capacity beyond what is planned for the expansion project (26.7MGD). The alternative has the same process flow diagram as Alternative 1A (see Figure 17-1) The design criteria for the RO membrane system are provided in Table 17-12.

Table 17-12. Alternative 1B – RO Membrane System Design Criteria

Criteria	Value
Influent flowrate	26.7 MGD
Influent cartridge filter size	5 micron
Number of membrane feed pumps	9 (8+1)
Membrane feed pump design (per pump)	4,167 gpm at 278 TDH
Membrane feed pump motor (per pump)	400 HP
RO Operational Recovery	80 %
Membrane type	CR100
Number of trains	9 (8+1)
Number of pressure vessels per train	693
Total number of stages	2
Modules per pressure vessel	7
Influent pressure	165 psi
Permeate flowrate	21.4 MGD
Concentrate flowrate	5.3 MGD
Frequency of CIP cleaning	4 months
Assumed membrane flux decline per year	7 %
Fouling factor	1
Volume of acidic cleaning agent	21,000 gal/year
Volume of basic cleaning agent	21,000 gal/year

The design criteria for GAC to treat RO membrane concentrate is provided in Table 17-13.

Table 17-13. Alternative 1B – GAC Concentrate Treatment System Design Criteria

Criteria	Units	Value
RO operational recovery	%	80
Influent flowrate	MGD	5.3
EBCT	min	19
Vessel number	each	12
Loading rate	gpm/ft^2	3.1
Vessel diameter	ft	12
Redundant vessels	each	0
Frequency of backwashing	Months	2
Volume of media per vessel	ft^3	835
Footprint	ft^2	79
Media depth	ft	10.6
Exhaustion rate	days	362

The UV design criteria for this system is shown in Table 17-14. One redundant reactor will be provided, for a total of eleven reactors. Other UV appurtenances not shown include power cabinets, UV transmitter monitors, UV intensity sensors, lamp wipers, lamp sleeves, ballasts, and control panels.

Table 17-14. Alternative 1B – UV/AOP Concentrate Treatment System Design Criteria

Criteria	Units	Value and Notes
Reactor quantity	each	10+1
Lamp pressure	N/A	Low Pressure, High Output
Flow rate per reactor	MGD	0.5
Reactor diameter	in.	24
Lamps per reactor	each	30
Lamp power	Watts	800
Design UV Dose	mJ/cm^2	3,000
Hydrogen Peroxide Dose	mg/L	12

Although Alternative 1B would have less connected electrical load than Alternative 1A it is recommended that the same electrical components are installed to provide the needed service when additional capacity is required.

17.5.2 Site Layout and Hydraulic Impacts

Same as is noted in Alternative 1A.

17.5.3 Water Quality Impacts

Same as is noted in Alternative 1A.

17.5.4 Operational and Residuals Handling Requirements

Same as is noted in Alternative 1A.

17.5.5 Cost Analysis

17.5.5.1 CAPEX

Table 17-15 presents the CAPEX of various components of the RO and GAC concentrate treatment system. The RO equipment includes pumps, cartridge filters, membrane skids, membranes, a clean-in-place (CIP) system, piping, valves, and chemical systems. The GAC equipment includes GAC vessels and media, piping, and valves. UV/AOP equipment includes UV reactors, ballasts, lamps, lamp sleeves, lamp wipers, control panels, power cabinets, UV transmitter monitors, UV intensity sensors, and a hydrogen peroxide feed system.

Table 17-15. Alternative 1B – CAPEX

Component		CAPEX
Process Equipment		$44,841,000
Building and Site Services		$11,212,000
Contractor Costs and Fees		$19,061,000
Escalation/Volatility		$11,268,000
Engineering Services		$11,268,000
Contingency		$22,535,000
	Total CAPEX:	**$120,185,000**
	Cost/MGD:	**$5.62**

17.5.5.2 OPEX

Annual OPEX in Table 17-16 includes estimates for the membrane and UV/AOP OPEX costs. These costs are the same as presented for Alternative 1A because they involve operating the same type of equipment at the same flow rate (producing 18 MGD of finished water). Major OPEX costs for the RO system include energy use and chemical use. Membrane replacement will ultimately be determined based on feedwater quality and cleaning regime. Here, membrane replacement is assumed every 10 years. Major OPEX costs for the UV/AOP system include energy use, lamp/sensor replacement, and chemical use.

The GAC facility OPEX includes media replacement every 362 days for PFOS and PFOA to remain below the draft MCLs. A majority of the GAC OPEX cost is media replacement, and the rest is for the dechlorination chemical.

Table 17-16. Alternative 1B – OPEX

Component		Annual OPEX
Membrane Facility		$3,457,000
UV/AOP Facility		$361,000
GAC Facility		$290,000
Operational Contingency		$411,000
	Total OPEX:	**$4,519,000**
	Cost/MGD:	**$0.25**

17.5.5.3 NET PRESENT VALUE

The NPV is presented in Table 17-17.

Table 17-17. Alternative 1B – NPV

Component	NPV
RO Membranes with UV/AOP and GAC Concentrate Treatment (21.4 MGD Production)	$187,417,000

17.6 Treatment Alternative 2 – Ozone/AOP with GAC

17.6.1 Process Flow Diagram and Design Criteria

Alternative 2 consists of ozone/AOP applied to the raw water for 1,4-dioxane removal and GAC contactors downstream of the filtration step for PFAS removal. The process flow diagram for Alternative 2 is shown in Figure 17-3. In this treatment train, ozone/AOP would be dosed at the raw water pump station, with the raw water pipeline serving as the ozone contactor. This analysis doesn't include an evaluation of the cost to convert or install the appropriate pipeline/liner to minimize corrosion impacts from the ozone. Typically, a concrete mortar lining is required to protect the pipeline. Following the end of the ozone contact, any remaining ozone residual would need to be quenched. It is possible that the high levels of organics and other compounds in the raw water may completely consume the ozone dose and therefore require no quenching. Table 17-18 presents the potential flow rates for the Ozone/AOP option and the anticipated contact time in the ozone pipeline. Based on the bench-scale testing, it appears that the contact time provided by the raw water pipelines is sufficient but additional testing should be conducted to confirm.

Table 17-18. Alternative 2 – Anticipated Plant Flows

Parameter	Expanded Plant Capacity	Ultimate Plant Capacity
Finished Water Flow	26.7 MGD	48 MGD
Loss between Sed/Filters	10%	10%
Raw Water Flow	29.7 MGD	53.3 MGD
Number of SPs	4	8
Flow per SP	7.4 MGD	6.7 MGD
Raw Water Pipeline Length	2,250 feet	2,250 feet
Raw Water Pipeline Diameter	42 inches	42 inches
Number of Raw Water Pipelines	1	2
Raw Water Pipeline Volume	161,924 gallons	323,847 gallons
Raw Water Contact Time	9 minutes	10 minutes

Depending on how the plant will be operated, the existing filtration system may need to be converted to biological filtration to remove small organics produced by the AOP. If all filtered water will be sent for PFAS removal, then the GAC system may be able to serve as the biological removal step in lieu of biological conversion. Additional filtration capacity will be needed as the plant is expanded beyond 26.7 MGD.

Following filtration, the CFE would be dechlorinated and pumped to gravity GAC contactors for the removal of emerging contaminants. These gravity GAC beds are operated and maintained similar to the existing GAC contactors. Following GAC, the flow would connect back to the existing CFE line before the clearwells. This results in the full treatment and production of 26.7 MGD with GAC gravity contactors minus losses associated with the infrequent backwashing.

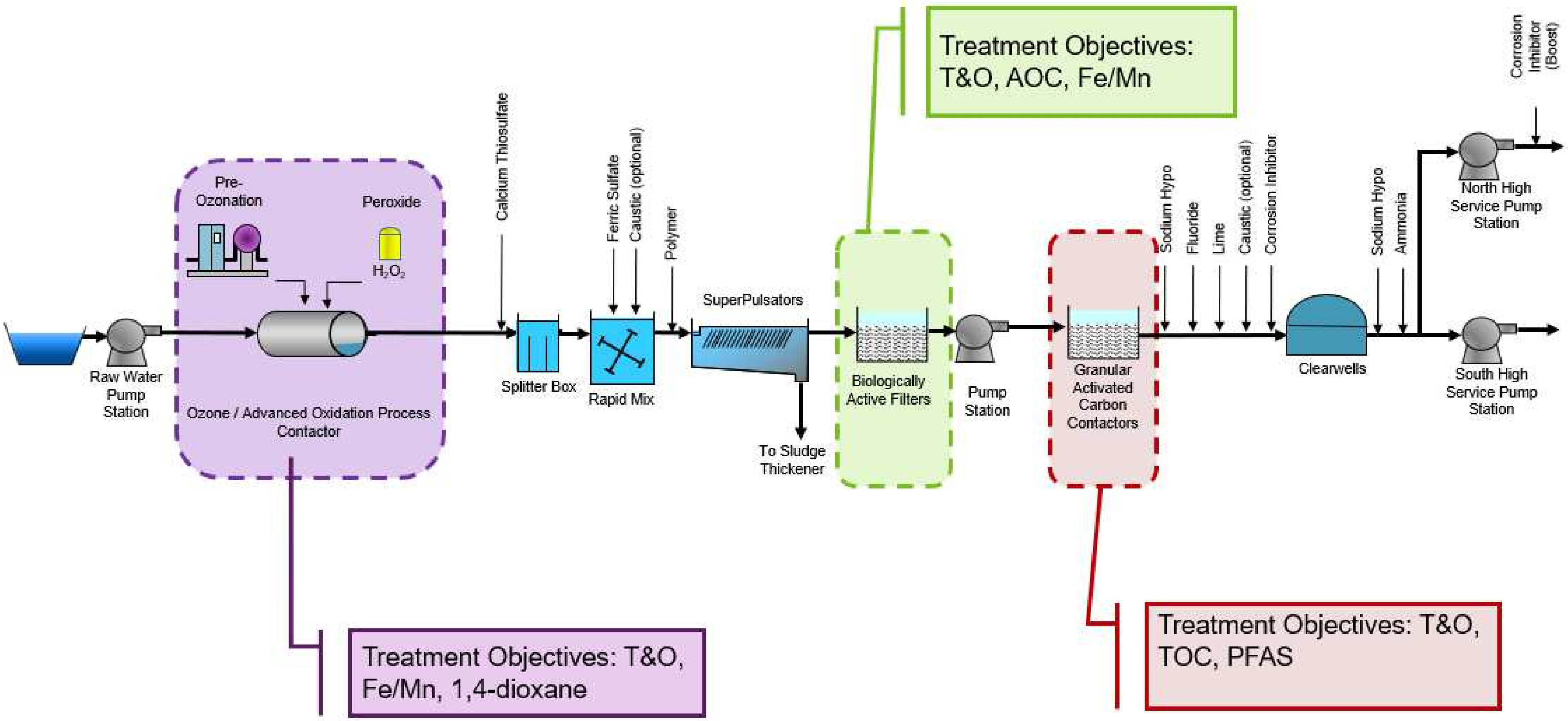

Figure 17-3. Alternative 2 – Process Flow Diagram

The design criteria for the Ozone/AOP system are provided in Table 17-19. The ozone generation system would need to be located near the Raw Water Pump Station so that ozone can be applied adjacent to where it is formed. In the future, PTRWA could potentially add lake aeration for algae control as the reservoir ages or changes due to climate impacts.

Table 17-19. Alternative 2 – Ozone/AOP System Design Criteria

Criteria	Units	Value and Notes
Design Ozone Production	ppd	3,700
Design Ozone Concentration	% wt.	10
Design Ozone Dose	mg/L	15
Number of Ozone Generators	each	2 + 1
Design Hydrogen Peroxide Dose	mg/L	7.5
Power Supply Units	each	1
Feed Gas Type	N/A	Liquid oxygen (LOX)
LOX Storage Tanks	each	1
LOX Storage Tank Volume	gal	13,000
LOX Vaporizer	each	3

The design criteria for the GAC system are provided in Table 17-20. Unlike Alternative 1A and 1B, this alternative does not require a concentrate treatment step. Unlike other options, the GAC system includes a backwash pump station to provide water supply during media loading and periodic system backwash. If selected as the PFAS treatment technology, the need for this pump station will be further investigated during preliminary design.

Table 17-20. Alternative 2 – GAC System Design Criteria

Criteria	Value
Influent flowrate	26.7 MGD (assume no wasting)
Number of GAC feed pumps	5 (4 duty + 1 standby)
GAC feed pump design (per pump)	4,167 gpm at 75 TDH
GAC feed pump motor (per pump)	125 HP
Contactor number	8 (7 duty + 1 redundant)
Contactor dimensions	22 ft x 33 ft
EBCT	20 min
Loading rate	3.8 gpm/ft^2
Frequency of backwashing	2 months
Backwash flowrate	15 gpm/ft^2
Number of backwash pumps	2 (1 duty + 1 standby)
Backwash pump flow (per pumps)	10,000 gpm
Volume of media per vessel	7,083 ft^3
Media depth	10.0 ft
Frequency of change out	0.4 change outs/year

A new electrical service (or increased service) will be needed at the Raw Water Pump Station to provide the power demands of the ozone system. Additional electrical service would be required to supply the GAC feed and backwash pumps.

17.6.2 Site Layout and Hydraulic Impacts

Water from the filtration system would be routed to a pump station that would supply water to the GAC system. Water would then flow by gravity through the GAC system and be routed back to the CFE line prior to the clearwells.

17.6.3 Water Quality Impacts

17.6.3.1 FINISHED WATER QUALITY

Ozone/AOP provides treatment advantages on the raw water including 1,4-dioxane treatment, oxidation of iron and manganese, taste and odor removal, and can provide treatment against many algal toxins. However, this process also breaks down organics and must be followed by a biological treatment step.

GAC does not affect the finished water quality in the same way that membrane treatment does. For example, the pH, alkalinity, and hardness values are roughly the same in the effluent as the influent, except during initial media loading and rinsing. Upon installation, PTRWA might need up to 120 bed volumes rinsed for pH control and arsenic removal. GAC impact on water quality can vary depending on the lifespan of the installed media. Elevation of pH can also occur with installation of new media; to prevent this, GAC should be thoroughly washed (up to 120 BVs) during installation; this flushing waste likely would be processed through the WTP's backwash waste system. In lieu of flushing the GAC, an acid addition could be investigated to lower the pH to acceptable levels or acid washed media could be specified. GAC provides TOC removal, which diminishes over time as the GAC is exhausted. Typically, the use of GAC results in lower disinfection by-product formation.

Similar to membranes (although completed using a different removal mechanism), GAC can remove a wide variety of contaminants such as taste and odor compounds, algal toxins, and other emerging contaminants. Other benefits include reduced chlorine demand, reduced nitrification potential, and reduced regrowth in the distribution system which can reduce targeted flushing. However, similar to PFAS removal, the ability to remove organics or taste and odor compounds would diminish over time as the GAC media becomes exhausted.

17.6.3.2 FINISHED WATER STABILITY

As previously noted, the application of ozone/AOP can result in unstable biological stability and must be followed by a biological treatment process to avoid biological regrowth in the distribution system.

Results from the pilot-scale study indicate that effluent water quality from the GAC system is similar to the influent water quality, except with a reduction in organics and PFAS. Therefore, it is anticipated that this alternative does not require more chemical addition than the plant currently uses.

17.6.4 Operational and Residuals Handling Requirements

The ozone system will require regular maintenance including servicing components such as the chiller system and the liquid oxygen system. Several utilities in North Carolina utilize service contracts with a liquid oxygen supplier to provide the full maintenance of the system. In general, the ozone process will not result in a significant increase in residuals handling requirements. Utilities also typically have service contracts to handle the maintenance for the ozone generators, power supply units, and open/closed loop cooling systems.

Because the GAC system is not used for filtration and is located downstream of the existing filters, the GAC contactors would not require frequent backwashing. However, backwashing would need to occur during media installation to remove fines and entrained air and potentially throughout the bed life to fluff the media. Due to the larger size of these contactors and the distance from the existing backwash system, a set of backwashing pumps would be located at the GAC system to provide backwash flow and pressure.

Periodically the GAC would need to be replaced. As noted in the membrane sections, GAC could potentially be thermally reactivated. However, it could also become more challenging or expensive to transport, reactivate, or dispose of GAC.

During initial installation, the GAC media would be backwashed frequently or rinsed with waste sent to the backwash equalization basin. WTP staff would need to prepare for the installation by scheduling filter washes in advance and draining the backwash equalization basin as much as possible to provide maximum storage.

Piloting data and research indicates that backwash waste does not contain PFAS. It is proposed that backwash waste be sent to the existing backwash systems at the plant. It appears that the backwash treatment system has adequate capacity to handle infrequent GAC backwashing but additional evaluations should be conducted as part of preliminary engineering.

17.6.5 Cost Analysis

17.6.5.1 CAPEX

Table 17-21 presents the CAPEX of various components of the ozone/AOP and GAC treatment systems. The ozone/AOP system includes ozone generators, ozone contactors, chemical storage and feed systems, ozone monitors, piping, and valves. The GAC equipment includes GAC contactors and media, piping, and valves. The CAPEX also includes the cost to upgrade the existing access road to the Raw Water Pump Station since the placement of the ozone generation system at that location will require regular deliveries of liquid oxygen.

Table 17-21. Alternative 2 – CAPEX

Component		CAPEX
Process Equipment		$42,334,000
Building and Site Services		$10,585,000
Contractor Costs and Fees		$17,995,000
Escalation/Volatility		$10,638,000
Engineering Services		$10,638,000
Contingency		$21,275,000
	Total CAPEX:	**$113,465,000**
	Cost/MGD:	**$4.25**

17.6.5.2 OPEX

Annual OPEX in Table 17-22 includes power use and chemicals for the ozone/AOP system and GAC system, as well as GAC media replacement.

The GAC facility OPEX for media replacement is projected to be every 932 days for PFOS and PFOA to remain below draft MCLs. A majority of the GAC OPEX cost is media replacement, and the rest is for the dechlorination chemical.

Table 17-22. Alternative 2 – OPEX

Component		Annual OPEX
GAC Facility		$2,660,000
Ozone/AOP		$2,796,000
Operational Contingency		$546,000
	Total OPEX:	**$6,002,000**
	Cost/MGD:	**$0.33**

17.6.5.3 NET PRESENT VALUE

The NPV is presented in Table 17-23.

Table 17-23. Alternative 2 – NPV

Component	NPV
Ozone/AOP and GAC Facilities	$202,760,000

17.7 Treatment Alternative 3 – UV/AOP with GAC

17.7.1 Process Flow Diagram and Design Criteria

Alternative 3 consists of UV/AOP treatment for 1,4-dioxane followed by large, gravity GAC contactors that are operated similarly to a traditional gravity filter for PFAS treatment. The process flow diagram for Alternative 3 is shown in Figure 17-4. In this treatment train, the CFE would be dechlorinated and pumped through the UV/AOP process and flow by gravity to the GAC system. Following GAC treatment, the flow would connect back to the existing CFE line before the clearwells. This results in the full treatment and production of 26.7 MGD with GAC gravity contactors minus losses associated with the infrequent backwashing.

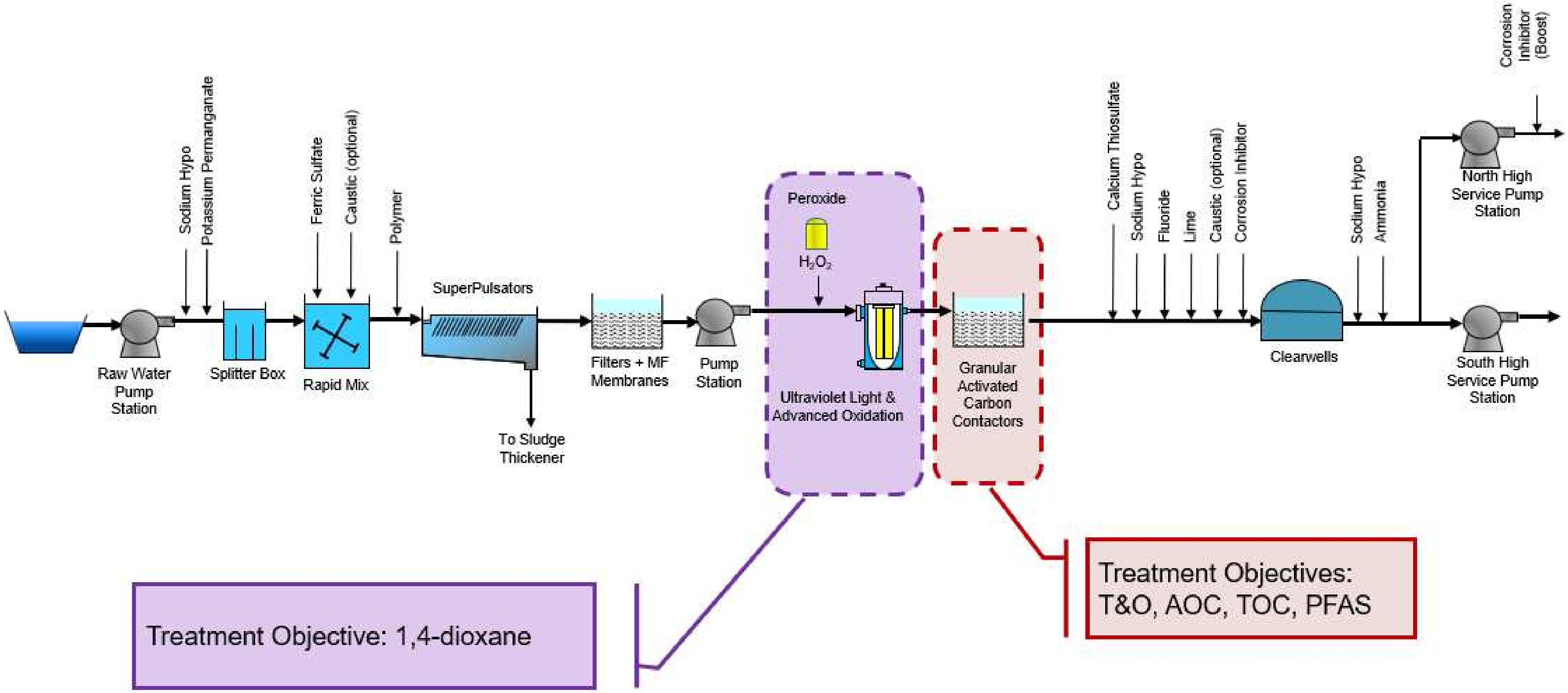

Figure 17-4. Alternative 3 – Process Flow Diagram

The design criteria for the UV system are provided in Table 17-24. Other UV appurtenances not shown include power cabinets, UV transmitter monitors, UV intensity sensors, lamp wipers, lamp sleeves, ballasts, control panels, and a hydrogen peroxide system.

Table 17-24. Alternative 3 – UV/AOP System Design Criteria

Criteria	Units	Value and Notes
Reactor quantity	each	40+1
Lamp pressure	N/A	Low Pressure, High Output
Flow rate per reactor	MGD	0.69
Reactor diameter	in.	24
Lamps per reactor	each	30
Lamp power	Watts	800
Design UV Dose	mJ/cm^2	2000
Hydrogen Peroxide Dose	mg/L	8

A new electrical service (or increased service) will be needed to provide the power demands of the UV/AOP and GAC system.

17.7.2 Site Layout and Hydraulic Impacts

Water from the filtration system would be routed to a pump station that would supply water to the UV system. Water would then flow by gravity through the UV system and onto the GAC gravity system before being routed back to the CFE line prior to the clearwells.

17.7.3 Water Quality Impacts

17.7.3.1 FINISHED WATER QUALITY

The finished water quality is similar to that presented in Alternative 2. UV/AOP has similar improvements to water quality as ozone/AOP. However, since this process is located downstream of filtration, fewer organics will be present for the UV/AOP process to degrade, resulting in slightly better biological stability than the ozone/AOP process.

An additional benefit of this treatment train is potentially utilizing UV/AOP for disinfection credit, which would reduce the CT required after chlorine and/or ammonia addition. From a long-term perspective, this could free up space in the clearwell that is currently needed for CT. Additional investigation would be required to understand how the UV/AOP system could be designed for both disinfection and 1,4-dioxane destruction.

17.7.3.2 FINISHED WATER STABILITY

The finished water stability is similar to that shown with Alternative 2.

17.7.4 Operational and Residuals Handling Requirements

The operational requirements for the UV/AOP system are similar to those presented in Alternatives 1A and 1B.

The operational and residuals handling requirements for GAC are similar to that shown in Alternative 2.

17.7.5 Cost Analysis for Treatment Train 3

17.7.5.1 CAPEX

Table 17-25 presents the CAPEX of various components of the UV/AOP and GAC treatment systems. UV/AOP equipment includes UV reactors, ballasts, lamps, lamp sleeves, lamp wipers, control panels, power cabinets, UV transmitter monitors, and UV intensity sensors.

The GAC equipment includes GAC vessels and media, piping, and valves.

Table 17-25. Alternative 3 – CAPEX

Component		CAPEX
Process Equipment		$40,029,000
Building and Site Services		$10,009,000
Contractor Costs and Fees		$17,016,000
Escalation/Volatility		$10,059,000
Engineering Services		$10,059,000
Contingency		$20,117,000
	Total CAPEX:	**$107,289,000**
	Cost/MGD:	**$4.02**

17.7.5.2 OPEX

Annual OPEX in Table 17-26 includes energy use, lamp/sensor replacement, and chemical use for the UV/AOP system, as well as GAC media replacement.

The GAC facility OPEX for media replacement is projected to be every 2,098 days for PFOS and PFOA to remain below MCLs. A majority of the GAC OPEX cost is media replacement, and the rest is for the dechlorination chemical.

Table 17-26. Alternative 3 – OPEX

Component		Annual OPEX
GAC Facility		$2,660,000
UV/AOP Facility		$1,332,000
Operational Contingency		$400,000
	Total OPEX:	**$4,392,000**
	Cost/MGD:	**$0.24**

17.7.5.3 NET PRESENT VALUE

The NPV is presented in Table 17-27.

Table 17-27. Alternative 3 – NPV

Component	NPV
GAC and UV/AOP Facilities	$172,631,000

17.8 Treatment Train Alternative Cost Summary

Table 17-28 summarizes the cost analysis for each treatment train alternative.

Table 17-28. Emerging Contaminant Treatment Train Alternatives – Cost Summary

Alternative	CAPEX		Annual OPEX		NPV
	Total	Cost per MGD	Total	Cost per MGD	
1A – RO + UV/AOP and GAC Concentrate Treatment (26.7 MGD Production)	$146,650,000	$5.49	$4,519,000	$0.25	$213,882,000
1B – RO + UV/AOP and GAC Concentrate Treatment (21.4 MGD Production)	$120,185,000	$5.62	$4,519,000	$0.25	$187,417,000
2 – Ozone/AOP + GAC Treatment	$113,465,000	$4.25	$6,002,000	$0.33	$202,760,000
3 – UV/AOP + GAC Treatment	$107,289,000	$4.02	$4,392,000	$0.24	$172,631,000

A

Appendix A. Emerging Contaminant Pilot Data

Daily Water Quality Data

GAC - Column 1 Effluent

Date	Time	Initials	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Influent Pressure (psi)	Effluent Pressure (psi)	Bed Depth (in)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.03	6.48	11.2	877	0.120	39	200			63.5	0.7	0.009
1/20/2023	11:00 AM	TH/WT	0.04	6.14	11.6	864	0.047	20	202	2.3	0	64	0.8	0
1/23/2023	10:30 AM	WT	0.06	6.00	11	783	0.061	20	190	2.5	-0.6	63	0.8	0.038
1/25/2023	10:00am	JD	0.05	6.13	11	797	0.058	15	195	2.3	-0.2	64.5	0.7	0.072
1/27/2023	8:25 AM	JY	0.05	5.90	**12.8**	617	0.060	12	141	2.4	0.7	63	0.7	0.064
1/30/2023	8:30am	JD	0.01	6.02	**11.9**	821	0.077	20	215	2.1	0.8	64	0.7	0.032
2/1/2023	9:15am	JY	0.04	6.00	**13.7**	697	0.060	15	191	3	3.6	63.5	0.7	0.031
2/3/2023	8:00am	jd	0.04	5.97	11.8	786	0.085	20	178	2.6	0	64	0.7	0.035
2/6/2023	9am	jd	0.01	5.99	10.7	793	0.091	21	185	2.5	-0.04	64	0.7	0.039
2/8/2023	8:40am	ES	0.03	6.10	12.9	805	0.043	17	190	2.2	1.4	62	0.7	0.057
2/10/2023	9:00 AM	JD	0.02	5.98	12.9	832	0.089	22	195	2.6	-0.3	63	0.7	0.037
2/13/2023	10am	JD	0.03	6.02	10.8	890	0.169	17	166	2.7	1	68	0.8	0.052
2/17/2023	9:10am	JY	0.05	6.00	14.3	949	0.311	14	198	2.8	0.4	67	0.7	0.063
2/20/2023	3	WT/JY	0.10	5.80	11.8	862	0.387	9	169	2.4	-0.1	65	0.7	0.059
2/22/2023	11:30	EAS	0.02	5.70	13.1	874	0.086	11	225	2.6	-0.3	67	0.7	0.145
2/24/2023	12:21pm	JY	0.04	5.88	14.1	819	0.322	10	224	3	0.3	67	0.7	0.077
2/27/2023	9:30AM	JD	0.01	5.86	13.9	788	0.178	13	185	2.9	0	67	0.8	0.093
3/1/2023	12:25pm	JY	0.05	5.96	15.7	772	0.533	15	187	2.2	1.8	67	0.7	0.059
3/3/2023	9:30AM	JD	0.03	6.19	15.6	786	0.265	25	182	3	0.3	67	0.6	0.089
3/6/2023	9:30am	jd	0.02	6.14	15.6	754	0.206	23	181	2.6	0	67.5	0.7	0.066
3/8/2023	8AM	EAS	0.04	6.30	15	675	0.278	29	195	2.8	0.2	66	0.8	0.090
3/10/2023	11AM	WT	0.09	6.40	15.4	608	0.200	27	195	2.7	0.2	66	0.8	0.088
3/13/2023	11AM	WT	0.04	6.50	14.9	696	0.120	33	190	2.6	-0.3	67	0.8	0.085
3/15/2023	8:15AM	EAS	0.03	6.40	13.9	665	0.166	39	195	2.5	0.6	66	0.8	0.081
3/17/2023	9AM	JD	0.03	6.31	14.3	777	0.136	30	205	2.8	-0.1	67.5	0.8	0.079
3/20/2023	8:36AM	JY	0.04	6.35	13.6	761	0.223	31	197	3	-0.4	67	0.7	0.083
3/22/2023	8:07	EAS	0.02	6.40	15	716	0.249	35	195	2.9	0.5	66	0.8	0.079
3/24/2023	1:00 PM	WT	0.09	6.51	25	796	0.331	42	190	2.9	-0.9	66	0.8	0.085
3/27/2023	8:30am	JD	0.03	6.51	17.2	836	0.197	43	191	2.1	-1.2	67	0.7	0.074
3/29/2023	8:23AM	EAS	0.02	6.61	16	763	0.123	46	179	2.5	0.7	67	0.8	0.072
3/31/2023	8:50AM	JY	0.05	6.73	17.4	792	0.139	47	197	2.9	0	67	0.7	0.078
4/3/2023	7:51AM	JY	0.06	6.61	17.3	786	0.117	47	212	3	0.1	67	0.7	0.121
4/5/2023	8AM	JD	0.02	6.54	18.2	818	0.094	55	218	2.7	0.4	67	0.7	0.119
4/7/2023	11:15AM	JY	0.05	6.67	19.2	778	0.110	49	198	2.4	-0.2	67	0.7	
4/10/2023	9:00 AM	JD/TH	0.03	6.61	15.9	845	0.063	59	210	2.9	0.1	67.5	0.8	0.131

GAC - Column 3 Effluent

Date	Time	Initials	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Influent Pressure (psi)	Effluent Pressure (psi)	Bed Depth (in)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.05	7.15	11.2	181.2	2.560	36	59			32	0.35	0.022
1/20/2023	11:00 AM	TH/WT	0.09	5.94	11.2	194.6	3.260	10	44	2.4	0.4	31.75	0.35	0.012
1/23/2023	10:30 AM	WT	0.09	5.81	10.2	159.4	0.071	15	38	2.6	1.7	33	0.40	0.031
1/25/2023	10:00am	JD	0.02	5.88	10.4	192.9	0.032	11	41	2.4	1.3	32.5	0.40	0.637
1/27/2023	8:25 AM	JY	0.04	5.70	11.7	157.6	0.070	7	42	3.3	2.3	32.5	0.50	0.013
1/30/2023	8:30am	JD	0.02	5.84	10.3	179.7	0.059	6	35	2.5	1.6	32	0.40	-0.008
2/1/2023	9:15am	JY	0.04	5.70	12.4	158.0	0.040	6	37	2.9	2.1	32.5	0.35	0.013
2/3/2023	8:00am	jd	0.02	5.77	10.3	179.4	0.041	9	38	2.5	1.6	32	0.30	0.015
2/6/2023	9am	jd	0.02	5.81	9.9	185.0	0.026	8	39	3	2.2	31.5	0.30	0.027
2/8/2023	8:40am	ES	0.02	5.80	11.1	178.4	0.030	10	42	2.8	2.1	32	0.36	0.019
2/10/2023	9:00 AM	JD	0.01	5.91	11.5	185.7	0.037	8	40	3.3	2.5	32	0.40	0.011
2/13/2023	10am	JD	0.02	5.93	10.7	206.6	0.045	9	35	2.4	1.1	33	0.40	0.022
2/17/2023	9:10am	JY	0.06	5.80	13.4	213.1	0.051	6	43	2.6	1.7	32	0.35	-0.01
2/20/2023	3	WT/JY	0.11	5.70	12.3	197.3	0.063	5	35	3.5	2.7	32	0.45	-0.018
2/22/2023	11:30	EAS	0.02	5.60	12.9	190.7	0.070	11	44	3.3	2.5	32	0.40	-0.016
2/24/2023	12:21pm	JY	0.02	5.69	14.1	177.6	0.069	6	38	2.4	1.2	32.5	0.35	0.009
2/27/2023	9:30AM	JD	0.02	5.76	12.7	183.5	0.067	7	40	2.9	2	32	0.30	0.001
3/1/2023	12:25pm	JY	0.04	5.66	14.7	179.5	0.093	6	34	2.7	1.8	32.5	0.36	0.015
3/3/2023	9:30AM	JD	0.03	5.85	14.5	175.6	0.048	10	39	2.9	1.9	32	0.40	0.018
3/6/2023	9:30am	jd	0.03	5.89	15.1	173.2	0.098	9	35	3.5	2.7	32	0.40	0.019
3/8/2023	8AM	EAS	0.03	5.90	14.8	167.1	0.030	12	43	3.1	2.3	32	0.40	0.018
3/10/2023	11AM	WT	0.08	6.10	15.1	170.2	0.050	15	40	3	2.2	32	0.40	0.024
3/13/2023	11AM	WT	0.07	6.10	14.2	172.8	0.092	15	45	3.4	2.6	32	0.40	0.011
3/15/2023	8:15AM	EAS	0.02	6.10	12.6	118.0	0.090	17	47	3.2	2.4	32	0.40	0.017
3/17/2023	9AM	JD	0.02	6.07	13.2	179.7	0.067	11	39	2.4	1	31.5	0.40	0.015
3/20/2023	8:36AM	JY	0.05	6.06	12.9	180.6	0.064	10	39	2.9	2.1	33	0.36	0.012
3/22/2023	8:07	EAS	0.01	6.10	14.3	158.5	0.068	13	40	2.5	1.6	32	0.30	0.014
3/24/2023	1:00 PM	WT	0.07	6.16	25	179.5	0.290	20	34	2.7	1.8	32	0.30	0.011
3/27/2023	8:30am	JD	0.01	6.22	16	178.4	0.056	15	45	2.5	1.7	32	0.30	0.010
3/29/2023	8:23AM	EAS	0.02	6.30	16.1	152.0	0.060	17	46	2.6	1.8	32	0.40	0.015
3/31/2023	8:50AM	JY	0.04	6.27	17	186.0	0.123	13	44	2.7	2	32	0.35	0.012
4/3/2023	7:51AM	JY	0.05	6.24	16.3	182.7	0.090	12	37	3.2	2.4	32.5	0.36	0.026
4/5/2023	8AM	JD	0.01	6.23	17.1	178.4	0.076	11	39	2.4	1.5	31.5	0.30	0.011
4/7/2023	11:15AM	JY	0.02	6.32	18.3	183.7	0.094	11	39	2.7	1.9	32	0.36	
4/10/2023	9:00 AM	JD/TH	0.03	6.42	15.3	190.2	0.068	20	39	2.6	1.8	32	0.30	0.007

GAC - Column 4 Effluent

Date	Time	Initials	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Influent Pressure (psi)	Effluent Pressure (psi)	Bed Depth (in)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.03	6.71	11.5	183.2	0.050	39	54			59	0.7	0
1/20/2023	11:00 AM	TH/WT	0.02	5.91	11.4	203.5	0.060	10	46	2.3	1.9	58.5	0.7	0.083
1/23/2023	10:30 AM	WT	0.08	5.79	9.9	161.4	0.038	10	35	2.4	1.9	56	0.7	0.127
1/25/2023	10:00am	JD	0.03	5.84	10.5	189.6	0.026	10	35	2	1.4	59	0.8	0
1/27/2023	8:25 AM	JY	0.05	5.70	12.7	158.5	0.030	7	38	2.5	2.1	59	0.7	0
1/30/2023	8:30am	JD	0.01	5.72	10.1	184.0	0.044	6	33	2.4	1.8	58.5	0.6	-0.008
2/1/2023	9:15am	JY	0.01	5.70	12.1	160.7	0.040	7	36	2.4	1.9	59	0.7	0.014
2/3/2023	8:00am	jd	0.01	5.71	10.1	174.4	0.034	8	41	2.3	1.7	59.5	0.7	0.012
2/6/2023	9am	jd	0.01	5.72	9.4	180.1	0.040	9	40	3.1	2.7	60	0.8	0.046
2/8/2023	8:40am	ES	0.01	5.70	10.9	111.4	0.028	11	42	2.4	1.9	58	0.9	0
2/10/2023	9:00 AM	JD	0.01	5.75	11.8	181.8	0.037	10	40	2.6	2.2	59	0.8	0.012
2/13/2023	10am	JD	0.01	5.81	10.8	201.5	0.037	7	33	2	1.9	63	0.8	0.021
2/17/2023	9:10am	JY	0.04	5.70	13.5	210.6	0.053	7	43	2.4	2.4	62.5	0.7	-0.022
2/20/2023	3	WT/JY	0.12	5.70	12.3	194.1	0.042	5	40	2.4	2.1	62	0.7	0.024
2/22/2023	11:30	EAS	0.03	5.60	13.2	182.1	0.070	15	40	2.2	1.9	61	0.8	-0.019
2/24/2023	12:21pm	JY	0.04	5.65	14.2	175.6	0.050	6	39	3.1	2.8	62.5	0.75	0.002
2/27/2023	9:30AM	JD	0.01	5.67	12.9	177.7	0.072	8	39	2.6	2.3	62.5	0.7	0.001
3/1/2023	12:25pm	JY	0.04	5.59	14.5	174.9	0.132	6	36	2.9	2.7	62.5	0.71	0.009
3/3/2023	9:30AM	JD	0.02	5.83	14.5	172.0	0.065	9	41	2.4	2.1	62	0.7	0.016
3/6/2023	9:30am	jd	0.02	5.83	15.1	169.1	0.059	10	34	2	1.6	62	0.7	0.014
3/8/2023	8AM	EAS	0.02	6.00	14.4	160.2	0.060	15	39	2.2	2.1	61	0.7	0.016
3/10/2023	11AM	WT	0.02	6.00	15.1	126.3	0.100	12	38	2.6	2.3	63	0.7	0.011
3/13/2023	11AM	WT	0.10	6.20	14.8	166.7	0.130	16	40	3.3	2	62	0.7	0.030
3/15/2023	8:15AM	EAS	0.02	6.00	12.7	169.3	0.090	12	37	2.4	2.1	61	0.7	0.010
3/17/2023	9AM	JD	0.01	5.97	13	170.6	0.119	10	37	2.9	1.8	62	0.7	0.013
3/20/2023	8:36AM	JY	0.05	5.99	12.9	175.1	0.089	9	38	2.3	0.6	62	0.71	0.016
3/22/2023	8:07	EAS	0.02	6.00	14.5	139.3	0.087	11	38	2.3	0.4	61	0.7	0.015
3/24/2023	1:00 PM	WT	0.06	6.10	25	171.8	0.116	17	32	2.4	0.6	62	0.7	0.014
3/27/2023	8:30am	JD	0.02	6.15	16.1	173.1	0.129	16	35	2.3	0.6	62	0.7	0.013
3/29/2023	8:23AM	EAS	0.02	6.26	15.2	167.2	0.112	18	43	2.3	0.6	61	0.7	0.015
3/31/2023	8:50AM	JY	0.06	6.21	17.1	172.2	0.135	11	40	2.4	0.5	62	0.7	0.013
4/3/2023	7:51AM	JY	0.04	6.18	16.1	175.1	0.133	12	34	2.4	0.5	62	0.72	0.075
4/5/2023	8AM	JD	0.02	6.15	17.2	174.2	0.153	16	40	2.5	0.6	62.5	0.7	0.017
4/7/2023	11:15AM	JY	0.04	6.21	18	175.6	0.114	12	35	2.4	0.7	62	0.73	
4/10/2023	9:00 AM	JD/TH	0.03	6.34	15.5	188.2	0.092	19	44	2.2	0.5	62.5	0.7	0.011

			Raw Feed	RO Membrane - Feed									
Date	Time	Initials	Cl2 Res (mg/L)	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Pressure (psi)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.23	0.07	5.65	11	186.0	0.040	8	40	131		0.024
1/20/2023	11:00 AM	TH/WT	0.19	0.05	5.55	10.8	197.8	0.042	7	48	127		0.013
1/23/2023	10:30 AM	WT	0.28	0.04	5.60	11.4	189.2	0.044	10	35	124		0.029
1/25/2023	10:00am	JD	0.15	0.02	5.55	10.6	184.9	0.045	9	37	123		0.028
1/27/2023	8:25 AM	JY	0.11	0.07	5.60	12.1	97.0	0.040	8	39	122		0.01
1/30/2023	8:30am	JD	0.17	0.01	5.69	11.1	179.6	0.024	9	36	123		0.015
2/1/2023	9:15am	JY	0.22	0.01	5.60	12.5	155.7	0.020	11	40	119		0.033
2/3/2023	8:00am	jd	0.23	0.02	5.58	10.6	175.4	0.047	9	38	119		0.021
2/6/2023	9am	jd	0.09	0.01	5.56	10.6	177.4	0.039	7	35	121		0.020
2/8/2023	8:40am	ES	0.19	0.01	5.60	11.5	166.2	0.038	8	39	120		0.020
2/10/2023	9:00 AM	JD	0.19	0.03	5.69	11.3	185.5	0.055	8	38	119		0.037
2/13/2023	10am	JD	0.07	0.03	5.58	12.5	196.4	0.070	7	40	116		0.035
2/17/2023	9:10am	JY	0.32	0.06	5.70	14.3	194.7	0.057	6	43	115		0.003
2/20/2023	3	WT/JY	0.45	0.12	5.59	13.5	190.8	0.057	4	39	111	19.8	0.011
2/22/2023	11:30	EAS	0.39	0.03	5.50	13.3	186.9	0.070	9	45	113	19.9	0.02
2/24/2023	12:21pm	JY	0.17	0.05	5.63	14.2	178.4	0.038	6	43	109		0.034
2/27/2023	9:30AM	JD	0.22	0.03	5.63	14.3	176.2	0.060	6	42	103		0.03
3/1/2023	12:25pm	JY	0.24	0.04	5.72	15.2	174.9	0.032	10	39	102		0.024
3/3/2023	9:30AM	JD	0.26	0.03	5.76	15.1	170.9	0.017	11	40	101		0.025
3/6/2023	9:30am	jd	0.23	0.02	5.79	15.1	174.7	0.043	11	37	98		0.01
3/8/2023	8AM	EAS	0.2	0.02	5.90	14.8	146.6	0.030	13	40	90		0.019
3/10/2023	11AM	WT	0.24	0.02	5.90	15.4	180.9	0.060	22	35	95	20	0.023
3/13/2023	11AM	WT	0.17	0.05	6.10	15	180.5	0.045	25	40	98	20	0.021
3/15/2023	8:15AM	EAS	0.12	0.01	5.90	14.6	167.1	0.050	13	39	95	20	0.023
3/17/2023	9AM	JD	0.12	0.01	5.95	13.9	172.6	0.038	11	35	101		0.021
3/20/2023	8:36AM	JY	0.16	0.04	5.92	13.3	172.1	0.101	14	35	97		0.022
3/22/2023	8:07	EAS	0.16	0.02	6.00	14.6	167.9	0.068	16	38	102	20	0.029
3/24/2023	1:00 PM	WT	0.24	0.10	6.06	25	174.6	0.062	20	42	101	20.1	0.020
3/27/2023	8:30am	JD	0.11	0.03	5.93	16.3	174.6	0.042	15	37	99		0.022
3/29/2023	8:23AM	EAS	0.02	0.02	6.23	15.8	156.2	0.028	19	40	88		0.019
3/31/2023	8:50AM	JY	0.13	0.06	6.16	17.3	172.9	0.026	15	39	91		0.023
4/3/2023	7:51AM	JY	0.13	0.05	6.11	16.6	175.5	0.034	16	43	90		0.049
4/5/2023	8AM	JD	0.09	0.02	6.04	17.4	176.9	0.019	17	39	92		0.026
4/7/2023	11:15AM	JY	0.1	0.04	6.07	18.3	176.8	0.028	16	41	80		
4/10/2023	9:00 AM	JD/TH	0.15	0.03	6.28	15.8	190.4	0.025	16	40	83		0.033

			RO Membrane - 1st Stage Permeate					RO Membrane - 2nd Stage Permeate				
Date	Time	Initials	Cl2 Res (mg/L)	Conductivity (uS/cm)	Hardness (mg/L as CaCO3)	Flow (gpm)	UV254 (cm-1)	Cl2 Res (mg/L)	Conductivity (uS/cm)	Hardness (mg/L as CaCO3)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.05	5.29		10.7	0.004	0.12	8.30	6	5.3	0.021
1/20/2023	11:00 AM	TH/WT	0.04	8.14	5	10.7	0.027	0.04	6.14	4	5.2	0.045
1/23/2023	10:30 AM	WT	0.05	8.71	6	10.7	0.003	0.05	6.40	5	5.3	0.000
1/25/2023	10:00am	JD	0.03	8.98	6	8	0.005	0.02	6.05	4	5.3	0
1/27/2023	8:25 AM	JY	0.06	4.68	8	10.6	0.009	0.06	5.47	5	5.3	0.011
1/30/2023	8:30am	JD	0.02	6.99	8	10.7	0.006	0.04	5.59	5	5.4	-0.002
2/1/2023	9:15am	JY	0.02	6.41	8	10.7	0.013	0.04	5.64	5	5.2	0.05
2/3/2023	8:00am	jd	0.02	7.26	8	10.6	0.012	0.02	5.82	6	5.2	0.047
2/6/2023	9am	jd	0.01	6.07	8	10.7	0.023	0.02	5.97	4	5.3	0.03
2/8/2023	8:40am	ES	0.02	5.77	6	10.7	0.036	0.02	5.93	4	5.3	0.038
2/10/2023	9:00 AM	JD	0.01	6.73	8	10.8	0.002	0.02	5.72	5	5.4	0.026
2/13/2023	10am	JD	0.01	6.53	8	10.7	0.027	0.02	6.01	4	5.3	0.021
2/17/2023	9:10am	JY	0.03	11.31	8	10.6	0.02	0.03	5.94	4.5	5.3	-0.003
2/20/2023	3	WT/JY	0.13	9.91	8	10.6	0.022	0.05	6.14	4	5.3	0.019
2/22/2023	11:30	EAS	0.01	5.33	6	11.1	-0.007	0.02	10.30	4	5.6	0.021
2/24/2023	12:21pm	JY	0.03	18.5	8	10.9	0.001	0.04	6.31	3.5	5.4	0.027
2/27/2023	9:30AM	JD	0.04	19.82	8	10.4	0	0.03	5.99	3	5.2	0.016
3/1/2023	12:25pm	JY	0.05	21.77	6	10.6	0.029	0.04	6.08	3	5.2	0.02
3/3/2023	9:30AM	JD	0.03	6.54	6	10.7	0.007	0.03	5.87	3	5.3	0.018
3/6/2023	9:30am	jd	0.03	7.19	6	10.6	0.008	0.02	6.00	3	5.3	0.018
3/8/2023	8AM	EAS	0.02	14.26	6	10	0.007	0.02	5.69	3	5	0.008
3/10/2023	11AM	WT	0.04	7.79	6	10.7	0.004	0.04	5.45	4	5.3	0.015
3/13/2023	11AM	WT	0.04	7.52	6	10.7	0.003	0.08	5.53	4	5.3	0.01
3/15/2023	8:15AM	EAS	0.01	8.05	6	10.3	0.003	0.03	5.59	4	5	0.011
3/17/2023	9AM	JD	0.01	6.98	6	10.7	0.006	0.04	5.59	3	5.3	0.014
3/20/2023	8:36AM	JY	0.05	13.7	6	10.5	0.005	0.05	5.68	4	5.1	0.010
3/22/2023	8:07	EAS	0.02	7.56	6	11	0.004	0.02	4.63	4	5.4	0.012
3/24/2023	1:00 PM	WT	0.07	10.87	6	10.7	0.004	0.04	4.97	4	5.5	0.014
3/27/2023	8:30am	JD	0.03	9.29	6	11	0.002	0.01	5.76	3	5.5	0.013
3/29/2023	8:23AM	EAS	0.01	11.8	6	10.6	0.003	0.02	5.45	4	5.1	0.011
3/31/2023	8:50AM	JY	0.05	13.36	6	10.6	0.002	0.04	5.62	3	5.4	0.014
4/3/2023	7:51AM	JY	0.05	22.79	6	10.4	0.006	0.04	5.78	3	5.3	0.016
4/5/2023	8AM	JD	0.01	6.23	6	10.9	0.006	0.01	5.90	3	5.3	0.012
4/7/2023	11:15AM	JY	0.05	17.9	7.9	10.1		0.04	6.12	2.5	5	
4/10/2023	9:00 AM	JD/TH	0.02	5.45	6	10.7	0.007	0.02	5.82	4	5.3	0.002

RO Membrane - Interstage

Date	Time	Initials	Cl2 Res (mg/L)	Conductivity (uS/cm)	Hardness (mg/L as CaCO3)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.08	376		5.3	0.125
1/20/2023	11:00 AM	TH/WT	0.05	386	134	5.2	0.038
1/23/2023	10:30 AM	WT	0.07	376	130	9.2	0.003
1/25/2023	10:00am	JD	0.03	377	128	5.3	0.04
1/27/2023	8:25 AM	JY	0.08	336	126	5.3	0.036
1/30/2023	8:30am	JD	0.03	375	127	5.4	-0.011
2/1/2023	9:15am	JY	0.05	353	125	5.2	0.039
2/3/2023	8:00am	jd	0.03	356	122	5.2	0.036
2/6/2023	9am	jd	0.01	359	124	5.3	0.018
2/8/2023	8:40am	ES	0.01	350	124	5.3	0.007
2/10/2023	9:00 AM	JD	0.02	367	126	5.4	0.052
2/13/2023	10am	JD	0.02	402	121	5.3	0.034
2/17/2023	9:10am	JY	0.03	405	122	5.3	0.054
2/20/2023	3	WT/JY	0.05	379	118	9.3	0.046
2/22/2023	11:30	EAS	0.02	360	122	5.6	0.022
2/24/2023	12:21pm	JY	0.04	350	121	5.4	0.04
2/27/2023	9:30AM	JD	0.05	349	112	5.2	0.024
3/1/2023	12:25pm	JY	0.04	343	112	5.2	0.059
3/3/2023	9:30AM	JD	0.02	346	113	5.3	0.042
3/6/2023	9:30am	jd	0.01	345	109	5.3	0.042
3/8/2023	8AM	EAS	0.02	325	99	5	0.053
3/10/2023	11AM	WT	0.03	337	104	9.3	0.012
3/13/2023	11AM	WT	0.05	339	104	9.3	0.008
3/15/2023	8:15AM	EAS	0.02	328	102	5	0.015
3/17/2023	9AM	JD	0.01	343	111	5.3	0.009
3/20/2023	8:36AM	JY	0.03	349	107	5.1	0.011
3/22/2023	8:07	EAS	0.02	329	115	5.4	0.009
3/24/2023	1:00 PM	WT	0.06	345	117	9.3	0.013
3/27/2023	8:30am	JD	0.02	350	116	5.5	0.009
3/29/2023	8:23AM	EAS	0.03	336	101	5.1	0.010
3/31/2023	8:50AM	JY	0.07	347	104	5.4	0.008
4/3/2023	7:51AM	JY	0.04	352	103	5.3	0.011
4/5/2023	8AM	JD	0.02	353	106	5.3	0.016
4/7/2023	11:15AM	JY	0.04	349	93	5	
4/10/2023	9:00 AM	JD/TH	0.00	376	94	5.3	0.078

RO Membrane - Total Permeate

Date	Time	Initials	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Pressure (psi)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.03	5.17	10.4	25.30	0.080	8	0	3	16	0.001
1/20/2023	11:00 AM	TH/WT	0.03	5.26	11.2	12.18	0.026	5	20	3	16	0.029
1/23/2023	10:30 AM	WT	0.08	5.23	10.7	12.26	0.045	8	15	3	16	0.044
1/25/2023	10:00am	JD	0.05	5.23	12.1	10.99	0.017	5	0	3	16	0.021
1/27/2023	8:25 AM	JY	0.05	5.20	11.5	7.00	0.020	5	0	3	15.8	0.004
1/30/2023	8:30am	JD	0.01	5.31	12.5	8.78	0.029	5	0	3	16	0.052
2/1/2023	9:15am	JY	0.02	5.20	13.3	8.27	0.020	4	0	3	15.9	0.011
2/3/2023	8:00am	jd	0.01	5.15	10.5	6.79	0.022	4	0	3	16	0.026
2/6/2023	9am	jd	0.01	5.21	10.6	7.87	0.028	3	0	3	16	0.024
2/8/2023	8:40am	ES	0.02	5.20	11.9	8.21	0.020	9	0	3	16	0.046
2/10/2023	9:00 AM	JD	0.01	5.21	12.4	7.28	0.020	6	0	4	16.1	0.084
2/13/2023	10am	JD	0.01	5.24	11.9	9.29	0.034	5	0	3	15.9	0.022
2/17/2023	9:10am	JY	0.03	5.30	13.5	6.96	0.049	3	0	3	15.9	-0.014
2/20/2023	3	WT/JY	0.02	5.36	13.3	13.41	0.045	3	0	3	15.9	-0.022
2/22/2023	11:30	EAS	0.01	5..3	13.1	6.95	0.050	7	0	3	16.4	-0.007
2/24/2023	12:21pm	JY	0.03	5.38	13.8	9.96	0.031	4	0	3	16.2	0.007
2/27/2023	9:30AM	JD	0.02	5.28	13.7	8.16	0.027	4	0	3	15.5	0.06
3/1/2023	12:25pm	JY	0.06	5.37	14.8	8.59	0.050	4	0	3	15.9	0.018
3/3/2023	9:30AM	JD	0.01	5.42	15.4	8.24	0.043	5	0	3	16.1	0.012
3/6/2023	9:30am	jd	0.02	5.42	15.1	8.39	0.025	6	0	3	15.7	0.012
3/8/2023	8AM	EAS	0.02	5.40	15	8.87	0.030	5	0	3	15.4	0.005
3/10/2023	11AM	WT	0.03	5.40	15.3	10.99	0.030	5	0	3	16	0.094
3/13/2023	11AM	WT	0.05	5.40	14.9	10.97	0.078	15	0	3	16	0.006
3/15/2023	8:15AM	EAS	0.01	5.40	13.6	10.20	0.080	6	0	3	15.3	0.005
3/17/2023	9AM	JD	0.01	5.42	13.9	10.22	0.023	5	0	3	15.9	0.007
3/20/2023	8:36AM	JY	0.04	5.37	13.1	8.14	0.024	5	0	3	15.6	0.010
3/22/2023	8:07	EAS	0.02	5.40	14.6	8.53	0.035	10	0	3	16.4	0.015
3/24/2023	1:00 PM	WT	0.10	5.41	25	20.81	0.088	8	0	3	16.2	0.009
3/27/2023	8:30am	JD	0.01	5.46	16	7.96	0.025	6	0	3	16.5	0.012
3/29/2023	8:23AM	EAS	0.03	5.55	16.1	7.27	0.021	13	0	3	16	0.014
3/31/2023	8:50AM	JY	0.05	5.44	17	7.91	0.040	4	0	3	15.9	0.011
4/3/2023	7:51AM	JY	0.05	5.44	16.4	7.52	0.039	5	0	4	15.6	0.016
4/5/2023	8AM	JD	0.01	5.51	17.5	6.84	0.025	6	0	4	16.4	0.012
4/7/2023	11:15AM	JY	0.02	5.49	18.3	8.27	0.031	4	0	3	15.2	
4/10/2023	9:00 AM	JD/TH	0.00	5.34	15.8	9.11	0.018	6	0	4	16	0.005

RO Membrane - Concentrate

Date	Time	Initials	Cl2 Res (mg/L)	pH (SU)	Temperature (°C)	Conductivity (uS/cm)	Turbidity (NTU)	Alkalinity (mg/L as CaCO3)	Hardness (mg/L as CaCO3)	Pressure (psi)	Flow (gpm)	UV254 (cm-1)
1/18/2023	2:00 PM	TH/JY	0.14	6.17	11.4	840	0.630	24	196	145	3.9	0.052
1/20/2023	11:00 AM	TH/WT	0.06	6.02	11.6	876	0.040	21	202	141	3.9	0.126
1/23/2023	10:30 AM	WT	0.04	5.95	12	832	0.079	20	183	140	3.9	0.124
1/25/2023	10:00am	JD	0.03	5.96	11.9	851	0.076	22	174	140	3.9	0.096
1/27/2023	8:25 AM	JY	0.16	6.00	12.6	760	0.030	17	172	138	3.9	0.103
1/30/2023	8:30am	JD	0.01	6.11	11.8	833	0.076	25	175	138	3.9	0.12
2/1/2023	9:15am	JY	0.04	6.00	13.8	804	0.040	15	179	135	3.9	0.099
2/3/2023	8:00am	jd	0.01	6.02	10.9	790	0.047	19	185	135	3.9	0.095
2/6/2023	9am	jd	0.01	6.03	11.3	794	0.048	15	178	139	4	0.095
2/8/2023	8:40am	ES	0.02	6.10	12.9	808	0.040	25	200	138	3.9	0.102
2/10/2023	9:00 AM	JD	0.02	5.99	12.9	826	0.045	22	165	135	3.9	0.0122
2/13/2023	10am	JD	0.02	5.85	12.6	904	0.064	20	205	134	3.9	0.120
2/17/2023	9:10am	JY	0.05	5.90	14.6	898	0.064	11	174	130	4	0.082
2/20/2023	3	WT/JY	0.06	5.74	14.1	836	0.072	8	169	129	3.9	0.124
2/22/2023	11:30	EAS	0.04	5.60	13.6	786	0.050	13	183	132	3.5	0.088
2/24/2023	12:21pm	JY	0.05	5.99	14.4	824	0.066	14	178	123	3.8	0.124
2/27/2023	9:30AM	JD	0.05	5.97	14.6	774	0.077	13	155	118	4	0.132
3/1/2023	12:25pm	JY	0.05	6.23	15.6	773	0.134	20	166	114	3.9	0.103
3/3/2023	9:30AM	JD	0.01	6.18	15.7	762	0.093	19	195	114	3.9	0.106
3/6/2023	9:30am	jd	0.03	6.22	15.2	734	0.098	22	171	110	4	0.106
3/8/2023	8AM	EAS	0.02	6.30	15.3	614	0.080	23	199	103	4	0.133
3/10/2023	11AM	WT	0.04	6.40	16	746	0.080	30	190	107	4	0.124
3/13/2023	11AM	WT	0.05	6.50	15.2	768	0.044	35	190	114	4	0.126
3/15/2023	8:15AM	EAS	0.03	6.40	13.5	722	0.090	39	184	115	4	0.123
3/17/2023	9AM	JD	0.01	6.36	14	758	0.042	29	151	121	4	0.116
3/20/2023	8:36AM	JY	0.16	6.43	13.8	771	0.095	28	165	123	4	0.112
3/22/2023	8:07	EAS	0.02	6.40	14.6	757	0.090	38	184	126	3.9	0.121
3/24/2023	1:00 PM	WT	0.13	6.58	25	784	0.083	45	190	123	3.9	0.115
3/27/2023	8:30am	JD	0.01	6.39	16.6	801	0.090	40	188	119	3.8	0.120
3/29/2023	8:23AM	EAS	0.01	6.64	16	761	0.072	48	193	107	3.8	0.119
3/31/2023	8:50AM	JY	0.07	6.72	17.8	784	0.041	38	183	106	3.9	0.116
4/3/2023	7:51AM	JY	0.03	6.65	17	788	0.060	47	177	108	4	0.122
4/5/2023	8AM	JD	0.01	6.63	18	804	0.071	50	170	108	4	0.128
4/7/2023	11:15AM	JY	0.05	6.60	18.8	769	0.106	40	162	93	3.9	
4/10/2023	9:00 AM	JD/TH	0.05	6.77	16.2	835	0.093	58	195	99	4	0.179

Weekly Water Quality Data

Date	Time	Initials	GAC - Column 1 TOC (mg/L)	GAC - Column 1 DOC (mg/L)	GAC - Column 3 TOC (mg/L)	GAC - Column 3 DOC (mg/L)	GAC - Column 4 TOC (mg/L)	GAC - Column 4 DOC (mg/L)	Raw Feed TOC (mg/L)	Raw Feed DOC (mg/L)
1/18/2023	2:30pm	MDF/MTH	0.7	0.86	0.283	0.363	2.90	5.77		
1/23/2023	2:45pm	MDF/MTH	2.69	4.54	0.380	0.513	0.36	2.55		
1/25/2023	11:45 AM	MDF/MTH		3.47		0.718		0.702		
1/30/2023	10:15am	MDF/MTH	4.27	3.88	0.553	1.15	0.527	0.767	1.78	2.89
2/6/2023	9:25am	MDF/MTH	5.8	6.09	0.757	0.983	2.08	3.22	2.15	2.26
2/13/2023	9:45am	MDF/MTH	6.5		0.825		0.868		2.35	
2/20/2023	10:00am	MDF/MTH	6.27		1.05		0.98		1.94	
2/27/2023	10:10am	MDF/MTH	6.07		0.922		0.96		1.88	
3/6/2023	9:55am	MDF/MTH	6.33		0.793		1.12		2.12	
3/13/2023	9:00am	MDF/MTH	8.68		1.1		1.38		2.53	
3/20/2023	10:15am	MDF/MTH	7.37		1.27		1.24		2.32	
3/27/2023	9:30am	MDF/MTH	11.1		1.83		1.78		2.75	
4/3/2023	10:00am	MDF/MTH	10.6		1.81		1.83		2.73	
4/10/2023	8:30am	MDF/MTH	8.88		1.72		1.75		2.56	

			RO Membrane - Feed														
Date	**Time**	**Initials**	**Total Fe (mg/L)**	**Diss Fe (mg/L)**	**Total Mn (mg/L)**	**Diss Mn (mg/L)**	**TOC (mg/L)**	**DOC (mg/L)**	**TDS**	**Chloride (mg/L)**	**Fluoride (mg/L)**	**Sulfate (mg/L)**	**Nitrate (mg/L)**	**Calcium (mg/L)**	**Magnesiu m (mg/L)**	**Potassium (mg/L)**	**Sodium (mg/L)**
1/18/2023	2:30pm	MDF/MTH	0.0237	0.0693	0.0085	0.009	2.05	1.97	72	20.9	0.13	45.1	0.32	24.6	11.8	12.9	44.9
1/23/2023	2:45pm	MDF/MTH					2	1.77			0.132	47.7					
1/25/2023	11:45 AM	MDF/MTH															
1/30/2023	10:15am	MDF/MTH	0.0262	0.0349	0.0056	0.0081	2.12	3.24	101	12.8	0.136	44.4	0.34	38.9	18.9	20.7	67.3
2/6/2023	9:25am	MDF/MTH					2.15	2.26			0.11	44.1	0.32				
2/13/2023	9:45am	MDF/MTH	0.0164	0.0324	0.0104	0.0146	2.26		85	15.5	0.17	45.3	0.31	38.2	19.2	19.2	65.3
2/20/2023	10:00am	MDF/MTH					2.3			14.7	1.44	47.9	0.045				
2/27/2023	10:10am	MDF/MTH	0.0286	0.0296	0.0061	0.0092	1.97		98	19.4	0.12	45.6	0.45	38.3	19.4	18.6	60.9
3/6/2023	9:55am	MDF/MTH					2.2			14.7	0.12	41.7	0.33				
3/13/2023	9:00am	MDF/MTH	0.0417	0.029	0.0079	0.0089	2.62		86	17.1	0.11	45.6	0.29	37.9	17.7	20.1	61.8
3/20/2023	10:15am	MDF/MTH	0.0258	0.0297	0.0062	0.0083	2.28			15	0.11	43.5	0.33	41.7	20.4	25.8	74.4
3/27/2023	9:30am	MDF/MTH					2.93		87	17.8	0.13	42.3	0.34				
4/3/2023	10:00am	MDF/MTH	0.0217	0.031	0.0062	0.0066	2.97			21.2	0.12	41.1	1.46	41.1	18.1	20.5	72.4
4/10/2023	8:30am	MDF/MTH					2.63		96	16.5	0.096	45.2	0.20				

			RO Membrane - 1st Stage Permeate						RO Membrane - 2nd Stage Permeate					
Date	Time	Initials	TOC (mg/L)	DOC (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)	TOC (mg/L)	DOC (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)
1/18/2023	2:30pm	MDF/MTH	0.243	0.247	0.801	0.02		0.025	0.223	0.3	0.644	0.02		0.005
1/23/2023	2:45pm	MDF/MTH	0.28	0.473			1.33		0.28	0.37			1.61	
1/25/2023	11:45 AM	MDF/MTH												
1/30/2023	10:15am	MDF/MTH	0.33	1.05	0.54	0.04		0.004	0.34	0.943	0.49	0.04		0.018
2/6/2023	9:25am	MDF/MTH	0.413	0.883			2.4		0.457	0.41			1.5	
2/13/2023	9:45am	MDF/MTH	0.468		0.76	0.04		0.067	0.468		0.59	0.04		0.04
2/20/2023	10:00am	MDF/MTH	0.557				2.19		0.557				1.78	
2/27/2023	10:10am	MDF/MTH	0.555		1.1	0.04		0.12	0.57		0.886	0.04		0.11
3/6/2023	9:55am	MDF/MTH	0.553				0.96		0.533				0.68	
3/13/2023	9:00am	MDF/MTH	0.512		1.03	0.04			0.602		0.897	0.04		
3/20/2023	10:15am	MDF/MTH	0.553				1.08		0.563				0.089	
3/27/2023	9:30am	MDF/MTH	0.477		1.41	0.03		0.05	0.487		1.09	0.04		0.06
4/3/2023	10:00am	MDF/MTH	0.522				1.03		0.522				0.59	
4/10/2023	8:30am	MDF/MTH	0.585		0.53	0.031		0.002	0.438		0.55	0.026		0.08

			RO Membrane - Interstage					
Date	Time	Initials	TOC (mg/L)	DOC (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (mg/L)	Nitrate (mg/L)
1/18/2023	2:30pm	MDF/MTH	4.02	3.84	53	0.22		0.639
1/23/2023	2:45pm	MDF/MTH	3.86	3.82			59	
1/25/2023	11:45 AM	MDF/MTH		5.19				
1/30/2023	10:15am	MDF/MTH	3.96	4.22	27.9	0.22		0.7
2/6/2023	9:25am	MDF/MTH	3.99	4.18			110.4	
2/13/2023	9:45am	MDF/MTH	4.41		32.1	0.26		0.72
2/20/2023	10:00am	MDF/MTH	3.85				87	
2/27/2023	10:10am	MDF/MTH	3.45		30.6	0.19		0.82
3/6/2023	9:55am	MDF/MTH	3.76				113.9	
3/13/2023	9:00am	MDF/MTH	4.80		34.9	0.21		
3/20/2023	10:15am	MDF/MTH	3.91				90.2	
3/27/2023	9:30am	MDF/MTH	5.34		33.7	0.19		0.67
4/3/2023	10:00am	MDF/MTH	5.54				176.4	
4/10/2023	8:30am	MDF/MTH	4.75		32.6	0.17		0.41

			RO Membrane - Total Permeate													
Date	**Time**	**Initials**	**Total Fe (mg/L)**	**Diss Fe (mg/L)**	**Total Mn (mg/L)**	**Diss Mn (mg/L)**	**TOC (mg/L)**	**DOC (mg/L)**	**TDS**	**Chloride (mg/L)**	**Fluoride (mg/L)**	**Sulfate (mg/L)**	**Nitrate (mg/L)**	**Calcium (mg/L)**	**Magnesium (mg/L)**	**Potassium (mg/L)**	**Sodium (mg/L)**
1/18/2023	2:30pm	MDF/MTH	0.0287	0.076	0.000	0.0001	0.2	0.257	479	0.58	0.03	1.35	0.006	0.05	0.02	0.08	0.5
1/23/2023	2:45pm	MDF/MTH					0.24	0.807			0.038	2.69					
1/25/2023	11:45 AM	MDF/MTH						2.26									
1/30/2023	10:15am	MDF/MTH	0.0226	0.0410	0.000	0.0000	0.333	0.733	24	0.83	0.371	0.19	0.014	0.0126	0.0038	0.0395	0.347
2/6/2023	9:25am	MDF/MTH					0.413	0.497			0.03	1.2	0.03				
2/13/2023	9:45am	MDF/MTH	0.0188	0.0369	0.001	0.0005	0.49		20	0.96	0.04	1.6	0.061	0.0142	0.0043	0.0368	0.369
2/20/2023	10:00am	MDF/MTH					0.543				0.06	1.23	0.046				
2/27/2023	10:10am	MDF/MTH	0.0296	0.0353	0.0001	0.0000	0.555		196	0.993	0.4	0.52	0.08	0.0042	0.0033	0.096	0.4678
3/6/2023	9:55am	MDF/MTH					0.557			0.781	0.5	0.45	0.029				
3/13/2023	9:00am	MDF/MTH	0.0122	0.032	0.0000	0.0001	0.555		102	1.3	0.04	0.56	0.04	0.0159	0.0142	0.0997	0.5584
3/20/2023	10:15am	MDF/MTH	0.0215	0.0323	0.0000	0.0000	0.507			0.583	0.04	0.71	0.03	0.0013	0.0003	0.1119	0.5183
3/27/2023	9:30am	MDF/MTH					0.513		116	1.18	0.04	0.55	0.07				
4/3/2023	10:00am	MDF/MTH	0.0045	0.0307	0.0000	0.0000	0.295					0.39	0.018	0.0103	0.0005	0.0791	0.6089
4/10/2023	8:30am	MDF/MTH					0.568		121	0.61	0.035	0.41	0.02				

			RO Membrane - Concentrate													
Date	**Time**	**Initials**	**Total Fe**	**Diss Fe**	**Total Mn**	**Diss Mn**	**TOC (ppm)**	**DOC (ppm)**	**TDS**	**Anions Cl (ppm)**	**Anions F (ppm)**	**Anions SO4**	**Anions NO3**	**Metals Ca**	**Metals Mg**	**Metals K**	**Metals Na**
1/18/2023	2:30pm	MDF/MTH	0.0694	0.069	0.0261	0.0277	8.67	8.58	531	113	0.54	over range	1.59	97.2	49.2	38.2	143.6
1/23/2023	2:45pm	MDF/MTH					8.33	8.32			0.497	244					
1/25/2023	11:45 AM	MDF/MTH															
1/30/2023	10:15am	MDF/MTH	0.0189	0.040	0.0215	0.0165	8.4	8.48	499	74.1	0.51	259	1.68	88.2	45.5	36.4	148.1
2/6/2023	9:25am	MDF/MTH					8.34	8.69			0.48	227.1	1.70				
2/13/2023	9:45am	MDF/MTH	0.0116	0.0384	0.039	0.0235	9.22		569	83.7	0.59	243	1.73	89	47.3	36.8	149.7
2/20/2023	10:00am	MDF/MTH					7.88			79.9	0.49	259	1.89				
2/27/2023	10:10am	MDF/MTH	0.0256	0.0290	0.020	0.027	7.36		491	70.7	0.42	207.6	1.82	99.4	59.7	43.8	159.8
3/6/2023	9:55am	MDF/MTH					7.71			85.7	0.45	195	1.51				
3/13/2023	9:00am	MDF/MTH	0.0196	0.0333	0.0196	0.0211	10.3		459	86.9	0.48	201	1.59	111.7	54.5	46.6	174.9
3/20/2023	10:15am	MDF/MTH	0.0157	0.0297	0.0257	0.0287	8.41			88.5	0.48	210.3	1.53	119.7	62.3	48.9	174.6
3/27/2023	9:30am	MDF/MTH					12.5		482	87.1	0.46	227.5	1.51				
4/3/2023	10:00am	MDF/MTH	0.018	0.0278	0.0265	0.0325	12.2			93		234.9	1.46	118.3	75.5	64.9	189.2
4/10/2023	8:30am	MDF/MTH					9.75		516	84	0.49	235.9	0.99				

PFAS Data

	GAC - Column 1															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	4.4	0	0	0	0	0	0	0
2/6/23	0	0	0	0	6.1	0	7.7	8.9	19	0	0	0	16	13	0	0
2/20/23	0	0	0	0	10	0	8.5	12	25	0	0	2	20	12	0	0
3/6/23	0	0	0	0	12	0	9.5	13	28	0	0	2.2	23	13	0	0
3/20/23	0	0	0	0	15	3.2	12	18	32	0	0	4.1	49	17	0	0
4/3/23	0	0	0	0	14	3	11	16	31	0	0	3.5	45	16	0	0

	GAC - Column 3															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/3/23	0	0	0	0	0	0	0	0	2.6	0	0	0	0	0	0	0

	GAC - Column 4															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/23	0	0	0	0	0	0	0	0	2.6	0	0	0	0	0	0	0
4/3/23	0	0	0	0	0	0	0	0	3.4	0	0	0	0	0	0	0

	RO Membrane - Feed															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	4.3	0	3.3	5.2	8.5	0	0	0	9	4.7	0	0
2/6/23	0	0	0	0	3.9	0	3.4	5.5	8.3	0	0	0	12	5.9	0	0
2/20/23	0	0	0	0	3.4	0	2.7	4.5	7.2	0	0	0	8.8	4.2	0	0
3/6/23	0	0	0	0	4.2	0	2.8	4.6	7.2	0	0	0	8.7	4.4	0	0
3/20/23	0	0	0	0	3.8	0	3	4.9	7.6	0	0	0	8.6	4.5	0	0
4/3/23	0	0	0	0	3.9	0	2.9	4.7	7.4	0	0	0	8.1	4.3	0	0

	RO Membrane - 1st Stage Permeate															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/3/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RO Membrane - 2nd Stage Permeate															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/3/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RO Membrane - Interstage															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	8.6	0	6.7	10	18	0	0	2.1	20	10	0	0
2/6/23	0	0	0	0	8.7	0	6.2	10	17	0	0	0	19	9.4	0	0
2/20/23	0	0	0	0	7.6	0	5.8	9.4	15	0	0	0	19	8.9	0	0
3/6/23	0	0	0	0	7.5	0	5.5	9.3	14	0	0	0	17	8.6	0	0
3/20/23	0	0	0	0	7.4	0	5.7	9.7	15	0	0	0	18	8.7	0	0
4/3/23	0	0	0	0	6.7	0	5.4	9.2	14	0	0	0	17	8.5	0	0

	RO Membrane - Total Permeate															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3/20/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4/3/23	0	0	0	0	0	0	0	2.2	0	0	0	0	12	0	0	0

	RO Membrane - Concentrate															
	GENx HFPO-DA	ADONA	NEtFOSAA	NMeFOSAA	PFBS	PFDA	PFHpA	PFHxS	PFHxA	PFDoA	PFTA	PFNA	PFOS	PFOA	PFTrDA	PFUnA
Date	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
1/23/23	0	0	0	0	4.8	2.8	16	25	43	0	0	5.1	49	24	0	0
2/6/23	0	0	0	0	19	2.4	15	24	42	0	0	4.3	44	23	0	0
2/20/23	0	0	0	0	18	2.2	14	23	37	0	0	4	45	21	0	0
3/6/23	0	0	0	0	17	2.2	13	23	35	0	0	3.9	43	21	0	0
3/20/23	0	0	0	0	17	2	13	22	35	0	0	3.6	42	19	0	0
4/3/23	0	0	0	0	18	2.1	14	24	37	0	0	3.9	42	21	0	0

External Lab Water Quality Data
- RO Membrane

	Barium (ug/L)			Silica (mg/L)			Strontium (ug/L)			Bromide (ug/L)			1,4-dioxane (ug/L)					
DATE	Feed	Total Permeate	Concentrate	Feed	Total Permeate	Concentrate	Feed	Total Permeate	Concentrate	Feed	Total Permeate	Concentrate	Feed	1st Stage Permeate	2nd Stage Permeate	Interstage	Total Permeate	Concentrate
1/23/2023	<400	<400	<400	7.5	<2.0	38	77	<2.0	380	16	<10	79	0.07	2.2	<0.070	4.8	0.07	12
1/30/2023													3.1				0.089	14
2/6/2023	<400	<400	<400	7.9	<2.0	40	80	<2.0	400	20	<10	99	2.2	<0.070	<0.070	4.7	0.07	14
2/13/2023													2.7				0.07	13
2/20/2023	20	<2.0	93	7.5	<0.043	36	76	<2.0	350	12	<10	57	2.7	<0.070	0.087	5.3	0.11	13
2/27/2023													2.26				0.091	13
3/6/2023	17	<2.0	80	6.2	<0.043	30	73	<2.0	350	16	<10	75	2.5	0.11	0.13	4.8	0.11	11
3/13/2023													2.1				0.074	11
3/20/2023	19	<2.0	93	6.2	<0.043	30	76	<2.0	350	15	<10	68	2.9	0.47	0.55	5.6	0.25	11
3/28/2023													2.3				0.07	11
4/3/2023	17	<2.0	86	5.7	<0.043	30	76	<2.0	380				2.3	0.11	0.12	4.6	0.1	11
4/5/2023													2.4	0.22			0.12	12
4/5/2023													2.3	0.12			0.16	12
4/10/2023													1.7				0.074	8.3

B

Appendix B. Xylem Bench-Scale Ozone/UV/AOP Test Report

OZONE AOP TREATABILITY STUDY REPORT
PIEDMONT REGIONAL WATER AUTHORITY
RANDLEMAN, NC

Customer:

Samantha Black

HDR

Description:

O_3/UV/AOP Dose-Response Testing

Subject:

O_3/UV/AOP treatment study to reduce 1,4-dioxane and manganese from membrane effluent and RO concentrate.

Prepared by:
Robert Piercey
Applications Development Engineer, Research & Development
Xylem Inc.

Table of Contents

Xylem Inc., Department of Research & Development
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1. Background

HDR is exploring the use of Advanced Oxidation Process (AOP) technologies to reduce the concentration of 1,4-dioxane and manganese from membrane effluent and RO concentrate at the Piedmont Triad Regional Water Authority in Randleman, NC. Xylem has been asked to perform various UV/chlorine, UV hydrogen peroxide and ozone-hydrogen peroxide dose test points to determine the treatment necessary to reduce the concentration of 1,4-dioxane and manganese to a sufficient level.

2. Sample Characterization

The treatability testing was conducted at Xylem's R&D facility in Charlotte, North Carolina. The "as received" sample's initial analysis results are listed in Table 1 below.

Table 1: Initial Analysis

Parameter	Results (RO Concentrate)	Results (Membrane Effluent)	Units	Method	Detection Limit/Range	Performed
Appearance	Clear	Clear	[-]	visual	NA	XYLEM
Hardness, Total	425	75	[mg CaCO3/L]	HACH Digital Titrator Method	10 – 4000 mg/L	XYLEM
pH	6.0	5.4	[-]	FISHER SCIENTIFIC Accumet Basic pH-Meter	0 -12	XYLEM
Alkalinity	80	40	[mg CaCO3/L]	HACH Water Quality Test Strip	0 - 240	XYLEM
UVT_{254nm}	71.0	95.4	[%]	HACH DR6000	1%	XYLEM
Color	5	2	[PtCo CU]	HACH, Platinum Cobalt Method	0 – 500 PtCo CU	XYLEM
Iron	0.025	0.010	[mg/L]	HACH TPTZ Method	0–1.8 mg/L	XYLEM

3. Ozone Testing

HPLC water (High Purity Water for Liquid Chromatography) was chilled to about 2-4 degrees Celsius and ozonated for about 45 min in a glass reservoir using diffusing stones. The achieved ozone concentration was 59 mg/l and was measured using HACH Indigo Trisulfonate AccuVacs.

Mixing the ozone stock solution with the actual sample in predefined ratios resulted in a range of ozone doses being delivered to the sample. The glass reservoir is equipped with a bottle top dispenser for precise and quick delivery of the ozone stock solution into the sample. The combined sample is then mixed using a stirring plate and stir bar. For the ozone AOP samples, H_2O_2 was added immediately following the addition of ozone.

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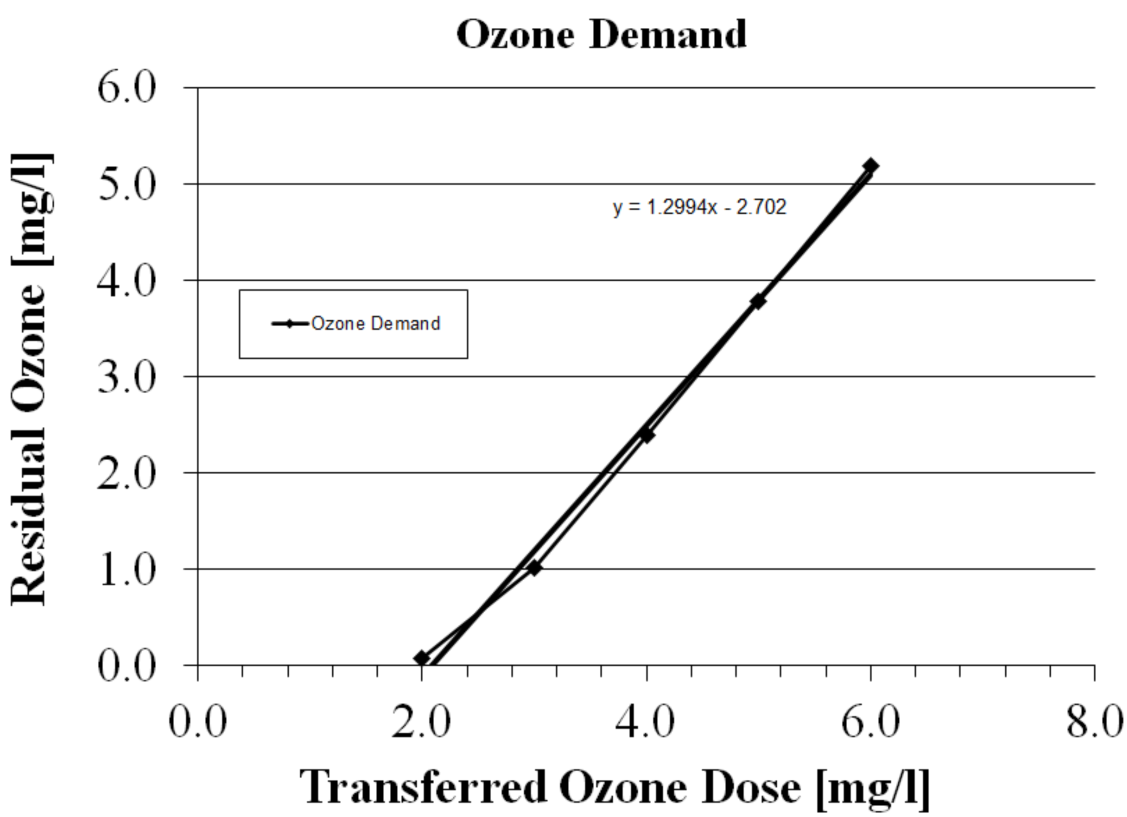
The sample was continually mixed using a stir bar and the dissolved ozone concentration is measured and recorded continuously using an online dissolved ozone monitor manufactured by Analytical Technology, Inc. The basic element in the ozone monitor is a polarographic membraned sensor. The sensor consists of a gas permeable membrane stretched tightly over a gold cathode. A silver anode and electrolyte solution complete the internal circuit. During operation ozone diffused through the membrane is reduced by means of a polarization voltage. The resulting current is directly proportional to the ozone concentration in the sample.

4. Ozone Demand Determination

The initial ozone demand is defined as the smallest ozone dose in which a residual can be detected. Initial ozone demand test results are presented in Figure 1. Using this data, the initial ozone demand of the RO concentrate water sample was determined to be approximately 2.08 mg/L.

Figure 1: Ozone Demand



Ozone doses of 0, 6, 10 & 15 mg/L with H_2O_2 doses of 3, 5, 7, 6, 10 & 15 mg/L were applied to the sample to determine the impact of ozone & H_2O_2 on the 1,4-dioxane and manganese concentrations in the received water sample. The analysis of 1,4-dioxane & manganese was contracted by Eaton Analytical/eurofins located in South Bend, IN. The ozone doses were allowed to decay over time resulting in the curves presented in Figure 2.

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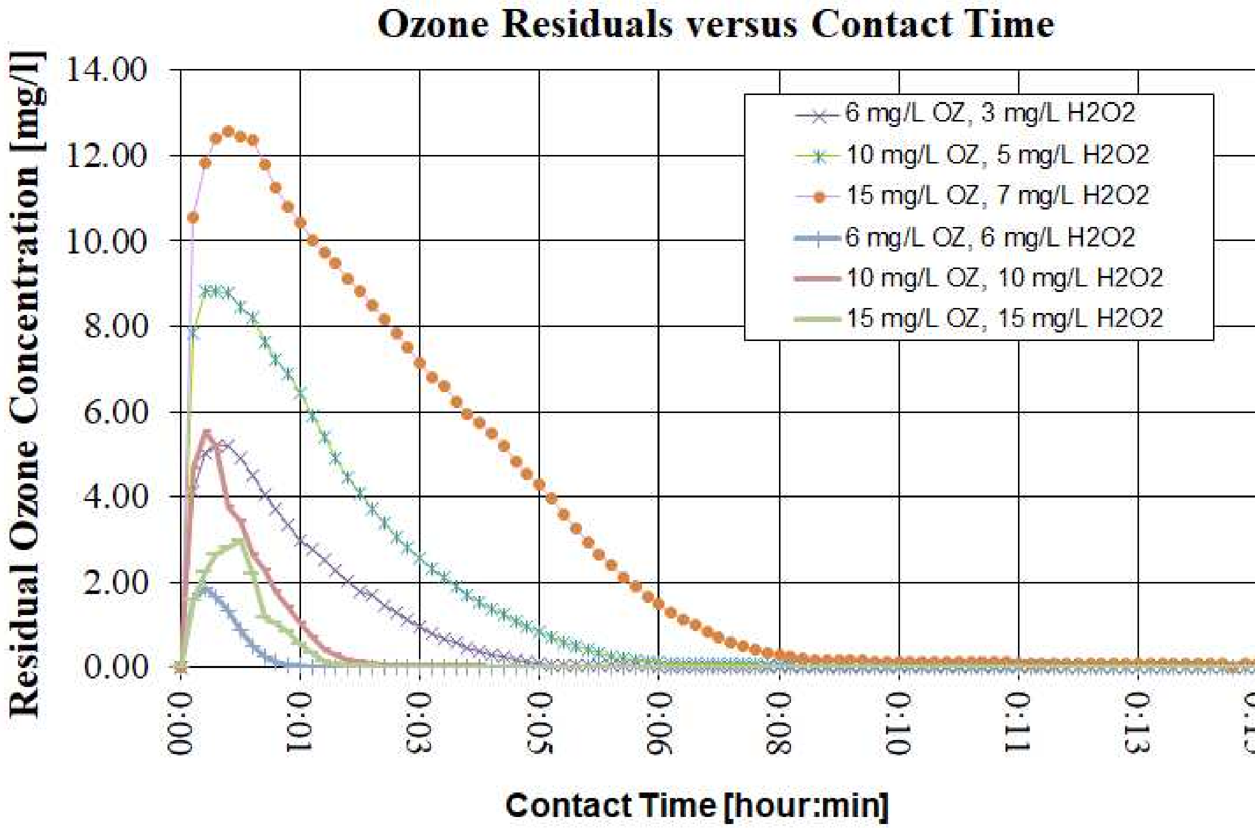
Figure 2: Ozone Residuals



After the initial ozone demand and decay testing was completed, seven (7) tests were conducted over a range of ozone & H_2O_2 doses to determine the impact on the 1,4-dioxane and manganese concentrations in the RO concentrate water sample. The RO concentrate water sample's 1,4-dioxane concentration was 11µg/L. Ozone doses of 6, 10 & 15 mg/L + H_2O_2 doses of 50% of the ozone doses reduced the 1,4-dioxane concentrations to 2.7, 0.44 & 0.092 µg/L, respectively. Ozone doses of 6, 10 & 15 mg/L + H_2O_2 doses equal to the ozone doses reduced the 1,4-dioxane concentrations to 5.0, 1.2 & 0.16 µg/L, respectively. These results are shown in Table 2 and Figure 3.

Table 2: Ozone Treatability results: (RO concentrate)

Sample Number	Ozone Dose	H_2O_2 Dose	1,4-dioxane concentration		Total Manganese concentration	Dissolved Manganese concentration	Bromide	Bromate
	[mg/L]	[mg/L]	[µg/L]	[Log Reduction]	[µg/L]	[µg/L]	[µg/L]	[µg/L]
23OZ011-A00	0	0	11	0.00	210	190	72	n/a
23OZ011-A01	6	3	2.7	0.61	180	170	n/a	1.8
23OZ011-A02	10	5	0.44	1.39	160	160	n/a	2.5
23OZ011-A03	15	7	0.092	2.07	140	130	n/a	3.5
23OZ011-A04	6	6	5.0	0.34	180	170	n/a	1.1
23OZ011-A05	10	10	1.2	0.96	160	150	n/a	1.7
23OZ011-A06	15	15	0.16	1.83	140	130	n/a	3.1

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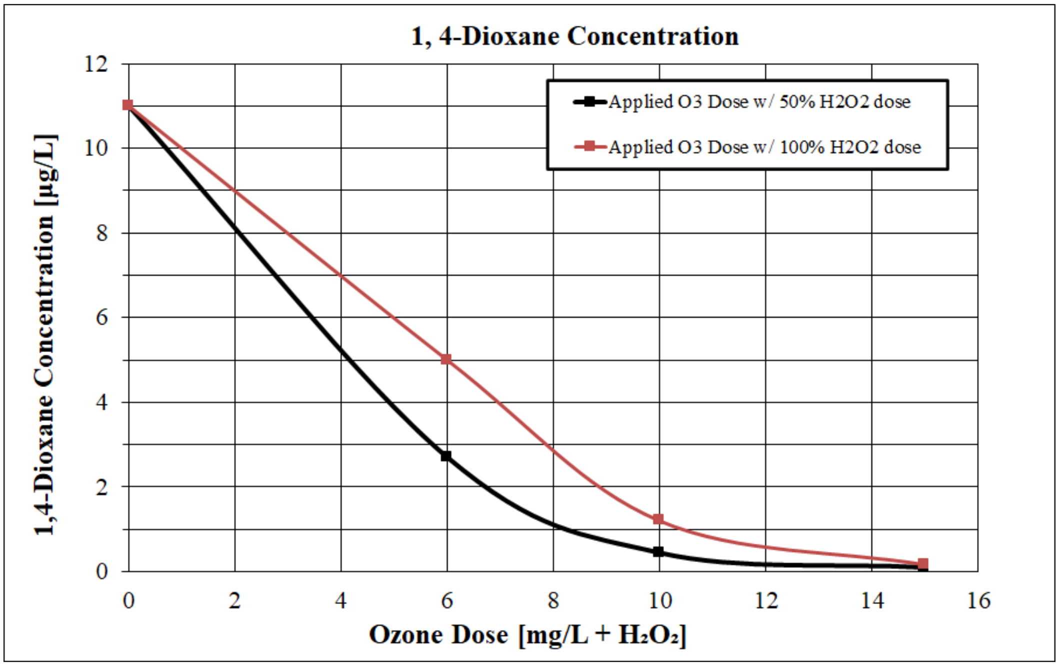
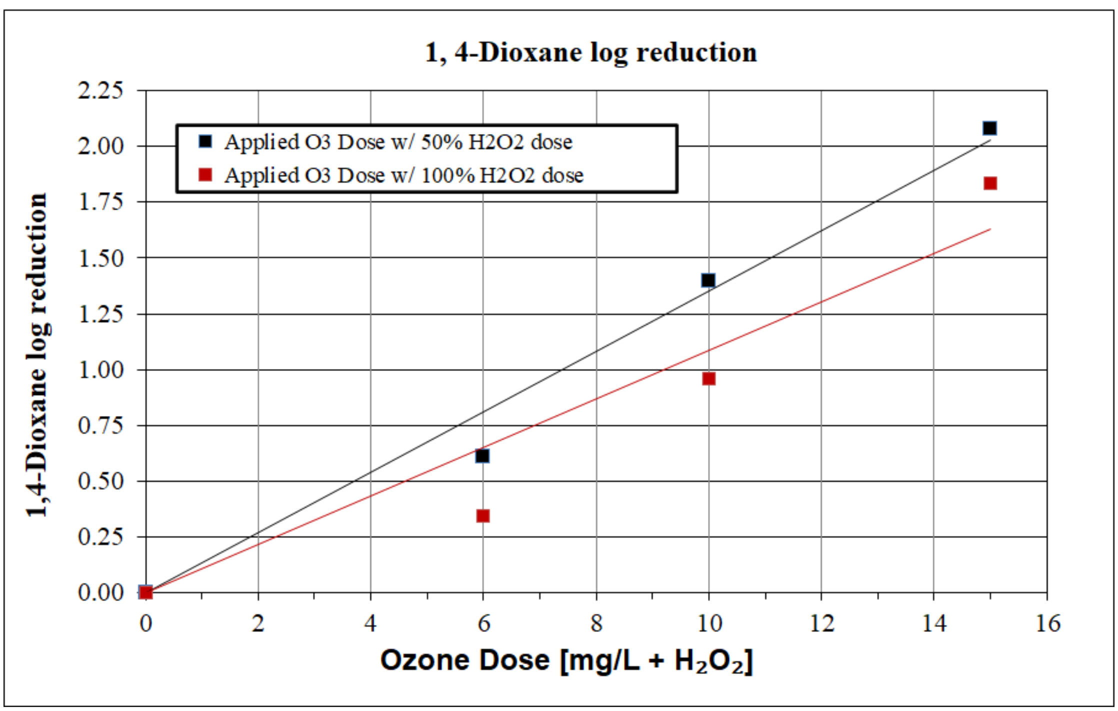
Figure 3: Impact of Ozone & H_2O_2 doses on 1,4-dioxane concentration.



The ozone doses of 6, 10 & 15 mg/l, with 50% H_2O_2 doses, provided 1,4-dioxane log reductions of 0.61, 1.3979 & 2.0776 respectively. The ozone doses of 6, 10 & 15 mg/l, with H_2O_2 doses equal to the ozone doses, provided 1,4-dioxane log reductions of 0.3424, 0.9622 & 1.8373 respectively. This can be seen visually in Table 2 and graphically in Figure 4.

Figure 4: Log Reduction of water sample's 1,4-dioxane concentration after O_3 & H_2O_2 doses.



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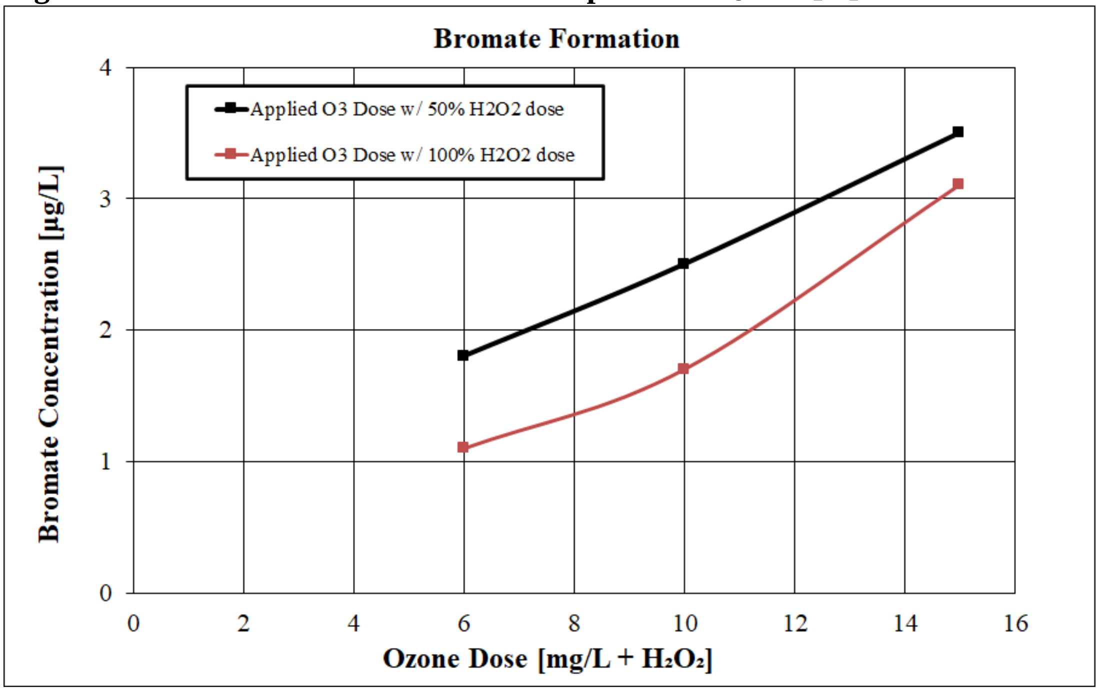
The RO concentrate sample's bromide concentration was 72 µg/L. An ozone dose of 15 mg/L + 7 mg/L of H_2O_2 resulted in a bromate concentration of 3.5 µg/L. An ozone dose of 15 mg/L + 15 mg/L of H_2O_2 resulted in a bromate concentration of 3.1 µg/L. This can be seen visually in Table 2 and graphically in Figure 5.

Figure 5: Bromate formation in water sample after O_3 & H_2O_2 doses.



The Ozone + H_2O_2 doses had various effects on the Color, Iron, and UVT of the RO concentrate water sample. These results are shown in Table 3.

Table 3: RO concentrate water sample O_3/H_2O_2 Treatability results:

Applied O_3 Dose	Applied H_2O_2 Dose	Color	UVT	Sample-ID
[mg/L]	[mg/L]	[PtCo CU]	[%]	[-]
0	0	5	71.0	23OZ011-A00
6	3	2	84.1	23OZ011-A01
10	5	3	86.9	23OZ011-A02
15	7	3	89.4	23OZ011-A03
6	6	0	82.9	23OZ011-A04
10	10	0	86.5	23OZ011-A05
15	15	0	88.3	23OZ011-A06

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5. Collimated Beam Study

UV Collimated Beam Testing

The Collimated Beam Device consists primarily of a lamp unit containing 4 low-pressure/low intensity UV-lamps, a monitoring device, a sensor (for control purposes only), a measuring table and magnetic stirrer. The exposure times are controlled by a timed shutter.

The UV intensity at 254nm wavelength is measured at the same sample surface than the water to be irradiated utilizing a portable International Light radiometer IL1700 with a SED240 UV sensor prior testing. By controlling and measuring the exposure time and maintaining a fixed UV-intensity the UV-dose can be calculated:

APPLIED UV DOSE (mJ/cm²) = APPLIED UV INTENSITY (mW/cm²) * EXPOSURE TIME (s)

The treated water samples were irradiated in 500 ml aliquots at pre-determined series of exposure times. The sample in the sterile petri dish will be well mixed throughout irradiation. Five (5) tests were conducted, which provided a wide range of UV-Chlorine doses. Addition of chlorine occurred immediately prior to the application of the UV doses.

6. UV + H_2O_2 Treatability Results

The Membrane Effluent sample's 1,4-dioxane concentration was measured to be 2.6 µg/L. The UV doses of 1700 & 2500 mJ/cm² + 8 mg/L of H_2O_2 decreased the 1,4-dioxane concentration to 0.15 & < 0.070 µg/L respectively. The UV doses of 500, 1000, 1700 & 2500 mJ/cm², with 8 mg/L H_2O_2 doses, provided 1,4-dioxane log reductions of 0.43, 0.70, 1.24 & 1.57, respectively. This can be seen visually in Table 4 and graphically in Figure 6 and 7.

Table 4: UV + H_2O_2 Treatability results: (Membrane Effluent)

Test	UV Dose (mJ/cm²)	H_2O_2 Dose (mg/L)	1,4-dioxane concentration (µg/L)	1,4-dioxane (log reduction)	Total Manganese concentration (µg/L)	Dissolved Manganese concentration (µg/L)	Sample ID
1	0	0	2.6	0.00	470	440	23UV011-B00
2	500	8	0.97	0.43	470	440	23UV011-B01
3	1000	8	0.52	0.70	470	440	23UV011-B02
4	1700	8	0.15	1.24	470	440	23UV011-B03
5	2500	8	< 0.070	1.57	470	440	23UV011-B04

The RO Concentrate sample's 1,4-dioxane concentration was measured to be 11 µg/L. The UV doses of 2000 & 3000 mJ/cm² + 12 mg/L of chlorine decreased the 1,4-dioxane concentration to 2.7 & 1.0 µg/L respectively. The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm², with 12 mg/L H_2O_2 doses, provided 1,4-dioxane log reductions of 0.14, 0.31, 0.40, 0.61 & 1.04, respectively. This can be seen visually in Table 5 and graphically in Figures 6 and 7.

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Table 5: UV + H_2O_2 Treatability results: (RO Concentrate)

Test	UV Dose (mJ/cm²)	H_2O_2 Dose (mg/L)	1,4-dioxane concentration (µg/L)	1,4-dioxane (log reduction)	Total Manganese concentration (µg/L)	Dissolved Manganese concentration (µg/L)	Sample ID
	0	0	11.0	0.00	210	190	23UV011-A00
6	500	12	8.0	0.14	210	200	23UV011-B05
7	800	12	5.4	0.31	210	200	23UV011-B06
8	1400	12	4.4	0.40	210	200	23UV011-B07
9	2000	12	2.7	0.61	210	200	23UV011-B08
10	3000	12	1.0	1.04	210	200	23UV011-B09

Figure 6: UV + H_2O_2 1,4-dioxane concentration:

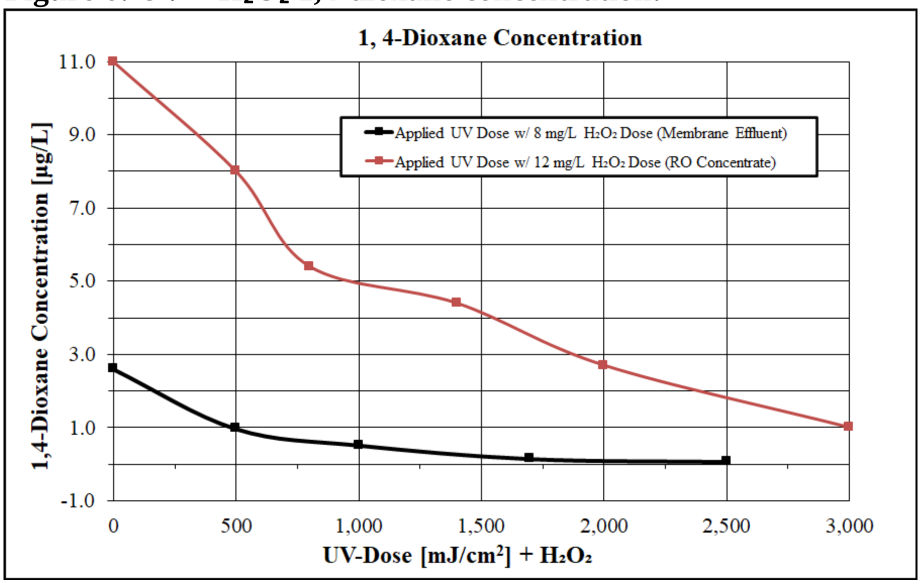
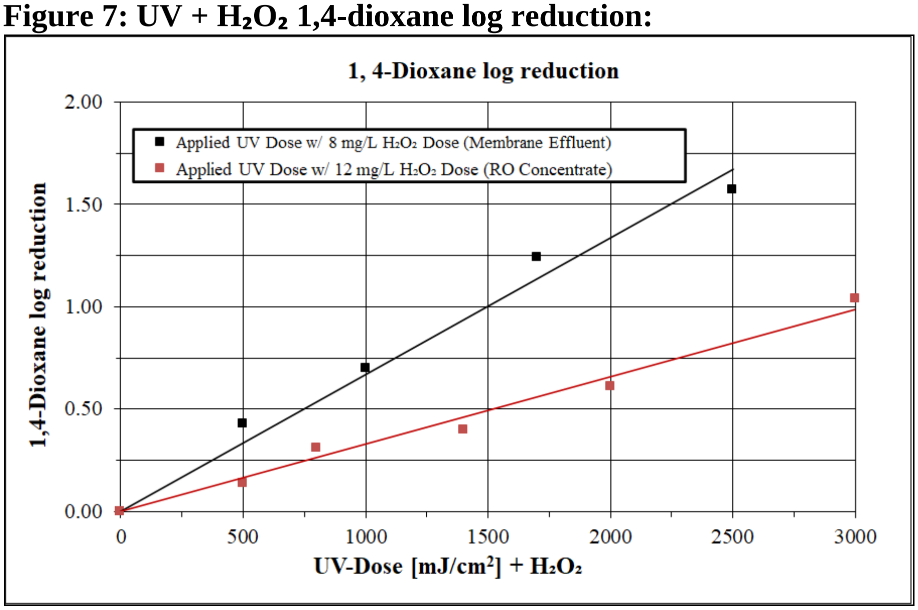


Figure 7: UV + H_2O_2 1,4-dioxane log reduction:



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7. UV + Chlorine Treatability Results

The Membrane Effluent sample's 1,4-dioxane concentration was measured to be 2.6 µg/L. The UV doses of 500, 1000, 1700 & 2500 mJ/cm² + 2 mg/L of chlorine decreased the 1,4-dioxane concentration to 1.6, 0.61, 0.73 & .75 µg/L respectively. The UV doses of 500, 1000, 1700 & 2500 mJ/cm², with 2 mg/L chlorine doses, provided 1,4-dioxane log reductions of 0.21, 0.63, 0.55 & 0.54, respectively. This can be seen visually in Table 6 and graphically in Figure 8 and 9.

Table 6: UV + Chlorine Treatability results: (Membrane Effluent)

Test	UV Dose (mJ/cm²)	Cl Dose (mg/L)	1,4-dioxane concentration (µg/L)	1,4-dioxane (log reduction)	Total Manganese concentration (µg/L)	Dissolved Manganese concentration (µg/L)	Sample ID
0	0	0	2.6	0.00	470	440	23UV011-B00
1	500	2	1.6	0.21	470	430	23UV011-C01
2	1000	2	0.61	0.63	470	440	23UV011-C02
3	1700	2	0.73	0.55	470	440	23UV011-C03
4	2500	2	0.75	0.54	470	440	23UV011-C04

The RO concentrate's sample's 1,4-dioxane concentration was measured to be 11.0 µg/L. The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm² + 4 mg/L of chlorine decreased the 1,4-dioxane concentration to 9.8, 9.5, 8.8, 9.2 & 8.4 µg/L respectively. The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm² + 4 mg/L of chlorine doses, provided 1,4-dioxane log reductions of 0.05, 0.06, 0.10, 0.8 & 0.12, respectively. This can be seen visually in Table 7 and graphically in Figure 8 and 9.

Table 7: UV + Chlorine Treatability results: (RO Concentrate)

Test	UV Dose (mJ/cm²)	Cl Dose (mg/L)	1,4-dioxane concentration (µg/L)	1,4-dioxane (log reduction)	Total Manganese concentration (µg/L)	Dissolved Manganese concentration (µg/L)	Sample ID
0	0	0	11.0	0.00	210	190	23UV011-B00
5	500	4	9.8	0.05	210	190	23UV011-C05
6	800	4	9.5	0.06	210	190	23UV011-C06
7	1400	4	8.8	0.10	210	180	23UV011-C07
8	2000	4	9.2	0.08	210	170	23UV011-C08
9	3000	4	8.4	0.12	210	190	23UV011-C09

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Figure 8: UV + Chlorine 1,4-dioxane concentration:

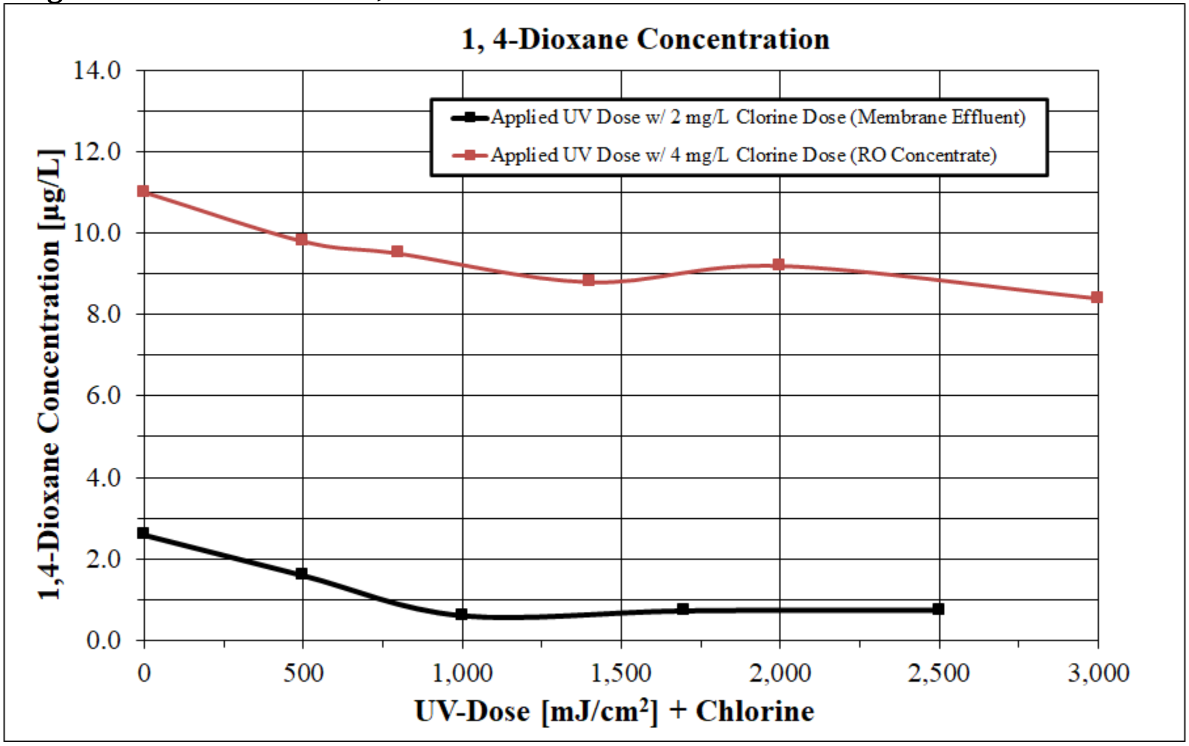
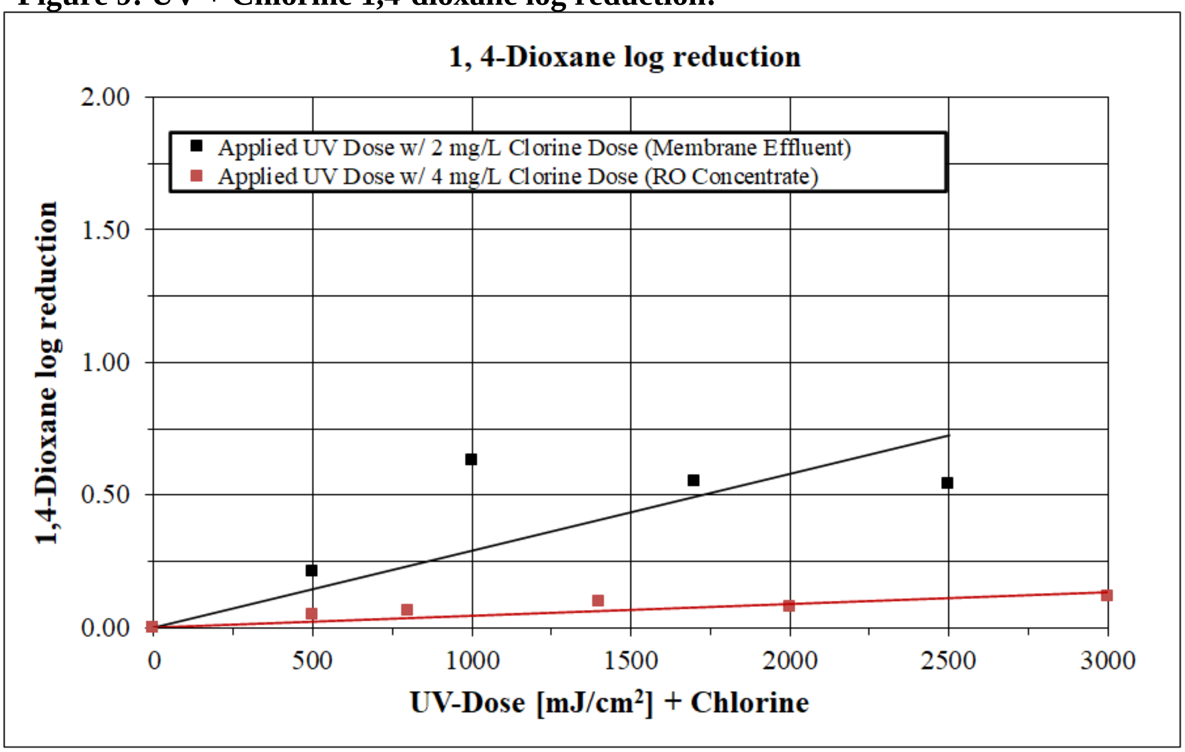


Figure 9: UV + Chlorine 1,4-dioxane log reduction:



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8. Ozone/UV/Hydrogen Peroxide Treatability Study Conclusions

The Ozone/UV/AOP treatability test results conducted for the Piedmont Triad Regional Water Authority with RO Concentrate & Membrane Effluent samples, taken on March 20th, 2023, are summarized below:

I) The ozone demand of the RO Concentrate water sample was determined to be ~2.08 mg/L.

II) The 1,4-dioxane concentration of the RO Concentrate sample was 11µg/L. The 1,4-dioxane concentration of the Membrane Effluent sample was 2.6 µg/L.

III) Ozone doses of 6, 10 & 15 mg/L + H_2O_2 doses of 50% of the ozone doses reduced the 1,4-dioxane concentration of the RO Concentrate sample to 2.7, 0.44 & 0.092 µg/L, respectively.

IV) Ozone doses of 6, 10 & 15 mg/L + H_2O_2 doses equal to the ozone doses reduced the 1,4-dioxane concentration of the RO Concentrate sample to 5.0, 1.2 & 0.16 µg/L, respectively.

V) The ozone doses of 6, 10 & 15 mg/l, with 50% H_2O_2 doses, applied to the RO Concentrate sample provided 1,4-dioxane log reductions of 0.61, 1.39 & 2.07 respectively.

VI) The ozone doses of 6, 10 & 15 mg/l, with H_2O_2 doses equal to the ozone doses, applied to the RO Concentrate sample provided 1,4-dioxane log reductions of 0.34, 0.96 & 1.83 respectively.

VII) The RO Concentrate sample's bromide concentration was 72 µg /L.

VIII) An ozone dose of 15 mg/L + 7 mg/L of H_2O_2, applied to the RO Concentrate water sample, resulted in a bromate concentration of 3.5 µg/L. An ozone dose of 15 mg/L + 15 mg/L of H_2O_2, applied to the RO Concentrate water sample, resulted in a bromate concentration of 3.1 µg/L.

IX) The UV doses of 1700 & 2500 mJ/cm² + 8 mg/L of H_2O_2, applied to the Membrane Effluent's water sample, decreased the 1,4-dioxane concentration to 0.15 & < 0.070 µg/L respectively.

X) The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm², with 12 mg/L H_2O_2 doses, applied to the Membrane Effluent's water sample, provided 1,4-dioxane log reductions of 0.14, 0.31, 0.40, 0.61 & 1.04, respectively.

XI) The UV doses of 500, 1000, 1700 & 2500 mJ/cm² + 2 mg/L of chlorine, applied to the Membrane Effluent's water sample, decreased the 1,4-dioxane concentration to 1.6, 0.61, 0.73 & .75 µg/L respectively.

XII) The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm² + 4 mg/L of chlorine, applied to the RO Concentrate water sample, decreased the 1,4-dioxane concentration to 9.8, 9.5, 8.8, 9.2 & 8.4 µg/L respectively.

XIII) The UV doses of 500, 800, 1400, 2000 & 3000 mJ/cm² + 4 mg/L of chlorine doses, applied to the RO Concentrate water sample, provided 1,4-dioxane log reductions of 0.05, 0.06, 0.10, 0.08 & 0.12, respectively.

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Ozone Testing Apparatus

Ozone Testing Apparatus

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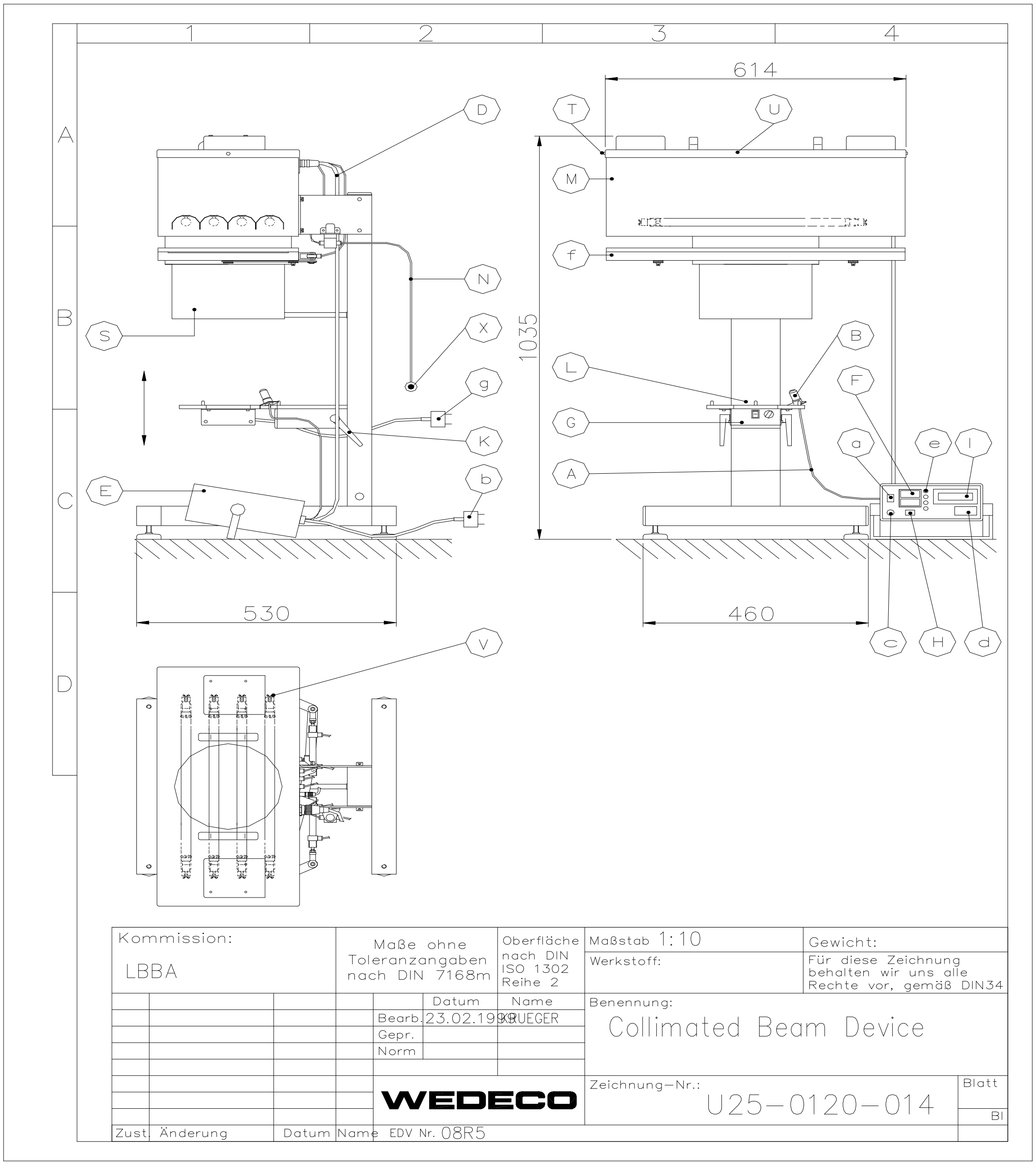
Collimated Beam Device



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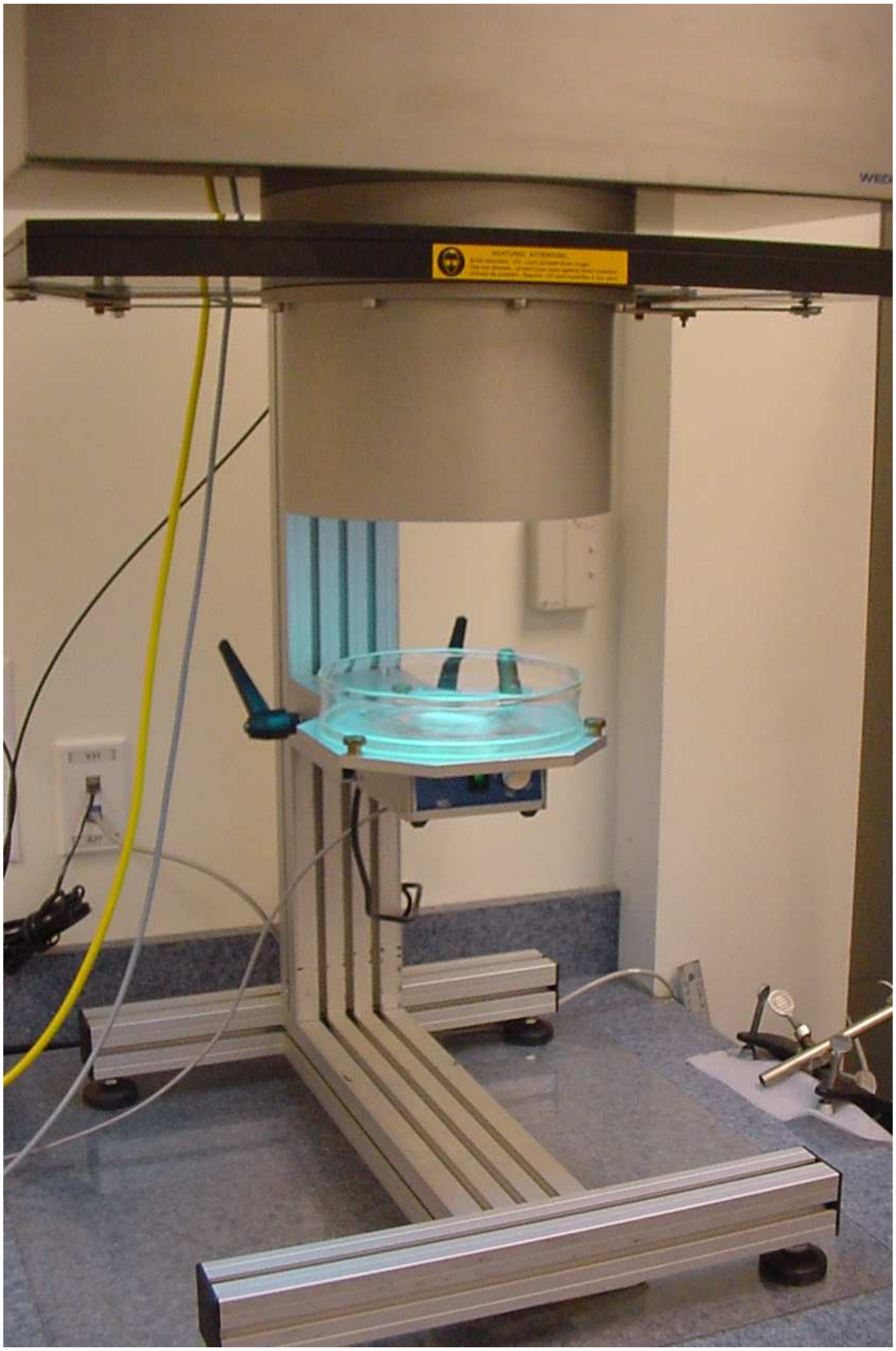
Collimated Beam Device



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C

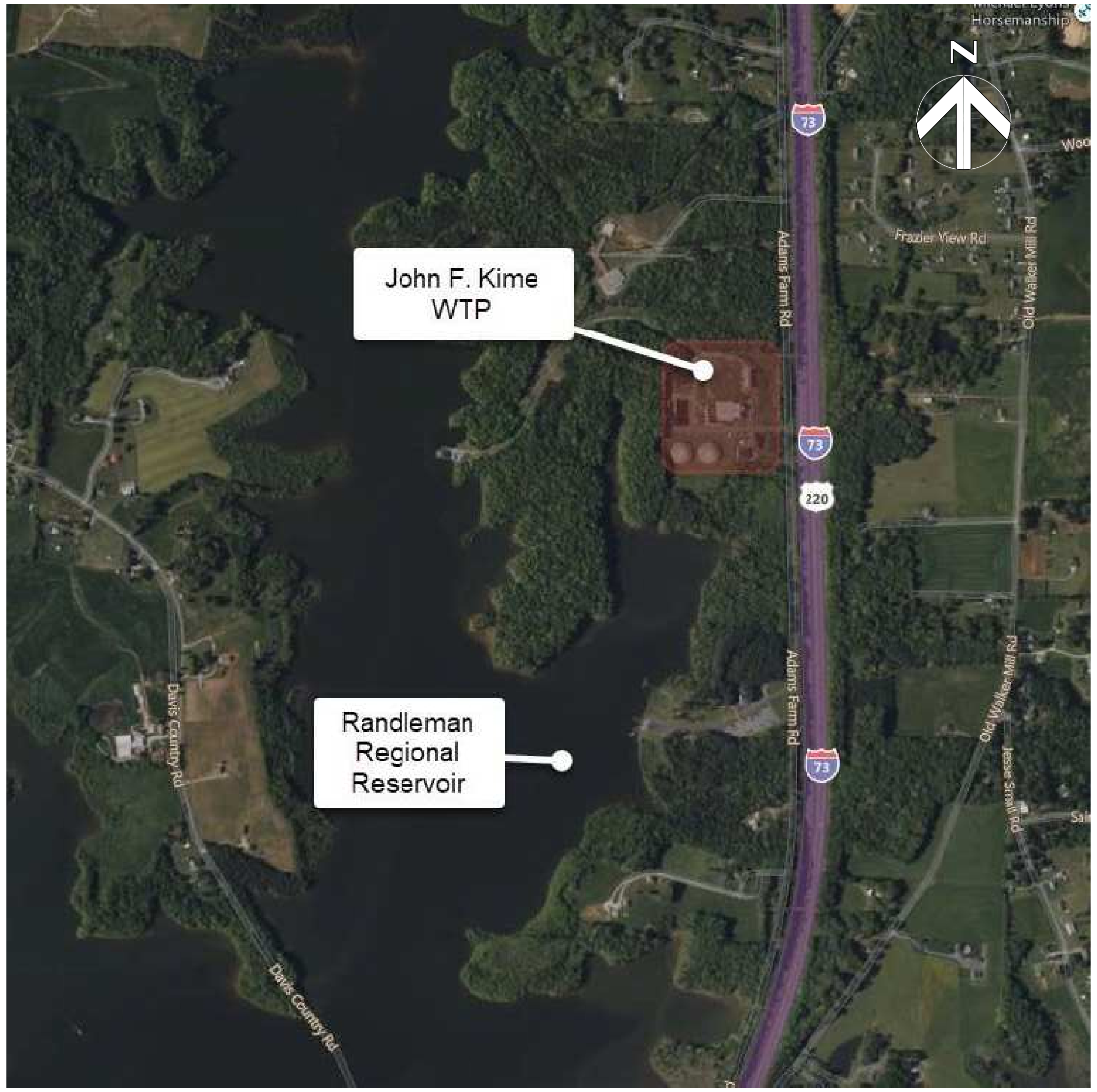
Appendix C. Preliminary Drawings

HDR Engineering, Inc. of the Carolinas
555 Fayetteville Street, Suite 900
Raleigh, NC 27601
919.232.6600

N.C.B.E.L.S. License Number F-0116

HDR Architecture, Inc.
440 S. Church Street, Suite 1000
Charlotte, NC 28202
704.338.6700

N.C. Board of Architecture
License Number 50019



Contract Drawings For

Piedmont Triad Regional Water Authority

Water Treatment Plant Expansion

30% Issued For Review

HDR Project No. 10343268
Project Address:
7297 Adams Farm Road
Randleman, NC 27317

Date: September 2023

PRELIMINARY - NOT FOR CONSTRUCTION OR RECORDING

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SHEET #	DESCRIPTION
SERIES 00 - GENERAL	
00G001	COVER SHEET
00G002	SHEET INDEX
00G003	ABBREVIATIONS
00G004	GENERAL LEGEND
00G006	HYDRAULIC PROFILE - SPLIT FLOW
00G007	EQUIPMENT DESIGN CRITERIA
00G008	PROCESS FLOW DIAGRAM
00MP001	MECHANICAL LEGEND
00E001	ELECTRICAL LEGEND
00Y001	INSTRUMENTATION LEGEND
00Y002	INSTRUMENTATION LEGEND
SERIES 01 - CIVIL	
01V101	EXISTING CONDITIONS
01X101	DEMOLITION
01C102	OVERALL SITE PLAN
01C103	SITE PLAN ENLARGEMENT
01C201	GRADING AND DRAINAGE PLAN
01C301	RAW WATERLINE PLAN AND PROFILE STA 0+00 TO STA 12+50
01C302	RAW WATERLINE PLAN AND PROFILE STA 12+50 TO STA 25+00
01C501	CIVIL DETAILS
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10DX101	DEMOLITION PLAN
10D101	PLAN
10D301	SECTION
SERIES 11 - SPLITTER BOX	
11S101	FOUNDATION AND UPPER PLANS
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11D101	PLANS
11D301	SECTIONS
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15S103	UPPER PLAN
15S301	SECTIONS
15S302	SECTIONS
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15D101	UPPER AND LOWER PLAN
15D301	SECTIONS 1
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52D101	PLAN AT EL 712.00
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71DX101	UPPER AND LOWER DEMOLITION PLAN
71DX102	SLUDGE TRANSFER PUMP STATION DEMOLITION PLANS AND SECTION
71DX301	DEMOLITION SECTIONS
71D101	UPPER AND LOWER PLAN
71D102	SLUDGE TRANSFER PUMP STATION PLANS AND SECTION
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72G101	LIFE SAFETY PLAN
72S101	FOUNDATION PLAN
72S102	ROOF PLAN
72S301	SECTIONS
72A101	FLOOR PLAN
72A102	ROOF PLAN
72A201	BUILDING ELEVATIONS
72A301	BUILDING SECTIONS
72D101	PLAN
72D102	BELOW GRADE PLAN
72D301	SECTIONS

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73G101	LIFE SAFETY PLAN
73S101	FOUNDATION PLAN
73S102	FRAMING PLAN
73S301	SECTIONS
73S501	DETAILS
73D101	PLAN
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74D301	SECTIONS
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12Y602	FLASH MIXER P&ID
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15Y605	SUPERPULSATOR NO.4 P&ID
15Y606	SUPERPULSATOR AND MEDIA FILTER WATER SAMPLE P&ID
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55Y601	SETTLING POLYMER SYSTEM
70Y601	SLUDGE POLYMER SYSTEM P&ID
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71Y602	BELT PRESS P&ID
72Y601	EQUALIZATION AND DECANT LAGOON P&ID
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98E601	OPERATIONS BUILDING - POWER ONE-LINE DIAGRAM
98E602	RAW WATER PUMP STATION - POWER ONE-LINE DIAGRAM

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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	C. CROTWELL
DRAWN BY	J. SEAGLE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SHEET INDEX

0 1" 2"

FILENAME 10343268-00-G.rvt

SCALE NONE

SHEET 00G002

A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
A	AMPERE
AB	ANCHOR BOLT
ABAN	ABANDON
ABC	AGGREGATE BASE COURSE
ABT	ABOUT
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACP	ACOUSTIC CEILING PANEL, ASPHALTIC CONCRETE PAVEMENT
ACST	ACOUSTIC
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AI	AREA INLET, ANALOG INPUT
AIC	AMPS INTERRUPTING CAPACITY
ALIG	ALIGNMENT
ALT	ALTERNATE, ALTITUDE
ALUM	ALUMINUM
AM	ACOUSTICAL MATERIAL
AMB	AMBIENT
ANC	ANCHOR
AO	ANALOG OUTPUT
AP	ACCESS PANEL
APRX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURAL
ASSY	ASSEMBLY
AT	ACOUSTICAL TILE, AMP TRIP
ATC	ACOUSTICAL TILE CEILING
ATM	ATMOSPHERE AUTO AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
AWT	ACOUSTICAL WALL TILE
B TO B	BACK TO BACK
BAL	BALANCE
BBD	BULLETIN BOARD
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER, BOLT CIRCLE
BD	BOARD
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE, BOARD FEET
BITUM	BITUMINOUS
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER, BOLLARD
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BTWLD	BUTT WELD
BU	BELL UP, BUILT-UP
BUR	BUILT-UP ROOFING
BW	BOTH WAYS
BYP	BYPASS
CTOC	CENTER TO CENTER
C&G	CURB AND GUTTER
C	CHANNEL SHAPE, CENTIGRADE, CONDUIT
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG, CATALOGIORY
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCW	COUNTER CLOCKWISE
CDF	CONTROLLED-DENSITY FILL
CE	CONCRETE EDGE
CER	CERAMIC
CF	CUBIC FEET (FOOT)
CFL	COUNTER FLASHING
CHBD	CHALKBOARD
CHD	CHORD
CHFR	CHAMFER
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIPB	CONCRETE INTERLOCKING PAVER BALLAST
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLG	CEILING
CLKG	CAULKING
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE
CON	CONCENTRIC
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS
COOR	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CRL	CORROSION-RESISTANT LINING
CSC	COMPRESSION SLEEVE COUPLING
CSK	COUNTERSINK
CSS	CLINIC SERVICE SINK
CT	CERAMIC TILE
CTJ	CONTRACTION JOINT
CTR	CENTER
CTRL	CONTROL
CVT	CULVERT
CU	COPPER, CUBIC
CW	CLOCKWISE
CY	CUBIC YARD
d	PENNY (NAIL MEASURE)
D	DEEP, DIFFUSER, DRAIN
DB	DUCT BANK, DECIBEL, DRY BULB
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON, DIGITAL INPUT
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DMJ	DOUBLE MECHANICAL JOINT
DMPF	DAMP PROOFING
DN	DOWN
DO	DISSOLVED OXYGEN, DIGITAL OUTPUT, DITTO
DP	DEPTH
DPDT	DOUBLE POLE, DOUBLE THROW
DPST	DOUBLE POLE, SINGLE THROW
DS	DOWN SPOUT
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DWG	DRAWING
DWL	DOWEL
DWR	DRAWER
E	EAST
EA	EACH, EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
ED	EQUIPMENT DRAIN
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMER	EMERGENCY
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOP	EDGE OF PAVEMENT
EQ	EQUAL EQUIP EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, EMERGENCY SHOWER
ESEW	EMERGENCY SHOWER AND EYE WASH
EST	ESTIMATE
EW	EACH WAY, EMERGENCY EYE/FACE WASH
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXP	EXPANSION, EXPOSED
EXST	EXISTING
EXT	EXTERIOR, EXTERNAL, EXTENSION
F TO F	FACE TO FACE
F&B	FACE AND BYPASS
FAB	FABRICATE
FB	FLOOR BEAM
FBD	FIBERBOARD
FBG	FIBERGLASS
FBM	BOARD FOOT MEASURE
FBO	FURNISHED BY OWNER
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FD	FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDR	FEEDER
FDTN	FOUNDATION
FE	FLANGED END
FEC	FIRE EXTINGUISHER CABINET
FES	FLARED END SECTION
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIG	FIGURE
FIN	FINISH
FJT	FLUSH JOINT
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FN	FENCE
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FRTM	FIRE RETARDANT TREATED MATERIAL
FS	FLOOR SINK, FAR SIDE
FT	FEET, FOOT
FTG	FOOTING, FITTING
FUR	FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE
G	GRILLE, GROUND
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GB	GRAB BAR, GRADE BREAK
GC	GROOVED COUPLING
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFMU	GROUND FACE MASONRY UNIT
GG	GUTTER GRADE
GJ	GROOVED JOINT
GL	GLASS
GLB	GLASS BLOCK, GLULAM BEAM
GND	GROUND
GP	GUY POLE
GR	GRADE
GRTG	GRATING
GSB	GYPSUM SHEATHING BOARD
GT	GREASE TRAP
GVL	GRAVEL
GW	GUY WIRE
GWB	GYPSUM WALLBOARD
GYP	GYPSUM HARDBOARD
H	HIGH
HB	HOSE BIBB
HBD	HARDBOARD
HC	HANDICAPPED, HOLLOW CORE, HORIZONTAL CURVE, HORIZONTAL CENTERLINE
HD	HEAD, HOT DIP
HDR	HEADER
HDW	HARDWARE
HEX	HEXAGONAL
HGR	HANGER
HH	HANDHOLE
HID	HIGH-INTENSITY DISCHARGE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER
HPC	HORIZONTAL POINT OF CURVATURE
HPS	HIGH-PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOSE REEL, HOUR
HS	HEADED STUD, HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HTG	HEATING
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC
HZ	HERTZ, CYCLES PER SECOND
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION, FOR EXAMPLE
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE, INCANDESCENT
INF	INFLUENT
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IR	INSIDE RADIUS, IRON ROD
IRR	IRRIGATION
ISO	ISOMETRIC
JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JST	JOIST
JT	JOINT
K	KIP
KB	KNEE BRACE
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
KW	KILOWATT
L	ANGLE, LENGTH, LAVATORY, LINTEL
LAD	LADDER
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LCTB	LIQUID CHALK AND TACK BOARD
LDG	LANDING
LDR	LEADER
LE	LIFTING EYE
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LMLU	LIQUID MARKER LECTURE UNIT
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT
LPS	LOW-PRESSURE SODIUM
LR	LONG RADIUS
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVL	LAMINATED VENEER LUMBER
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
MA	MIXED AIR
MACH	MACHINED
MAINT	MAINTENANCE
MAN	MANUAL
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MC	MECHANICAL CONTRACTOR, MECHANICAL COUPLING, MOMENT CONNECTION
MCB	METAL CORNER BEAD
MCJ	MASONRY CONTROL JOINT
MDMJ	MODIFIED DOUBLE MECHANICAL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFR	MANUFACTURER
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
ML	MASONRY LINTEL
MLO	MAIN LUGS ONLY
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODULAR, MODIFY
MON	MONUMENT
MPT	MALE PIPE THREAD
MRGWB	MOISTURE-RESISTANT GYPSUM WALLBOARD
MS	MOP SINK
MSL	MEAN SEA LEVEL
MT	MOUNT
MU	MASONRY UNIT
MULL	MULLION
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL, NATIONAL
NC	NORMALLY CLOSED
NEG	NEGATIVE
NF	NEAR FACE, NON-FUSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
O TO O	OUT TO OUT
OA	OUTSIDE AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OED	OPEN END DUCT
OF	OUTSIDE FACE, OFFICE FURNISHING
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
OG	ORIGINAL GROUND
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
OR	OUTSIDE RADIUS
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT
PA	PUBLIC ADDRESS
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX
PBD	PARTICLE BOARD
PC	POINT OF CURVE, PIECE, PRECAST
PCC	POINT OF COMPOUND CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCT	PERCENT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PFMU	PREFACED MASONRY UNIT
PH	PHASE
PI	POINT OF INTERSECTION
PKG	PACKAGE
PL	PLATE, PROPERTY LINE, PRECAST LINTEL
PLAS	PLASTER
PLAT	PLATFORM
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
POL	POLISH POS POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PRI	PRIMARY
PROP	PROPERTY, PROPOSED
PROT	PROTECTION
PS	PIPE SUPPORT
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PST	PRESTRESSED
PT	POINT, POINT OF TANGENCY
PTN	PARTITION
PVC	POLYVINYL CHLORIDE, POINT OF VERTICAL CURVE
PVMT	PAVEMENT POUNDS PER SQUARE INCH ABSOLUTE
PWD	PLYWOOD
PWJ	PLYWOOD WEB JOIST
PZ	PIEZOMETER
Q	RATE OF FLOW
QT	QUARRY TILE
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
R	RADIUS, REGISTER, RISER
RA	RETURN AIR
RB	RESILIENT BASE, ROCK BERM
RCPT	RECEPTACLE
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCING
REM	REMOVE
REQD	REQUIRED
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RF	RESILIENT FLOORING
RFG	ROOFING
RFL	REFLECTED, REFLECTOR
RGH	ROUGH
RGS	RIGID GALVANIZED STEEL
RGS-PVC	PVC COATED RGS
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RL	REQUIRED LAP
RLFA	RELIEF AIR
RND	ROUND
RNG	RUNNING
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RSP	ROCK SLOPE PROTECTION
RT	RIGHT
RVT	RESILIENT VINYL TILE
RY	READY
S	SOUTH, SINK
SA	SUPPLY AIR
SAMU	SOUND-ABSORBING MASONRY UNIT
SAN	SANITARY
SB	SPLASH BLOCK
SC	SOLID CORE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCN	SCREEN
SE	STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS
SECT	SECTION
SEP	SEPARATE
SF	SQUARE FOOT, SILT FENCE
SG	SHEET GLASS, SEALANT GROOVE
SH	SHOWER
SHT	SHEET
SHTG	SHEATHING
SIL	SILENCE
SIM	SIMILAR
SJ	SLAB JOINT
SL	SLOPE, STEEL LINTEL
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SOG	SLAB ON GRADE
SP	SOUNDPROOF, STANDPIPE
SPA	SPACING
SPEC	SPECIFICATION
SPLY	SUPPLY
SPST	SINGLE POLE SINGLE THROW
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T	TILE, TREAD
TA	TOILET ACCESSORY, TEMPERED AIR
TAN	TANGENT
TBM	TEMPORARY BENCHMARK
TCE	TEMPORARY CONSTRUCTION EASEMENT
TEF	TROWELED EPOXY FLOORING
TEMP	TEMPORARY, TEMPERATURE
THD	THREAD
THK	THICK THRESH THRESHOLD
TKBD	TACK BOARD
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM, TOP OF BERM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL, TOE OF SLOPE
TOW	TOP OF WALL
TP	TOILET PARTITION, TELEPHONE POLE, TOE PLATE, TRAP PRIMER
TPD	TOILET PAPER DISPENSER
TPG	TOPPING, THROUGH PLATE GIRDER
TR	TRANSOM
TRANS	TRANSITION
TRD	TRENCH DRAIN
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY, VOLT
VA	VOLT AMPERE
VAC	VACUUM
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VCT	VINYL COMPOSITION TILE, VERTICAL CENTERLINE
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VERTS	VERTICAL REINFORCING
VG	VERTICAL GRAIN
VIF	VERIFY IN FIELD
VIN	VINYL
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VS	VERSUS, VAPOR SEAL
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W/	WITH
W/O	WITHOUT
W	WATT, WEST, WIDE, WINDOW, WIRE, WIDE FLANGE BEAM
WB	WOOD BASE
WC	WATER CLOSET, WATER COLUMN
WD	WOOD, WIDTH
WF	WIDE FLANGE, WASH FOUNTAIN
WG	WIRE GLASS, WATER GAGE
WH	WALL HYDRANT, WEEP HOLE
WI	WROUGHT IRON
WL	WATER LEVEL
WLD	WELDED
WM	WIRE MESH
WP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSCT	WAINSCOT
WT	WEIGHT, WATER TIGHT
WTHP	WATERPROOF, WORKING POINT
WWF	WELDED WIRE FABRIC
XP	EXPLOSION-PROOF
XS	EXTRA STRONG
XSECT	CROSS SECTION
XXS	DOUBLE EXTRA STRONG
YH	YARD HYDRANT
YS	YIELD STRENGTH

GENERAL NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY THAT ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF A WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION, "INC" MAY MEAN INCLUDED OR INCLUDING, AND "REINF" MAY MEAN REINFORCE OR REINFORCING.
4. SEE INSTRUMENTATION AND GENERAL LEGEND SHEETS FOR PROJECT-SPECIFIC EQUIPMENT AND PIPING SYSTEM ABBREVIATIONS.

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ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	C. CROTWELL
DRAWN BY	J. SEAGLE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

ABBREVIATIONS

0 1" 2"

FILENAME 10343268-00-G.rvt

SCALE NONE

SHEET 00G003

1 2 3 4 5 6 7 8

MATERIALS IN PLAN/SECTION

- ACOUSTICAL CEILING TILE (SECTION)
- ASPHALT (PLAN OR SMALL-SCALE SECTION)
- ASPHALT (LARGE-SCALE SECTION)
- BATT INSULATION (SECTION)
- BRICK MASONRY (PLAN AND/OR SECTION)
- CHECKERED PLATE (PLAN)
- CONCRETE (PLAN AND/OR SECTION)
- CONCRETE MASONRY (PLAN AND/OR SECTION)
- DEMOLITION (PLAN AND/OR SECTION)
- EARTH (SECTION)
- FILTER POINT MAT (PLAN)
- FINISHED WOOD (SECTION)
- GLULAM LUMBER (SECTION)
- GRANULAR FILL (SECTION)
- GRATING (SECTION)
- GRATING (PLAN)
- GROUT (SECTION)
- GYPSUM BOARD (SECTION)
- METAL (SECTION)
- ORIENTED STRAND BOARD (SECTION)
- PARTICLE BOARD (SECTION)
- PLYWOOD (LARGE-SCALE SECTION)
- PLYWOOD (SMALL-SCALE SECTION)
- PRECAST CONCRETE (PLAN AND/OR SECTION)
- RIGID INSULATION (SECTION)
- RIPRAP (PLAN AND/OR SECTION)
- SAND (SECTION)
- SOD (SECTION)
- WEEP JOINT MORTAR PROTECTION SYSTEM (SECTION)
- WOOD - CONTINUOUS (SECTION)
- WOOD - BLOCKING (SECTION)

GENERAL SYMBOLOGY

ARROW INDICATES DIRECTION OF PLAN NORTH

N N

NORTH ARROW

PLAN
1/4" = 1'-0"

PLAN TITLE

ARROW INDICATES DIRECTION OF SECTION CUT
SECTION LETTER
X XXX X XXX
SHEET WHERE SECTION IS LOCATED

FULL BUILDING SECTION CUT MARKER

SECTION LETTER
FLAG INDICATES DIRECTION OF SECTION CUT
X XXX
SHEET WHERE SECTION IS LOCATED

SECTION CUT MARKER

SECTION LETTER
X XXX SECTION
3/8" = 1'-0"
SHEET WHERE SECTION VIEW IS FIRST CUT *

SECTION TITLE

DETAIL NUMBER
XXX
SHEET WHERE DETAIL IS LOCATED *

DETAIL MARKER

FOR REFERENCING DETAILS INCLUDED IN DRAWING SET.

XXXXXX

DETAIL MARKER

FOR REFERENCING DETAILS BOUND IN SPECIFICATIONS OR SEPARATE VOLUME.

DETAIL NUMBER
X XXX DETAIL
1/4" = 1'-0"
SHEET WHERE DETAIL IS LOCATED *

DETAIL TITLE

* EXCEPTIONS WHERE THE SHEET NUMBER IS REPLACED BY A DASH (-).
1) FOR COMMON DETAILS, SECTIONS, ELEVATIONS OR DETAILS THAT ARE CUT OR CALLED OUT ON MULTIPLE SHEETS.
2) SECTIONS, ELEVATIONS OR DETAILS THAT ARE LOCATED ON THE SAME SHEET THEY ARE CUT OR CALLED OUT ON.

X
XXX
INTERIOR
X XXX
EXTERIOR
ARROW INDICATES POINT OF VIEW
ELEVATION NUMBER
SHEET WHERE ELEVATION IS LOCATED *

SINGLE ELEVATION OR PHOTO MARKER

X X X XXX X
ELEVATION NUMBER
ARROW INDICATES POINT OF VIEW ELEVATION
INDICATES SHEET WHERE ELEVATION IS LOCATED

MULTIPLE ELEVATION OR PHOTO MARKER

ELEVATION IDENTIFICATION NUMBER
X XXX ELEVATION
3" = 1'-0"
SHEET WHERE POINT OF VIEW MARKER CAN BE FOUND *

ELEVATION TITLE

TARGET ELEVATION

ARCHITECTURAL

ROOM NAME XX-XX	ROOM NUMBER
XXX X	DOOR NUMBER
A	COLUMN GRID LINE
X	WALL TYPE
X	WINDOW TYPE
X	LOUVER
X	ACCESSORY, FURNITURE, AND MISCELLANEOUS EQUIPMENT IDENTIFIER

KEY NOTE DESIGNATION

KEY NOTE NUMBER

GENERAL LINE SYMBOLOGY

- 4-HOUR FIRE RATED WALL
- 3-HOUR FIRE RATED WALL
- 2-HOUR FIRE RATED WALL
- 1-HOUR FIRE RATED WALL
- COLUMN GRID LINE/CENTERLINE

IDENTIFICATION SYMBOLOGY

PIPING

FIGURE — 36"-PLE — EXAMPLE

FIGURE	EXAMPLE
LINE SIZE	36"
SERVICE	PLANT EFFLUENT

EQUIPMENT IDENTIFICATION

ALTERNATIVE 1

NPWP2023

FIGURE	EXAMPLE
SERVICE ABBREVIATION	INDICATES NON-POTABLE WATER
EQUIPMENT ABBREVIATION	INDICATES PUMP
BUILDING OR STRUCTURE NUMBER	BUILDING 20
EQUIPMENT NUMBER	PUMP 23

ALTERNATIVE 2

NPWP-23

FIGURE	EXAMPLE
SERVICE ABBREVIATION	INDICATES NON-POTABLE WATER
EQUIPMENT ABBREVIATION	INDICATES PUMP
EQUIPMENT NUMBER	PUMP 23

SHEET NAMING CONVENTION

AREA DESIGNATION

00	GENERAL
01	CIVIL
10	RAW WATER PUMP STATION
11	SPLITTER BOX
15	SUPERPULSATOR
52	FERRIC SULPHATE STORAGE
71	SLUDGE HOLDING TANK
72	DEWATERING BUILDING
73	SLUDGE STORAGE
74	SLUDGE THICKENER
75	THICKENED SLUDGE PUMP STATION
97	INSTRUMENTATION
98	ELECTRICAL
99	DETAILS, DIAGRAMS, AND SCHEDULES

DISCIPLINE DESIGNATOR & DISCIPLINE ORDER

G	GENERAL
V	SURVEYING/MAPPING
X	DEMOLITION
C	CIVIL
U	MULTI-DISCIPLINE
S	STRUCTURAL
A	ARCHITECTURAL
D	PROCESS
M	MECHANICAL (HVAC)
P	PLUMBING
F	FIRE PROTECTION
E	ELECTRICAL
Y	INSTRUMENTATION

SHEET TYPE DESIGNATOR

0	GENERAL (SYMBOLS, LEGENDS)
1	PLANS
2	ELEVATIONS
3	SECTIONS
4	LARGE SCALE VIEWS
5	DETAILS
6	SCHEDULES AND DIAGRAMS
8	PROFILES
9	3D REPRESENTATIONS

EXAMPLE

RAW WATER PROCESS SECTION, DRAWING 01

1	0					BUILDING OR AREA 10

BUILDING OR AREA DESIGNATION

		D				PROCESS

DISCIPLINE DESIGNATOR

			3			SECTIONS

SHEET TYPE DESIGNATOR

				0	1	SHEET 01

SHEET NUMBER

1	0	D	3	0	1	EXAMPLE

GENERAL NOTES:

1. THIS IS A STANDARD SHEET SHOWING COMMON SYMBOLOGY. ALL SYMBOLS ARE NOT NECESSARILY USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

D C B A

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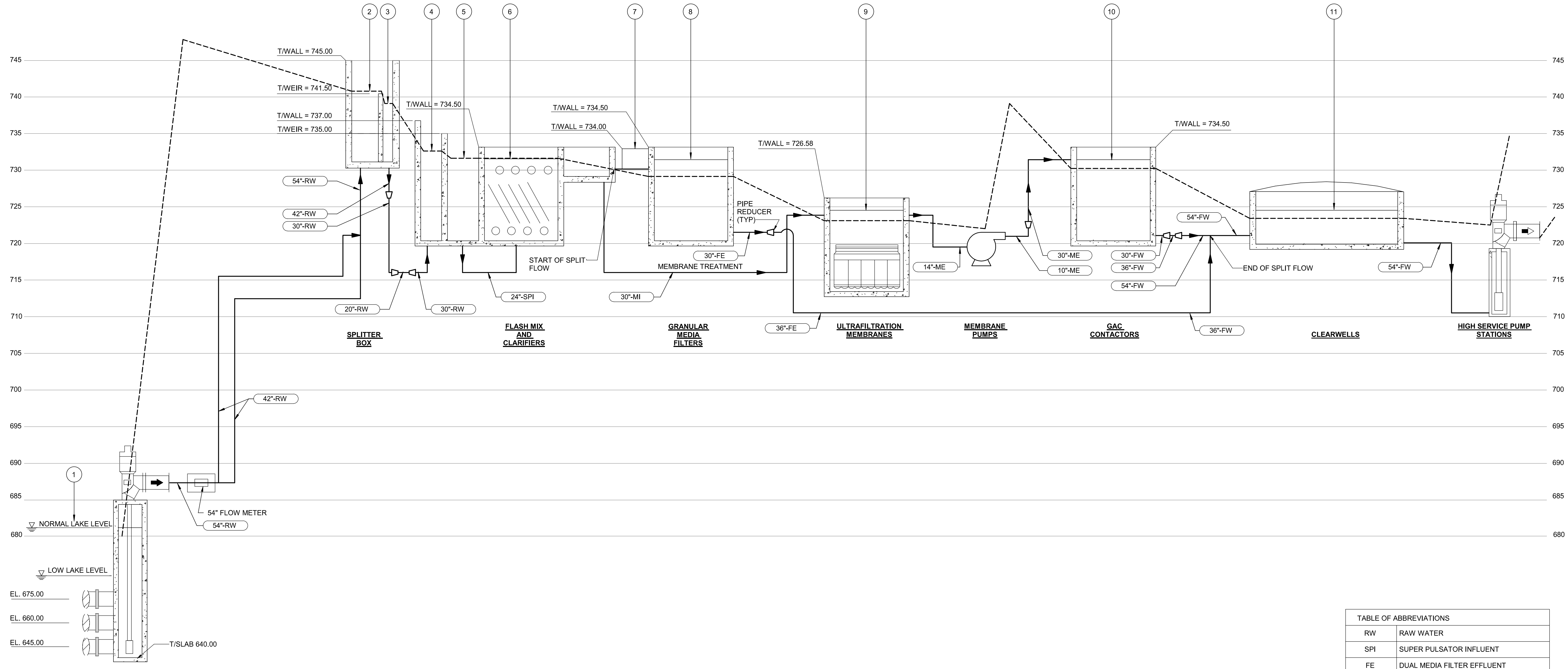
GENERAL LEGEND

0 1" 2"

FILENAME	10343268-00-G.rvt
SCALE	NONE

SHEET 00G004



RAW WATER PUMP STATION

WATER ELEVATION AT POINT			1	2	3	4	5	6	7	8	9	10	11
EXPANSION FLOW (26.7 MGD FINISHED WATER)	MEMBRANE TRAIN FLOW ALLOCATION	15.2 MGD	682.0	742.81	740.18	735.93	733.40	733.14	N/A	N/A	721.00	731.43	721.00
	GRANULAR MEDIA TRAIN FLOW ALLOCATION	14.7 MGD	682.0	742.81	740.18	735.93	733.40	733.14	730.65	730.63	N/A	N/A	721.00

TABLE OF ABBREVIATIONS	
RW	RAW WATER
SPI	SUPER PULSATOR INFLUENT
FE	DUAL MEDIA FILTER EFFLUENT
MI	ULTRAFILTRATION MEMBRANE INFLUENT
ME	ULTRAFILTRATION MEMBRANE EFFLUENT
FW	FINISHED WATER

*NOTE:
FLOW PATH MODELED IS RAW WATER PUMP STATION THROUGH SPLITTER STRUCTURE THROUGH EXISTING SUPER PULSATOR. 50.8% of FLOW TO MEMBRANE #5 AND TO GAC #4. 49.2% OF FLOW TO DUAL MEDIA FILTER #4.

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N.C.B.E.L.S. License Number F-0116

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	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	L. GROTZ
CHECKED BY	C. CROTWELL
DRAWN BY	T. CASH
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

HYDRAULIC PROFILE - SPLIT FLOW

0 1" 2"

FILENAME 10343268-00-G.rvt

SCALE NONE

SHEET 00G006

RAW WATER INTAKE	
TAG NUMBERS-	P-10-4
PUMP TYPE-	RAW WATER FEED PUMP
FLOW-	7,100 GPM
HEAD-	79 FEET
HP-	200 HP
FLASH MIX AND PRETREATMENT	
TAG NUMBERS-	VP-14-4, VP-14-5, VP-14-6
PUMP TYPE-	VACUUM PUMP FOR SUPERPULSATOR
FLOW-	450 SCFM, 3500 RPM
HP-	7.5 HP
EQUIPMENT TYPE-	2 SUPERPULSATORS
FLOW-	8 MGD EACH
OVERFLOW-	2.63 GPM/SF
TAG NUMBERS-	F-12
FLOW-	16 MGD
HP-	15 HP
G VALUE	250
TAG NUMBERS-	SP-12B, SP-15B
PUMP TYPE-	SAMPLE PUMP
FLOW-	40 GPM
HEAD-	40 FT
HP-	0.17

CHEMICAL ADDITION			
TAG NUMBERS-	BTK-56A, BTK-56B, BTK-56C, BTK-56D	TAG NUMBERS-	TK-52A, TK-52B
EQUIPMENT TYPE-	SODIUM HYPOCHLORITE TANK	EQUIPMENT TYPE-	FERRIC SULFATE DAY TANK (2)
STORAGE CAPACITY-	12,000 GAL EACH	STORAGE CAPACITY-	2,500 GAL
NOTES-	REUSE OF EXISTING TANKS		
		TAG NUMBERS-	BTK-52A, 52B, 52C, 52D
TAG NUMBERS-	MX-5502B	EQUIPMENT TYPE-	FERRIC SULFATE BULK TANK (4)
PUMP TYPE-	POLYMER SYSTEM	STORAGE CAPACITY-	12,000 GAL
FLOW-	100 LBS/DAY		
		TAG NUMBERS-	TP-52A, TP-52B
		PUMP TYPE-	MAGNECTIC DRIVE
		FLOW-	150 GPM
		HP-	10
		TAG NUMBERS-	P-52A, P-52B, P-52C
		PUMP TYPE-	DIAPHRAGM
		FLOW-	100 GPH
		HP-	TBD

SOLIDS THICKENING	
TAG NUMBERS-	P-75-1, P-75-2, P-75-3
PUMP TYPE-	PROGRESSIVE CAVITY PUMP
FLOW-	200 GPM
HEAD-	50 PSI
HP-	
TAG NUMBERS-	P-70-1, P-70-2
EQUIPMENT TYPE	WET-PIT SUBMERSIBLE PUMP
FLOW-	500 GPM
HEAD-	
HP-	
TAG NUMBERS-	TK-74-1
SURFACE OVERFLOW RATE	200 GPM/SF
SOLIDS LOADING RATE	4 LB/DAY/SF
TAG NUMBERS-	TK-71-1
EQUIPMENT TYPE	SUPERPULSATOR SLUDGE HOLDING TANK
EQUIPMENT TYPE-	FLOATING MIXING SYSTEM
HP	
TAG NUMBERS-	PFP-72-1, PFP-72-2, PFP-72-3
EQUIPMENT TYPE	DRY POLYMER FEED SYSTEM
CAPACITY	20 LB/HR

TAG NUMBERS-	BFP-72-1, BFP-72-2
EQUIPMENT TYPE	BELT FILTER PRESS
SOLIDS LOADING RATE	1,800 LB/H
HYDRAULIC LOADING RATE	160 GPM @ 2% SOLIDS
TAG NUMBERS-	SG-75-1, SG-75-2, SG-75-3
EQUIPMENT TYPE	SLUDGE GRINDERS
HP-	3 HP
TAG NUMBERS-	SCW-72-1, SCW-72-2, SCW-72-3
EQUIPMENT TYPE	SHAFTLESS SCREW CONVEYOR
CAPACITY	100 CF/H
TAG NUMBERS-	P-71-1, P-71-2
FLOW	400 GPM
HEAD	
HP	

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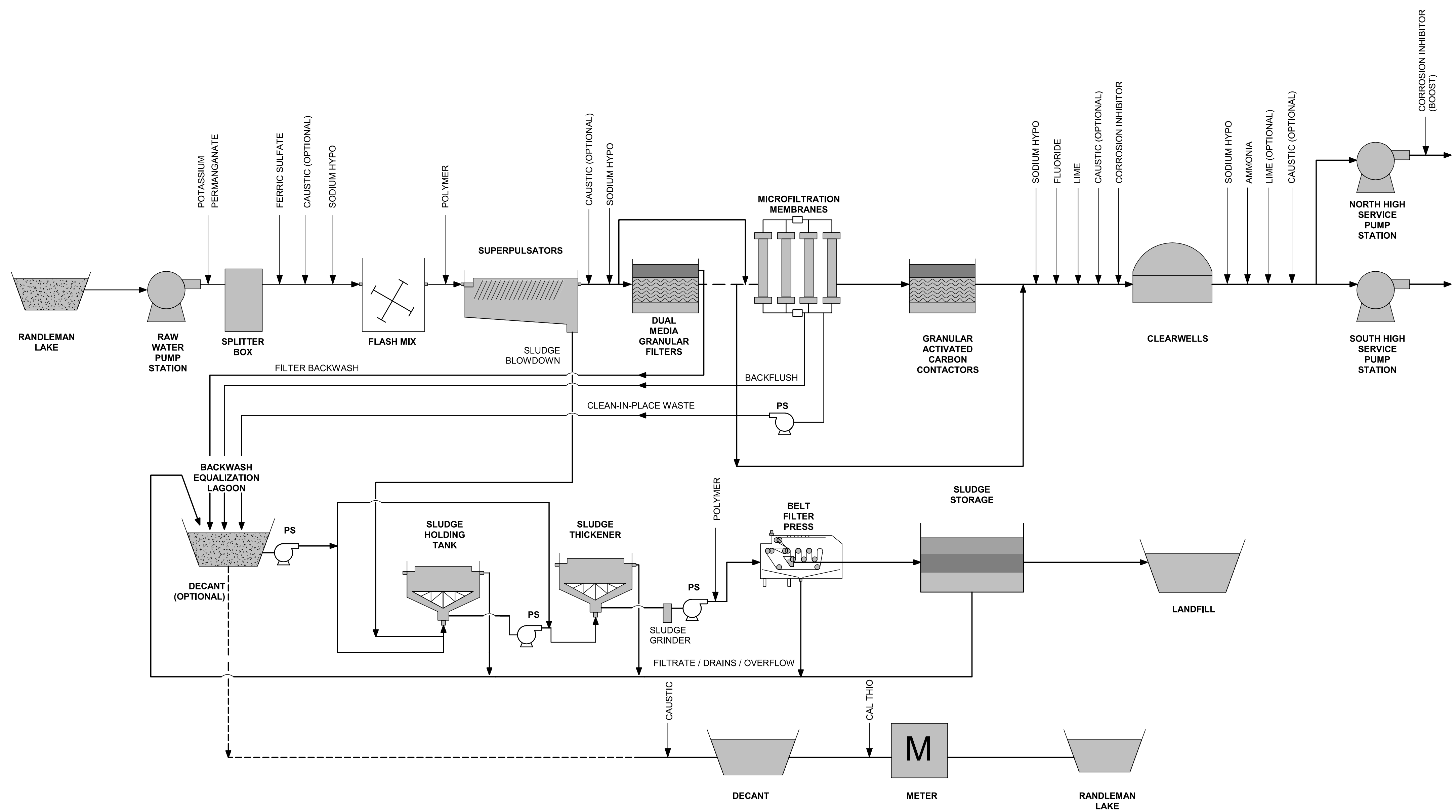
EQUIPMENT DESIGN CRITERIA

0 1" 2"

FILENAME 10343268-00-G.rvt

SCALE NONE

SHEET 00G007



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PROCESS FLOW DIAGRAM

0 1" 2"

FILENAME 10343268-00-G.rvt

SCALE NONE

SHEET 00G008

PIPING SYSTEMS

	COLD WATER, POTABLE (CW)
	HOT WATER, POTABLE (HW)
	HOT WATER RECIRCULATING, POTABLE (HWC)
NPW	NON POTABLE COLD WATER
140	HOT WATER - TEMPERATURE, POTABLE
TW	TEPID WATER, POTABLE
TWR	TEPID WATER RETURN, POTABLE
SAN	SANITARY SEWER BELOW GRADE
SAN	SANITARY SEWER ABOVE GRADE
V	SANITARY VENT
AW	ACID WASTE
AV	ACID VENT
CWV	COMBINATION WASTE AND VENT
PD	PRESSURE DRAINAGE
SD	STORM DRAIN ABOVE GRADE
SD	STORM DRAIN BELOW GRADE
OD	STORM DRAIN OVERFLOW
NG	NATURAL GAS
LP	LIQUEFIED PROPANE
CA	COMPRESSED AIR
HWS	HEATING HOT WATER SUPPLY
HWR	HEATING HOT WATER RETURN
GHWS	GLYCOL HEATING HOT WATER SUPPLY
GHWR	GLYCOL HEATING HOT WATER RETURN
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
GCWS	GLYCOL CHILLED WATER SUPPLY
GCWR	GLYCOL CHILLED WATER RETURN
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
CD	CONDENSATE DRAIN
CPD	CONDENSATE PUMP DISCHARGE
STM -15	STEAM SUPPLY - PSI
BBD	BOILER BLOW DOWN
BF	BOILER FEED
SV	STEAM VENT
MU	MAKE-UP WATER

PIPING SYMBOLOGY

	PIPE ANCHOR
	PIPE GUIDE
	EXPANSION JOINT
PT	PRESSURE/ TEMPERATURE PORT
	THERMOMETER
	THERMOWELL
	PRESSURE GAUGE
T	TEMPERATURE GAUGE
	FLEXIBLE PIPING CONNECTION
	WYE STRAINER
	MANUAL AIR VENT
A	AUTOMATIC AIR VENT
M	METER (WATER, GAS, OTHER)
FCO	FLOOR CLEANOUT
CO	CLEANOUT
WCO	WALL CLEANOUT
GCO	DOUBLE GRADE CLEANOUT
	WATER HAMMER ARRESTOR
E	EARTHQUAKE VALVE
	CONCENTRIC REDUCER
	ECCENTRIC REDUCER, FLAT ON BOTTOM
	ECCENTRIC REDUCER, FLAT ON TOP
	ELBOW, 90° TURN DOWN
	ELBOW, 90° TURN UP
	TEE, OUTLET UP
	TEE, OUTLET DOWN
	TEE, OUTLET UP W/ 90° TURN
	TEE, OUTLET DOWN W/ 90° TURN
	PIPE BREAK
	PIPE CAP
	BLIND FLANGE
	UNION
	FLOW ARROW
	SHUTOFF VALVE (NORMALLY OPEN)
	SHUTOFF VALVE (NORMALLY CLOSED)
	DRAIN VALVE
	CHECK VALVE
VB	VACUUM BREAKER
	AUTOMATIC FLOW CONTROL VALVE
	CALIBRATED MANUAL BALANCING VALVE
OR	PRESSURE-RELIEF VALVE
	PRESSURE-REDUCING VALVE (PRV)
	AUTOMATIC CONTROL VALVE, 2-WAY
	AUTOMATIC CONTROL VALVE, 3-WAY
BFP	BACKFLOW PREVENTER
XX-1	PLUMBING FIXTURE

HVAC SYMBOLOGY

24x18	SUPPLY AIR OR OUTSIDE AIR DUCT UP (SECTION CUT, FIRST DIMENSION DUCT WIDTH)
	SUPPLY AIR OR OUTSIDE AIR DUCT DOWN (NO SECTION CUT)
	RETURN AIR DUCT UP (SECTION CUT)
	RETURN AIR DUCT DOWN (NO SECTION CUT)
	EXHAUST AIR DUCT UP (NO SECTION CUT)
	EXHAUST AIR DUCT DOWN (NO SECTION CUT)
	ROUND ELBOW UP
	ROUND ELBOW DOWN
	TRANSITION - RECTANGULAR TO ROUND DUCT
	STANDARD BRANCH
	ELBOW - W/TURNING VANE (RECTANGULAR)
	ELBOW - (RECTANGULAR), SMOOTH RADIUS
18x24	RECTANGULAR DUCT OR OPENING SIZE FIRST NUMBER INDICATES SIZE OF SIDE SHOWN
18ø	ROUND DUCT SIZE
R OR D	RECTANGULAR DUCT INCLINE - RISE OR DROP IN RESPECT TO THE AIR FLOW
R OR D	ROUND DUCT INCLINE - RISE OR DROP IN RESPECT TO THE AIR FLOW
18x24	HIDDEN DUCT
T 9'-10" B 9'-0" 18x10	DUCT/PIPE ELEVATION TAG ABOVE FINISH FLOOR
	VOLUME DAMPER
M	MOTOR OPERATED DAMPER
	FIRE DAMPER
S	SMOKE DAMPER
S	SMOKE AND FIRE DAMPER
	FLEXIBLE CONNECTION
	FLEXIBLE DUCT - TWO LINE
	FLEXIBLE DUCT - ONE LINE
	ACOUSTICAL LINING - DUCT DIMENSIONS FOR NET FREE AREA
UC	UNDERCUT DOOR
	NEW TO EXISTING CONNECTION
	REMOVE EXISTING UP TO THIS POINT
	HVAC EMERGENCY SHUTDOWN SWITCH
TAG-SIZE CFM	SUPPLY AIR REGISTER
TAG-SIZE CFM	EXHAUST AIR OR RETURN AIR GRILLE
TAG CFM	EXHAUST AIR OR RETURN AIR GRILLE
TAG CFM	SUPPLY AIR ASSEMBLY SQUARE DIFFUSER
TAG CFM	SUPPLY AIR ASSEMBLY ROUND DIFFUSER

TEMPERATURE CONTROL DIAGRAM SYMBOLOGY

MISCELLANEOUS DEVICE IDENTIFIER

CO	SPACE CARBON MONOXIDE SENSOR
CO2	SPACE CARBON DIOXIDE SENSOR
H	SPACE HUMIDITY SENSOR
NO2	SPACE NITROGEN DIOXIDE SENSOR
S	SPACE TEMPERATURE SENSOR
T	THERMOSTAT

CONTROL DEVICE IDENTIFIER

AFS	AIRFLOW MEASURING STATION
AM	AIRFLOW MEASURING SENSOR
CO	CARBON MONOXIDE SENSOR
CO2	CARBON DIOXIDE SENSOR
F	FLOW SWITCH
FRZ	FREEZE STAT
H	HUMIDITY SENSOR
HS	HIGH STATIC SWITCH
LS	LOW STATIC SWITCH
NO2	NITROGEN DIOXIDE SENSOR
P	PRESSURE SENSOR
S	SPACE TEMPERATURE SENSOR
SD	SMOKE DETECTOR
T	TEMPERATURE SENSOR
TS	TEMPERATURE SWITCH
ΔP	DIFFERENTIAL PRESSURE SENSOR

CONTROL INPUT/OUTPUT IDENTIFIER

AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT

COIL IDENTIFIERS

CC	CHILLED WATER COOLING COIL
DG	DIRECT FIRED GAS BURNER
DX	DIRECT EXPANSION COOLING COIL
EH	ELECTRIC HEATING COIL
ER	DIRECT EVAPORATIVE COIL
FC	FACE AND BYPASS COOLING COIL
FH	FACE AND BYPASS HEATING COIL
HC	HEATING HOT WATER HEATING COIL
IG	INDIRECT FIRED GAS BURNER
ST	STEAM HEATING COIL

CONTROL ABBREVIATIONS

BTU	BTU METER
COMM	COMMUNICATION
CT	CURRENT TRANSMITTER
EC	ELECTRONICALLY COMMUTATED
EF	EXHAUST FAN
FM	FLOW METER
M	MOTOR ACTUATOR
MA	MIXED AIR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OA	OUTDOOR AIR
RA	RETURN AIR
RL	RELIEF FAN
RF	RETURN FAN
SA	SUPPLY AIR
SF	SUPPLY FAN
TCC	TEMPERATURE CONTROL CONTRACTOR
VFC	VARIABLE FREQUENCY CONTROLLER

S	DUCT MOUNTED SMOKE DETECTOR
T	TEMPERATURE AVERAGING SENSOR
M	MOTOR OPERATED DAMPER
M	MOTOR OPERATED SINGLE BLADE DAMPER
	BACKDRAFT DAMPER
	HUMIDIFIER
AFS	AIRFLOW MEASURING STATION
	INTAKE/ EXHAUST LOUVER
	FILTER
FRZ	FREEZE STAT
	SEE CONTROL ABBREVIATIONS (TYP)
M XX	FAN
EC XX	FAN WITH EC MOTOR
	PUMP
EC	PUMP WITH EC MOTOR

ABBREVIATIONS

AD	ACCESS DOOR
AFR	ABOVE FINISHED ROOF
AHU	AIR HANDLING UNIT
APD	AIR PRESSURE DROP
ARF	ABOVE RAISED FLOOR
AV	ABOVE RAISED FLOOR
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACK DRAFT DAMPER
BHP	BRAKE HORSE POWER
BOE	BOTTOM OF EQUIPMENT
BTUH	BRITISH THERMAL UNITS PER HOUR
CAV	CONSTANT AIR VOLUME
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
COP	COEFFICIENT OF PERFORMANCE
COR	CONTRACTING OFFICER'S REPRESENTATIVE
CRAC	COMPUTER ROOM AIR CONDITIONER
CU	CONDENSING UNIT
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DH	DEHUMIDIFIER
DX	DIRECT EXPANSION
EAT	ENTERING AIR TEMPERATURE
EDH	ELECTRIC DUCT HEATER
EER	ENERGY EFFICIENCY RATIO
EMCS	ENERGY MANAGEMENT CONTROL SYSTEM
ERU	ENERGY RECOVERY UNIT
ESP	EXTERNAL STATIC PRESSURE
ESS	EMERGENCY SHUTOFF SWITCH
EWT	ENTERING WATER TEMPERATURE
F	FUTURE
FA	FREE AREA
FCP	FAN CONTROL PANEL
FCU	FAN COIL UNIT
FDBK	FEEDBACK
FLA	FULL LOAD AMPS
FLT	FILTER
FPB	FAN POWERED BOX
FPM	FEET PER MINUTE
GC	GENERAL CONTRACTOR
GE	GRAVITY EXHAUST
GI	GRAVITY INTAKE
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
I/O	INPUT/OUTPUT
I/P	CURRENT TO PNEUMATIC
IAQ	INDOOR AIR QUALITY
IPLV	INTEGRATED PART LOAD VALUE
LAT	LEAVING AIR TEMPERATURE
LVR	LOUVER
LWT	LEAVING WATER TEMPERATURE
MAU	MAKE-UP AIR UNIT
MBH	THOUSAND BTUH
MCC	MOTOR CONTROL CENTER
NC	NOISE CRITERIA
NO	NUMBER
NRC	NOISE REDUCTION COEFFICIENT
OS&Y	OUTSIDE SCREW AND YOKE
PD	PRESSURE DROP
PPH	POUNDS PER HOUR
RH	RELATIVE HUMIDITY
RTU	ROOFTOP UNIT
S	SIGNAL PORT
SCFM	STANDARD CUBIC FEET PER MINUTE
SEER	SEASONAL ENERGY EFFICIENCY RATIO
SP	STATIC PRESSURE
TC	TECHNOLOGY CONTRACTOR
TCP	TEMPERATURE CONTROL PANEL
TD	TEMPERATURE DIFFERENTIAL
TES	THERMAL ENERGY STORAGE
TSP	TOTAL STATIC PRESSURE
UH	UNIT HEATER
V&C	VALVE AND CAP
VAV	VARIABLE AIR VOLUME
VRF	VARIABLE REFRIGERANT FLOW
VTR	VENT THROUGH ROOF
WB	WET BULB
WC	WATER COLUMN
WPD	WATER PRESSURE DROP

GENERAL NOTES

GENERAL MECHANICAL DEMOLITION NOTES

1. THE CONTRACTOR SHALL COMPLETELY REMOVE ALL PIPING, DUCTWORK, COILS, EQUIPMENT, TERMINAL UNITS, ASSOCIATED CONTROLS, WIRING, AND OTHER ITEMS SHOWN BOLD AND/OR BOLD DASHED LINES UNLESS SPECIFICALLY NOTED OTHERWISE. THE ITEMS INDICATED ON THE DRAWINGS TO BE REMOVED ARE ONLY TO INDICATE IN GENERAL THE TYPE AND EXTENT OF DEMOLITION WORK INVOLVED. A SITE INVESTIGATION BY THE CONTRACTOR MUST BE PERFORMED TO AID IN DETERMINING THE COMPLETE EXTENT OF WORK INVOLVED.
2. PIPING AND DUCTWORK EMBEDDED IN FLOORS, WALLS, AND CEILINGS MAY REMAIN IF SUCH MATERIALS DO NOT INTERFERE WITH NEW INSTALLATIONS. REMOVE MATERIALS ABOVE ACCESSIBLE CEILINGS. REMAINING PIPING SHALL BE DRAINED AND CAPPED WITHOUT CREATING DEAD LEGS IN THE SYSTEM. REMAINING DUCTWORK SHALL BE CAPPED.
3. LOCATE, IDENTIFY, AND PROTECT MECHANICAL SERVICES PASSING THROUGH DEMOLITION AREA AND SERVING OTHER AREAS OUTSIDE THE DEMOLITION LIMITS. MAINTAIN SERVICES TO AREAS OUTSIDE DEMOLITION LIMITS. WHEN SERVICES MUST BE INTERRUPTED, NOTIFY OWNER AND INSTALL TEMPORARY SERVICES FOR AFFECTED AREAS.
4. EXISTING EQUIPMENT BEING REMOVED AND CONSIDERED SALVAGEABLE BY THE OWNER SHALL BE TURNED OVER TO THE OWNER.
5. CONTRACTORS SHALL COORDINATE AND SCHEDULE ALL NECESSARY UTILITY SHUT-OFFS WITH OWNER PRIOR TO PROCEEDING WITH SUCH WORK.
6. COORDINATE SAW-CUTTING OF THE FLOOR OR WALL WITH OTHER TRADES.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING, PAINTING, REPAIRING OR REPLACEMENT OF ALL WALLS, FLOORS, CEILINGS, OR OTHER BUILDING ELEMENTS THAT ARE DISTURBED AS PART OF THE DEMOLITION OR INSTALLATION OF MECHANICAL WORK. SUCH WORK SHALL MATCH THE EXISTING CONSTRUCTION, FINISH, AND RATING. FIRE SEAL WALL OPENINGS AS REQUIRED.
8. REPLACE/REPAIR DAMAGED PIPING AND/OR DUCTWORK INSULATION TO MATCH EXISTING.
9. CONTRACTOR SHALL PROVIDE WORK IN PHASES AS REQUIRED BY THE CONTRACT DOCUMENTS WHILE MINIMIZING POTENTIAL WORK DELAYS AND UTILITY SHUT-DOWNS. COORDINATE ALL WORK WITH PROJECT PHASING PLAN AND WORK SHOWN ON DEMOLITION AND NEW PLANS. ALL EXISTING AREAS OF THE BUILDING NOT A PART OF A CURRENT PHASE OF WORK SHALL REMAIN OPERATIONAL WHILE WORK IN EACH INDIVIDUAL PHASE IS COMPLETED.

GENERAL MECHANICAL NOTES

1. THESE NOTES ARE NOT ALL INCLUSIVE. REFER TO DRAWINGS AND SPECIFICATION FOR ADDITIONAL REQUIREMENTS.
2. THIS IS A STANDARD MECHANICAL (HVAC AND PLUMBING) SYMBOLOGY AND ABBREVIATIONS SHEET. LISTING OF SYMBOLS AND ABBREVIATIONS DOES NOT IMPLY ALL SYMBOLS AND ABBREVIATIONS HAVE BEEN USED ON THIS PROJECT.
3. VALVE SYMBOLS SHOWN HERE ARE APPLICABLE ONLY TO MECHANICAL SHEETS.
4. PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT FOR COMPLETE AND OPERABLE SYSTEMS AS INDICATED ON THE DRAWINGS AS SPECIFIED, OR AS REQUIRED BY CODE.
5. MECHANICAL INSTALLATION SHALL COMPLY WITH THE ADA/ABA ACCESSIBILITY GUIDELINES.
6. DETAILS APPLY TO THE ENTIRE PROJECT AND ARE ONLY REFERENCED TO PROVIDE CLARITY IF THERE ARE MULTIPLE DETAILS THAT COULD APPLY TO A PARTICULAR PROJECT CONDITION.
7. COORDINATE LOCATION OF ALL MECHANICAL EQUIPMENT, DUCTWORK, AND PIPING WITH OTHER TRADES BEFORE PROCEEDING WITH WORK. DO NOT INSTALL MECHANICAL EQUIPMENT, DUCTWORK, OR PIPING ABOVE ELECTRICAL EQUIPMENT WHERE PROHIBITED BY ELECTRICAL CODES (SWITCHBOARDS, PANELS, ETC.).
8. LIGHT LINE WEIGHT INDICATES EXISTING PIPING, DUCTWORK, AND/OR EQUIPMENT TO REMAIN. BOLD LINE WEIGHT INDICATES NEW WORK TO BE INSTALLED AS WORK OF THIS CONTRACT.
9. COORDINATE INSTALLATION OF OUTSIDE AIR INTAKE WITH INSTALLATION OF PLUMBING VENTS, FLUES AND EXHAUST/RELIEF OUTLETS TO MAINTAIN 10' SEPARATION.
10. ALL WORK IN FINISHED SPACES SHALL BE LOCATED ABOVE CEILINGS, IN CHASES OR OTHER CONCEALED ACCESSIBLE LOCATIONS UNLESS NOTED OTHERWISE. LOCATE AND ARRANGE VALVES, DRAIN FITTINGS, ETC. TO BE ACCESSIBLE THROUGH LAY-IN CEILINGS, ACCESS PANELS OR ACCESS DOORS. PROVIDE AN ACCESS PANEL OR DOOR FOR ALL NON-ACCESSIBLE INSTALLATIONS. COORDINATE LOCATION OF ACCESS PANELS OR DOORS WITH THE ARCHITECT/ENGINEER AND OTHER TRADES.
11. ALL MATERIALS LOCATED IN PLENUM SHALL BE RATED FOR PLENUM INSTALLATION.
12. ALL DUCTWORK, PIPING, AND EQUIPMENT SUPPORTED FROM STRUCTURAL STEEL SHALL BE COORDINATED WITH ALL TRADES. ALL ATTACHMENTS TO STEEL BAR JOISTS, TRUSSES, OR JOIST GIRDERS SHALL BE AT PANEL POINTS OR AS SHOWN ON THE MECHANICAL OR STRUCTURAL DRAWINGS. WELDING TO STRUCTURAL MEMBERS SHALL NOT BE PERMITTED.
13. ALL MISCELLANEOUS METALS AND MATERIALS REQUIRED TO ENSURE PROPER INSTALLATION AND AS SHOWN IN DETAILS FOR PIPING, DUCTWORK, AND EQUIPMENT (UNLESS OTHERWISE NOTED) SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.
14. PROVIDE DIELECTRIC UNIONS AT ALL CONNECTIONS OF DISSIMILAR METALS (SUCH AS COPPER TO GALVANIZED STEEL).
15. PROVIDE ISOLATION VALVES AT EACH PIECE OF EQUIPMENT. ALSO PROVIDE ISOLATION VALVES ON EACH BRANCH AND/OR RISER SERVING MULTIPLE PIECES OF EQUIPMENT OR FIXTURES AND ELSEWHERE AS INDICATED. INSTALL VALVES AS CLOSE TO MAIN AS POSSIBLE.

GENERAL HVAC NOTES

1. DUCTWORK DIMENSIONS: FIRST NUMBER INDICATES SIDE OF DUCTWORK SHOWN. ALL DIMENSIONS ARE IN INCHES AND ARE INSIDE CLEAR DIMENSIONS.
2. VOLUME DAMPERS ABOVE PLASTER OR GYPBOARD CEILINGS SHALL HAVE EXTENSION RODS AND CHROME-PLATED ESCUTCHEON PLATES.
3. COORDINATE ALL GRILLE, REGISTER AND DIFFUSER LOCATIONS WITH REFLECTED CEILING PLAN, LIGHTING, AND ALL OTHER CEILING MOUNTED DEVICES.
4. PROVIDE FLEXIBLE CONNECTIONS IN ALL DUCTWORK AND PIPING SYSTEMS CONNECTED TO FANS, PUMPS AND OTHER EQUIPMENT WHICH REQUIRE VIBRATION ISOLATION.
5. PROVIDE ACCESSIBLE VOLUME DAMPERS OR OTHER MEANS OF AIRFLOW ADJUSTMENT AT ALL DUCT RUN-OUTS TO DIFFUSERS AND GRILLES.
6. PROVIDE DUCT ACCESS DOORS AT OUTSIDE AIR INTAKE PLENUMS.
7. ALL DUCT RUN-OUTS TO DIFFUSERS AND GRILLES SHALL BE THE SAME AS THE DIFFUSER OR GRILLE NECK SIZE UNLESS NOTED OTHERWISE.
8. ALL PIPING RUNOUTS SHALL BE 3/4" UNLESS NOTED OTHERWISE.

GENERAL PLUMBING NOTES

1. SANITARY SEWER PIPING SMALLER THAN 3" SHALL BE SLOPED AT 1/4" PER FOOT, 3" AND LARGER SHALL BE SLOPED AT 1/8" PER FOOT.
2. WALL HYDRANTS SHALL BE INSTALLED BETWEEN 18" MIN AND 24" MAX ABOVE FINISH GRADE. COORDINATE ELEVATIONS OF FINISH FLOOR OR FINISH EXTERIOR GRADE. PROVIDE ACCESSIBLE INSIDE SHUTOFF VALVE FOR EACH WALL HYDRANT.
3. INSTALL WALL CLEANOUTS (WCO) ON ALL SANITARY AND STORM RISERS AT 30" ABOVE FINISH FLOOR UNLESS NOTED OTHERWISE. COORDINATE EXACT HEIGHT WITH OTHER TRADES TO ENSURE ACCESSIBILITY.
4. ROUTE ALL STORM PIPING AS HIGH AS POSSIBLE AND SLOPE AT 1/8" PER FOOT UNLESS NOTED OTHERWISE. OVERFLOW DOWN SPOUT NOZZLES SHALL BE INSTALLED AT 12" ABOVE FINISH EXTERIOR GRADE UNLESS NOTED OTHERWISE.
5. PROVIDE BACKFLOW PREVENTERS IN ACCORDANCE WITH THE LOCAL CODES. PROVIDE AIR GAP FITTINGS FOR ALL RPZ BACKFLOW PREVENTERS AND ROUTE DISCHARGE PIPING TO NEAREST FLOOR DRAIN OR FLOOR SINK OR AS SHOWN ON DRAWINGS.
6. PROVIDE GAS REGULATORS, REGULATOR VENT PIPING, SHUTOFF VALVES, DIRT LEGS, AND UNIONS ON ALL GAS FIRED EQUIPMENT. REGULATE GAS PRESSURE AS REQUIRED FOR EACH SPECIFIC PIECE OF GAS FIRED EQUIPMENT.

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DRAWN BY	J. SEAGLE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

MECHANICAL LEGEND

0 1" 2"

FILENAME 10343268-00-G.rvt
SCALE NONE
SHEET 00MP001

ONE-LINE, POWER, AND LIGHTING SYMBOLOGY

X 20A 3P OR X 100AF 80AT 3P — LOW VOLTAGE CIRCUIT BREAKER (CB). RATING AND NO. OF POLES AS SHOWN. WHEN SPECIFIC TYPE, OTHER THAN MCCB, IS REQUIRED, X INDICATES TYPE.

TYPES:
- MCCB - MOLDED CASE
- ICCB - INSULATED CASE
- LVP - LOW VOLTAGE POWER
- MCP - MOTOR CIRCUIT PROTECTOR (RATING PER CONNECTED LOAD)

TRIP UNIT:
- L - LONG TIME PICKUP
- S - SHORT TIME PICKUP
- I - INSTANTANEOUS PICKUP
- G - GROUND FAULT PICKUP
- A - ARC FLASH MAINTENANCE

X — INTERLOCK: X - INDICATES TYPE

TYPES:
- E - ELECTRICAL
- M - MECHANICAL
- K - KEY

GFP — GROUND FAULT PROTECTION

52 — MEDIUM VOLTAGE CIRCUIT BREAKER

FUSE, RATING, AND NUMBER OF FUSES AS NOTED

FUSED CUTOUT, CURRENT RATING, FUSE RATING, AND QUANTITY AS NOTED

FUSIBLE SWITCH, CURRENT RATING, FUSE RATING, AND QUANTITY AS NOTED (3 POLE UON)

NON-FUSED SWITCH, CURRENT RATING, AND NUMBER OF POLES AS NOTED (3 POLE UON)

DISCONNECT OR DRAWOUT CONNECTION

A B & A B — MAGNETIC MOTOR STARTER AND SEPARATELY MOUNTED COMBINATION MAGNETIC MOTOR STARTER

D & D — MOTOR/LOAD CONTROLLER AND SEPARATELY MOUNTED MOTOR/LOAD CONTROLLER WITH SHORT CIRCUIT PROTECTION AND DISCONNECT

MOTOR STARTER AND CONTROLLER SUBSCRIPTS:

A - MAGNETIC STARTER NEMA SIZE

B - STARTER TYPE
- NONE - FULL VOLTAGE NON-REVERSING (FVNR)
- FVR - FULL VOLTAGE REVERSING
- 2S - TWO SPEED
- RVAT - REDUCED VOLTAGE AUTO TRANSFORMER

C - CONTROL DIAGRAM OR CONTROLS SCHEDULE NUMBER (IF REQUIRED)

D - CONTROLLER TYPE
- VFD - VARIABLE FREQUENCY DRIVE
- SS - SOLID STATE
- CONT - CONTACTOR

SEPARATELY MOUNTED COMBINATION MOTOR STARTER OR CONTROLLER; SEE ELECTRICAL ONE - LINE DIAGRAM OR SCHEDULE FOR DESCRIPTION

SEPARATELY MOUNTED MOTOR STARTER OR CONTROLLER; SEE ELECTRICAL ONE-LINE DIAGRAM OR SCHEDULE FOR DESCRIPTION.

X — NON-FUSED SAFETY SWITCH, 30A, 3P, X INDICATES AMP RATING GREATER THAN 30A

X Y — FUSED SAFETY SWITCH, 3P, X INDICATES AMP RATING GREATER THAN 30A, Y INDICATES FUSE SIZE

CB — SEPARATELY MOUNTED CIRCUIT BREAKER; SEE ELECTRICAL ONE - LINE DIAGRAM OR SCHEDULE FOR DESCRIPTION

7 1/2 OR HP — MOTOR WITH DESIGN HORSEPOWER (WHEN INDICATED)

G — GENERATOR

ATS — TRANSFER SWITCH, CURRENT RATING, AND NUMBER OF POLES AS NOTED
- ATS - AUTOMATIC
- MTS - MANUAL

TRANSFORMER
- 3-PHASE, 3-WIRE DELTA CONNECTION
- 3-PHASE, 4-WIRE GROUNDED WYE CONNECTION

LP100 208/120V 3Ø, 4W — SWITCHBOARD OR PANELBOARD; NAME, VOLTAGE, PHASE, NUMBER OF WIRES WHEN INDICATED

100 KVA — NON-MOTOR LOAD WITH DESIGN KVA, KW, OR AMP

VOLTAGE TRANSFORMER (VT, PT, OR CPT)

CURRENT TRANSFORMER (CT)

WH — UTILITY WATT-HOUR METER PER UTILITY REQUIREMENTS

DMP — DIGITAL METERING PACKAGE

GROUND

LIGHTNING ARRESTER

SPD — LOW VOLTAGE SURGE PROTECTIVE DEVICE

SS — SELECTOR SWITCH

PB — PUSHBUTTON

IC — INSTRUMENTATION/CONTROL DEVICE

CONTROL PANEL INTEGRAL OR PROVIDED WITH ASSOCIATED EQUIPMENT

CONTROL PANEL WITH DISCONNECT SWITCH INTEGRAL OR PROVIDED WITH ASSOCIATED EQUIPMENT

J — JUNCTION OR PULL BOX

PANELBOARD (250V TO 600V)

PANELBOARD (LESS THAN 250V)

X — ELECTRICAL EQUIPMENT ENCLOSURE: SWITCHBOARD, MOTOR CONTROL CENTER, CONTROL PANEL, TRANSFORMER OR OTHER EQUIPMENT AS INDICATED. ESTIMATED SIZE AS INDICATED. WHEN USED X INDICATES EQUIPMENT TYPE.

EQUIPMENT TYPES:
- ATS - AUTOMATIC TRANSFER SWITCH
- CP - CONTROL PANEL
- MTS - MANUAL TRANSFER SWITCH
- MCC - MOTOR CONTROL CENTER
- UPS - UNINTERRUPTIBLE POWER SUPPLY
- VFD - VARIABLE FREQUENCY DRIVE
- SB - SWITCHBOARD
- SG - SWITCHGEAR
- T - TRANSFORMER

CEILING/PENDANT/BOLLARD MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED

CEILING/PENDANT/BOLLARD MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED, EMERGENCY (INTERNAL OR EXTERNAL POWER SOURCE AS INDICATED)

WALL MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED

WALL MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED, EMERGENCY (INTERNAL OR EXTERNAL POWER SOURCE AS INDICATED)

WALL MOUNTED FLOOD LUMINAIRE, LAMP TYPE AS SPECIFIED

POLE/STANCHION MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED

POLE/STANCHION MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED, EMERGENCY (INTERNAL OR EXTERNAL POWER SOURCE AS INDICATED

POLE/STANCHION MOUNTED FLOOR LUMINAIRE, LAMP TYPE AS SPECIFIED

CEILING/PENDANT MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED

WALL MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED

CEILING/PENDANT MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED, ALL OR PARTIAL EMERGENCY (INTERNAL OR EXTERNAL POWER SOURCE AS INDICATED

WALL MOUNTED LUMINAIRE, LAMP TYPE AS SPECIFIED, ALL OR PARTIAL EMERGENCY (INTERNAL OR EXTERNAL POWER SOURCE AS INDICATED

EMERGENCY LIGHT, NUMBER OF ATTACHED HEADS AS SHOWN

EMERGENCY LIGHT, REMOTE MOUNTED HEAD

DOUBLE-FACED CEILING OR WALL MOUNTED EXIT LIGHT; DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS

SINGLE-FACED CEILING OR WALL MOUNTED EXIT LIGHT; DIRECTIONAL ARROWS (IF REQUIRED) AS INDICATED ON PLANS

LIGHTING FIXTURE SUBSCRIPTS:
- X - INDICATES LUMINAIRE TYPE PER LUMINAIRE SCHEDULE
- Y - INDICATES CIRCUIT NUMBER FROM PANELBOARD
- Z - INDICATES CONTROLLING SWITCH (IF REQUIRED)
- NL - NIGHT LIGHT UNSWITCHED

$\$_X^Y$ — WALL SWITCH

SUBSCRIPTS:

X - INDICATES TYPE
- NONE - SINGLE POLE
- 2 - DOUBLE POLE
- 3 - THREE-WAY
- 4 - FOUR-WAY
- K - KEY SWITCH
- P - PILOT LIGHT
- L - LIGHTED HANDLE
- DM - DIMMING
- MC - MOMENTARY CONTACT
- T - TIMER

Y - INDICATES CONTROLLING SWITCH (IF REQUIRED)

$\$_X^Y$ — MANUAL MOTOR STARTER

SUBSCRIPTS:

X - INDICATES TYPE
- HP - HORSEPOWER RATED
- TE - HORSEPOWER RATED WITH THERMAL ELEMENT
- FT - HORSEPOWER RATED WITH FUSETRON FUSE

Y - INDICATES SWITCH TYPE
- NONE - TOGGLE SWITCH TYPE
- R - ROTARY SWITCH TYPE

PC — PHOTOCELL

TC — TIME CLOCK

$\$_{OSX}$ OR OSX — LIGHTING CONTROL OCCUPANCY SENSOR, WALL MOUNTED, X INDICATES SPECIFIC TYPE AS SPECIFIED

OSX — LIGHTING CONTROL OCCUPANCY SENSOR, CEILING MOUNTED, X INDICATES SPECIFIC TYPE AS SPECIFIED

X — ROOM/AREA LIGHTING CONTROL TYPE, SEE LIGHTING CONTROL SCHEDULE FOR REQUIREMENTS

PLUG-IN RECEPTACLE STRIP, QUANTITY AND SPACING OF RECEPTACLES AS NOTED OR SPECIFIED

SPECIAL-PURPOSE RECEPTACLE AS DEFINED ON PLANS

TWO RECEPTACLES IN 2-GANG BOX UNDER COMMON COVER PLATE

DUPLEX RECEPTACLE

SIMPLEX RECEPTACLE

RECESSED FLOOR MOUNTED BOX, QUANTITY AND TYPE OF RECEPTACLES AS INDICATED

SUBSCRIPTS:

X - INDICATES TYPE
- GFCI - GROUND FAULT CIRCUIT INTERRUPTER
- IG - ISOLATED GROUND
- TR - TAMPER RESISTANT
- PLH - PLUG LOAD HALF CONTROLLED
- PLD - PLUG LOAD DUAL CONTROLLED
- USB - USB CHARGING STATION
- SPD - SURGE PROTECTIVE DEVICE

Y - INDICATES CIRCUIT NUMBER FROM PANELBOARD

CONDUIT TURNING UP

CONDUIT TURNING DOWN

HOMERUN TO PANEL
SINGLE PHASE: 2 #12, 1 #12G IN 3/4"C
THREE PHASE: 3 #12, 1 #12G IN 3/4"C
UNLESS OTHERWISE NOTED, CONDUCTOR SIZE IS FOR ENTIRE CIRCUIT.

CONDUIT CONNECTION TO EQUIPMENT

CIRCUIT RUN BETWEEN DEVICES EXPOSED IN NON-ARCHITECTURALLY FINISHED AREAS; CONCEALED IN ARCHITECTURALLY FINISHED AREAS. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE CIRCUIT.

CONDUIT RUN BETWEEN DEVICES CONCEALED IN NON-ARCHITECTURALLY FINISHED AREAS OR UNDER FLOOR SLAB. CONDUIT AND CONDUCTOR SIZES SHALL BE THE SAME AS THE HOMERUN FOR THE CIRCUIT.

CIRCUIT HASH MARKS (WHEN INDICATED); LONG, SHORT, SINGLE DOT, AND DOUBLE DOT REPRESENT PHASE, NEUTRAL, EQUIPMENT GROUND, AND ISOLATED EQUIPMENT GROUND, RESPECTIVELY. #12 IN 3/4" CONDUIT UNLESS OTHERWISE INDICATED.

CIRCUIT CONTINUATION

CONDUIT STUBBED OUT AND CAPPED

CORD AND PLUG CONNECTION

XXX OR XXX — CONDUIT TAG OR CIRCUIT NUMBER - WIRE AND CONDUIT SIZE AS SPECIFIED IN CIRCUIT SCHEDULE ON THE SHEETS

GROUND CABLE

GROUND ROD

GENERAL NOTES:

1. THIS IS A STANDARD ELECTRICAL SYMBOLOGY SHEET. NOT ALL SYMBOLS MAY BE USED ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.
3. SEE P&ID LEGEND SHEET FOR PROJECT SPECIFIC EQUIPMENT SYMBOLS, EQUIPMENT ABBREVIATIONS, AND PIPING SYSTEM ABBREVIATIONS.

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ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	S. QUIN
CHECKED BY	C. CROTWELL
DRAWN BY	C. SHAW
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

ELECTRICAL LEGEND

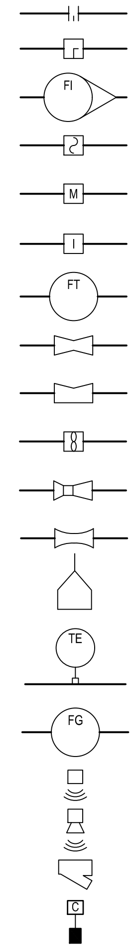
0 1" 2"

FILENAME	10343268-00-G.rvt
SCALE	NONE

SHEET 00E001

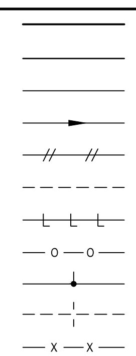
1 2 3 4 5 6 7 8

PRIMARY ELEMENT SYMBOLOGY



- ORIFICE PLATE
- PITOT TUBE OR ANNUBAR
- ROTOMETER
- SONIC OR ULTRASONIC FLOWMETER
- MAGNETIC FLOWMETER
- INSERTION FLOWMETER
- MASS DISPERSION FLOWMETER
- FLUME
- WEIR
- PROPELLER OR TURBINE METER
- VENTURI TUBE
- VENTURI FLUME
- FLOAT SWITCH
- TEMPERATURE ELEMENT WITH THERMOWELL
- SIGHT FLOW GLASS
- ULTRASONIC LEVEL SENSOR
- RADAR LEVEL SENSOR
- STRAINER
- CAPACITIVE LEVEL SENSOR

LINE TYPES



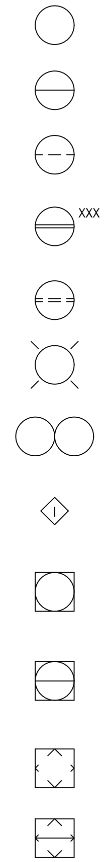
- MAIN PROCESS LINE
- SECONDARY PROCESS LINE
- AUXILIARY PROCESS LINE
- DIRECTION OF FLOW
- PNEUMATIC SIGNAL
- ELECTRICAL SIGNAL
- HYDRAULIC SIGNAL
- SOFTWARE OR DATA LINK
- SIGNAL CONNECTION
- CROSSOVER - NO CONNECTION
- CAPILLARY

CROSS REFERENCE SYMBOLOGY

ZZZ XXX YYY OFF PAGE CONNECTOR

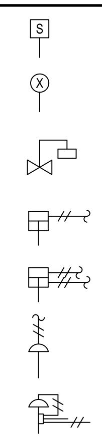
SUBSCRIPTS
XXX - CONNECTOR NUMBER
YYY - SHEET CONTINUATION
ZZZ - SERVICE ABBREVIATION

INSTRUMENT SYMBOLOGY



- LOCALLY MOUNTED FIELD INSTRUMENTATION
- MOUNTED ON PANEL FRONT
- MOUNTED INSIDE PANEL
- FRONT PANEL MOUNTED ON AUXILIARY PANEL (SUBSCRIPT INDICATES PANEL)
- MOUNTED INSIDE AUXILIARY PANEL
- PILOT LIGHT
- INSTRUMENT FUNCTIONS SHARING COMMON HOUSING
- COMPLEX INTERLOCK AS DEFINED IN CONTROL DIAGRAM OR IN SPECIFICATIONS
- SHARED DISPLAY, SHARED CONTROL, FIELD MOUNTED
- SHARED DISPLAY, SHARED CONTROL, PRIMARY LOCATION - NORMALLY ACCESSIBLE TO OPERATOR
- PROGRAMMABLE LOGIC CONTROL, PRIMARY LOCATION - NORMALLY ACCESSIBLE TO OPERATOR
- PROGRAMMABLE LOGIC CONTROL, FIELD MOUNTED

ACTUATOR SYMBOLOGY



- SOLENOID
- OPERATOR ABBREVIATIONS:
  M = MOTOR
  P = PNEUMATIC
- FLOAT OPERATOR
- SPRING-OPPOSED SINGLE-ACTING PNEUMATIC CYLINDER
- DOUBLE-ACTING PNEUMATIC CYLINDER
- PNEUMATIC DIAPHRAGM
- PNEUMATIC DIAPHRAGM WITH POSITIONER

TYPES OF POWER SUPPLY

A	PLANT COMPRESSED AIR
IA	INSTRUMENTATION AIR
ES	ELECTRIC SUPPLY
NG	NATURAL GAS
HYD	HYDRAULIC

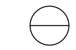
INSTRUMENT IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	VARIABLE MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT/ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USERS CHOICE			CONTROL	CLOSED
D	USERS CHOICE	DIFFERENTIAL			DEVIATION
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, GAUGE VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN	SCAN		
K	TIME, TIME SCHEDULE	TIME; RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE				MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE TOTALIZE		
R	RADIATION		RECORD		RUN
S	SPEED, FREQUENCY	SAFETY		SWITCH	STOP
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECH. ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL PROBE		
X	UNCLASSIFIED	X AXIS	ACCESSORY DEVICES UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		AUXILLIARY DEVICES	
Z	POSITION, DIMENSION	Z AXIS SAFETY INSTRUMENTED SYSTEM		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

MISCELLANEOUS INSTRUMENTATION ABBREVIATIONS

AI	ANALOG INPUT
AO	ANALOG OUTPUT
CL2	CHLORINE (ANALYZER MODIFIER)
CO	CARBON MONOXIDE (ANALYZER MODIFIER)
CO2	CARBON DIOXIDE (ANALYZER MODIFIER)
COMB	COMBUSTIBLES (ANALYZER MODIFIER)
COND	CONDUCTIVITY (ANALYZER MODIFIER)
DEN	DENSITY (ANALYZER MODIFIER)
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
DO	DISSOLVED OXYGEN (ANALYZER MODIFIER)
E/P	VOLTAGE TO PNEUMATIC
H2S	HYDROGEN SULFIDE (ANALYZER MODIFIER)
HCL	HYDROGEN CHLORIDE (ANALYZER MODIFIER)
I/O	INPUT/OUTPUT
I/P	CURRENT TO PNEUMATIC
NOX	NITROGEN OXIDE (ANALYZER MODIFIER)
OI	OPERATOR INTERFACE
O2	OXYGEN (ANALYZER MODIFIER)
P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
PHOS	PHOSPHATE
SS	SUSPENDED SOLIDS (ANALYZER MODIFIER)
TURB	TURBIDITY (ANALYZER MODIFIER)
WAN	WIDE AREA NETWORK
LCP	LOCAL CONTROL PANEL
TEMP	TEMPERATURE
PRV	PRESSURE RELIEF VALVE
CFE	COMBINED FILTER EFFLUENT

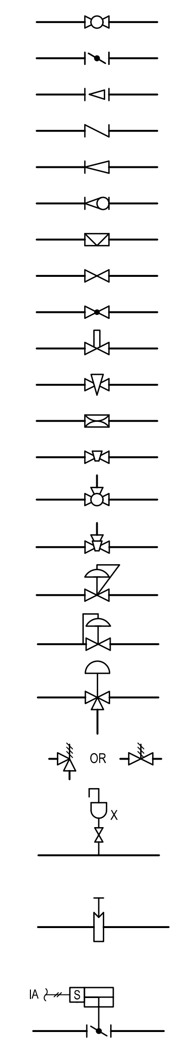
CONTROL SWITCH NOTATION ABBREVIATIONS



XXX

ACK	ACKNOWLEDGE
ES	EMERGENCY STOP
FAIL	FAILURE
FOR	FORWARD-OFF-REVERSE
FR	FORWARD-REVERSE
FS	FAST-SLOW
HA	HAND-AUTO
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
LL	LEAD-LAG
LLS	LEAD-LAG-STANDBY
LOR	LOCAL-OFF-REMOTE
LR	LOCAL-REMOTE
LS	LEAD-STANDBY
MA	MANUAL-AUTO
OAC	OPEN-AUTO-CLOSE
OC	OPEN-CLOSE
OO	ON-OFF
OSC	OPEN-STOP-CLOSE
RJ	RUN-JOG
RJR	RUN-JOG-REVERSE
SIL	SILENCE
SS	START-STOP
STR	START
STP	STOP

VALVES



- BALL VALVE
- BUTTERFLY VALVE
- CONE VALVE
- CHECK VALVE
- DOUBLE-DISK CHECK VALVE
- BALL CHECK VALVE
- DIAPHRAGM VALVE
- GATE OR GENERAL VALVE
- GLOBE VALVE
- KNIFE GATE VALVE
- NEEDLE VALVE
- PINCH VALVE
- PLUG VALVE
- THREE-WAY BALL VALVE
- THREE-WAY PLUG VALVE
- PRESSURE-REDUCING VALVE
- PRESSURE-REGULATING VALVE
- THREE-WAY CONTROL VALVE
- OR PRESSURE-RELIEF VALVE
- X AIR-RELEASE VACUUM VALVE
  A = AIR RELEASE
  VAC = VACUUM
- MUD VALVE
- IA S SOLENOID OPERATED PNEUMATIC ACTUATOR AND VALVE

MISCELLANEOUS SYMBOLOGY

GENERAL NOTES:

1. THIS IS A STANDARD INSTRUMENTATION SYMBOLOGY AND ABBREVIATIONS SHEET. LISTING OF SYMBOLS AND ABBREVIATIONS DOES NOT IMPLY ALL SYMBOLS AND ABBREVIATIONS HAVE BEEN USED ON THIS PROJECT.

PIPING LEGEND

PIPE MATERIALS AND SERVICE

DESCRIPTION	DI	CS	ABS	SS	PVC	CPVC	HDPE	COP	GIP
RAW WATER	Y	Y	Y	Y	N	N	N	N	N
FILTRATE WATER	Y	Y	Y	Y	N	N	N	N	N
WASTE (BACKWASH)	Y	Y	N	Y	N	N	Y	N	N
CIP	N	N	Y	Y	Y	Y	Y	N	N
PROCESS AIR	Y	Y	N	Y	N	N	N	Y	Y
CONTROL AIR	N	N	N	Y	N	N	N	Y	Y

Y = SUITABLE
N = NOT RECOMMENDED

D C B A

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ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	
DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

INSTRUMENTATION LEGEND

0 1" 2"

FILENAME 00Y001.DWG
SCALE NONE

SHEET **00Y001**

1 2 3 4 5 6 7 8

VALVES

- 3 WAY MULTI-PORT VALVE
- 4 WAY MULTI-PORT VALVE
- MANUAL VALVE
- ANGLE VALVE
- BACK-PRESSURE VALVE
- BACKFLOW PREVENTER VALVE
- PRESSURE BALANCED DIAPHRAGM DIFFERENTIAL EXTERNAL
- DIAPHRAGM VALVE
- FLAP VALVE
- HOSE BIBB VALVE
- SLEEVE VALVE
- TELESCOPING VALVE
- FLOAT VALVE
- NORMALLY OPEN/NORMALLY CLOSED (TYPICAL FOR ALL VALVE SYMBOLS)
- ORIFICE VALVE
- ORIFICE IN QUICK CHANGE FITTING

BLOWERS

- AERATOR
- BLOWER
- POSITIVE DISPLACEMENT BLOWER
- SINGLE STAGE CENTRIFUGAL BLOWER

PUMPS & COMPRESSORS

- SLUDGE DIAPHRAGM PUMP
- HORIZONTAL CENTRIFUGAL PUMP
- GENERIC PUMP
- CHEMICAL METERING PUMP
- DRUM PUMP
- ROTARY GEAR PUMP
- SPLIT-CASE PUMP
- HOSE / PERISTALTIC PUMP
- PLUNGER / PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- ROTARY LOBE PUMP
- SUBMERSIBLE SUMP PUMP
- SUBMERSIBLE TURBINE PUMP
- VERTICAL CAN PUMP
- VERTICAL CENTRIFUGAL PUMP
- INCLINED ARCHIMEDES SCREW PUMP
- SLUDGE GRINDER
- VERTICAL SUMP PUMP
- RECIPROCATING COMPRESSOR
- ROTARY SCREW COMPRESSOR
- SHAFTLESS CONVEYOR
- SCREW CONVEYOR
- BELT CONVEYOR
- DEWATERED SLUDGE CAKE PUMP
- AIR COMPRESSOR
- COMPRESSED AIR FILTER
- COMPRESSED AIR REGULATOR
- AIR DRYER
- HYDRAULIC PUMP

PIPING ACCESSORIES

- CAP - BREATHER
- CAP - SCREW / THREADED
- CAP - WELDED
- CAP - QUICK DISCONNECT
- DIAPHRAGM SEAL
- DRAIN
- EXPANSION CHAMBER WITH RUPTURE DISK
- EDUCTOR
- FLANGED
- FLEXIBLE CONNECTION - BELLOWS TYPE (OR)
- FLAME ARRESTOR
- FLOOR CLEANOUT (FCO)
- FLUME
- FILTER
- HUB DRAIN
- INLINE MIXER
- PIPE MATERIAL CHANGE
- PULSATION DAMPENER
- REDUCER - CONCENTRIC
- REDUCER - ECCENTRIC
- REMOVABLE SPOOL PIECE
- UNION
- RUPTURE DISK
- STRAINER - BASKET TYPE
- SLOPE
- TRAP
- WALL CLEANOUT (WCO OR WCO)
- TIE-IN POINT (TP)
- AIR DRYER
- ANNULAR SEAL
- ATMOSPHERIC VENT
- BLIND FLANGE
- FLEX COUPLING
- FLEXIBLE HOSE

PIPING ACCESSORIES

- EXPANSION JOINT

MISCELLANEOUS

- BRIDGE CRANE
- BELT PRESS
- CALIBRATION COLUMN
- CONTAINER SCALE
- CARTRIDGE FILTER
- DEMISTOR
- FIRE HYDRANT
- GAS BOTTLE
- HEAT EXCHANGER - PLATE TYPE
- HEAT EXCHANGER - STRAIGHT TYPE
- HEAT EXCHANGER - U TUBE
- HEATER
- HORN
- PANEL-MOUNTED HORN
- BEACON
- MISCELLANEOUS EQUIPMENT
- MIXER
- MOTOR SYMBOL
- HORIZONTAL PRESSURE VESSEL
- VERTICAL PRESSURE VESSEL
- RADIO ANTENNA
- REFRIGERATOR DRYER
- SAMPLE COOLER
- AUTO-BACKWASHING STRAINER
- TANK WITH CONE SHAPED ROOF
- TANK WITH DOME ROOF
- TANK WITH FLOATING COVER
- TANK, VESSEL, OR BIN
- TEMPERING TANK
- TOTE TANK
- WATER LEVEL
- GENERATOR

MISCELLANEOUS

- JET AERATOR DIFFUSER
- MUFFLER
- POTENTIAL TRANSFORMER (PT)
- CIRCUIT BREAKER
- CURRENT TRANSFORMER (CT)

VALVE AND GATE ACTUATORS

- DIAPHRAGM ACTUATOR
- E/H = ELECTROHYDRAULIC
P = PNEUMATIC
S = SOLENOID
- FAIL STATE:
FO = FAIL OPEN
FC = FAIL CLOSED
- MOTOR ACTUATOR
- PISTON ACTUATOR
- FLOAT OPERATOR
- SPRING- OPPOSED SINGLE ACTING PNEUMATIC CYLINDER
- DOUBLE- ACTING PNEUMATIC CYLINDER
- PNEUMATIC DIAPHRAGM
- PNEUMATIC DIAPHRAGM WITH POSITIONER
- INTAKE SCREEN

GATES

- SLIDE GATE
- STOP GATE OR SHEAR GATE

HVAC

- AIR CONDITIONING UNIT
- DUCT AIR FILTER
- AIR HANDLING UNIT
- NON-MOTORIZED DAMPER
- MOTORIZED DAMPER
- DEHUMIDIFIER
- DUCT SMOKE DETECTOR
- EVAPORATIVE COOLER
- HVAC BOILER
- HVAC FAN
- VENT FAN
- HVAC LOUVER
- THERMOSTAT
- UNIT HEATER
- WATER HEATER

INPUT / OUTPUT SYMBOLS

- ▲ ANALOG INPUT (AI)
- ▼ ANALOG OUTPUT (AO)
- △ DISCRETE INPUT (DI)
- ▽ DISCRETE OUTPUT (DO)

EQUIPMENT SUPPLIER DESIGNATIONS

- ◇ INSTRUMENTS /EQUIPMENT SUPPLIED BY ELECTRICAL CONTRACTOR
- ◆ INSTRUMENTS /EQUIPMENT SUPPLIED BY EQUIPMENT VENDOR

D C B A

HDR

HDR Engineering, Inc. of the Carolinas
555 Fayetteville Street, Suite 900
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919.232.6600
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER

DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

INSTRUMENTATION LEGEND

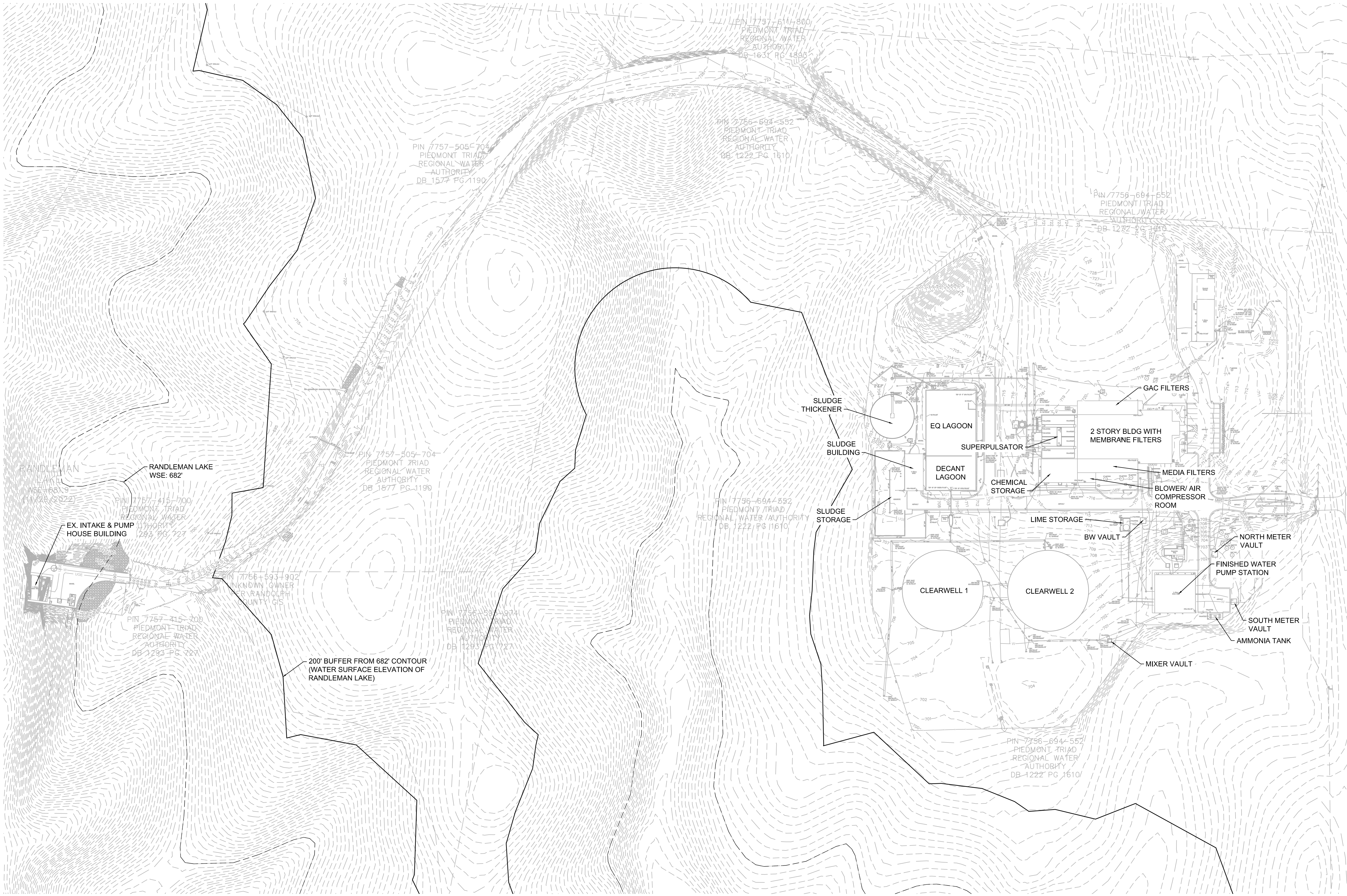
0 1" 2"

FILENAME 00Y002.DWG

SCALE NONE

SHEET **00Y002**

1 2 3 4 5 6 7 8



GENERAL NOTES:

1. THE SPECIFIC PURPOSE SURVEY WAS PREPARED BY: FRANCIS M. HARTER III, PROFESSIONAL LAND SURVEYOR, AND COMPLETED IN OCTOBER 2022. ALL COORDINATES ARE BASED ON NAD83/2011, AND ELEVATIONS BASED ON NAVD 88.
2. THE SURVEY WAS MAPPED FOR PIEDMONT TRIAD REGIONAL WATER AUTHORITY.
3. THIS PROPERTY MAY BE SUBJECT TO ANY EASEMENTS, RESTRICTIVE COVENANTS AND/OR RIGHT OF WAY RECORD.
4. THE PURPOSE OF THE SURVEY IS TO SHOW IMPROVEMENTS AND TOPOGRAPHICAL INFORMATION ONLY. A BOUNDARY SURVEY WAS NOT PERFORMED UNDER THE SCOPE OF THIS PROJECT.
5. CONTOURS SHOWN HEREON ARE 1 FOOT INCREMENTS.
6. AREA BY COORDINATE METHOD. ALL DISTANCES SHOWN ARE HORIZONTAL AND IN U.S. FEET.
7. THE LOCATION OF UTILITIES AS SHOWN HEREON, WHETHER PUBLIC OR PRIVATE, ARE BASED ON THE LOCATION OF VISIBLE ABOVE GROUND APPURTENANCES AS WELL AS LEVEL B SUE DESIGNATION PERFORMED BY CES GROUP ENGINEERS, LLP. OTHER UTILITIES WHICH WERE NOT OBSERVED AND NOT SHOWN HEREON MAY EXIST. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
8. NO NCGS OR USGS MONUMENTS LOCATED WITHIN 2000' OF SUBJECT PARCEL.

LEGEND

- CONTOUR (MAJOR)
- CONTOUR (MINOR)
- FENCE
- WATERLINE
- UNKNOWN UTILITY
- UNDERGROUND ELECTRIC
- UNDERGROUND COMM
- OVERHEAD ELECTRIC
- FLOODPLAIN
- TREELINE
- POWER POLE

D C B A

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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
A	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

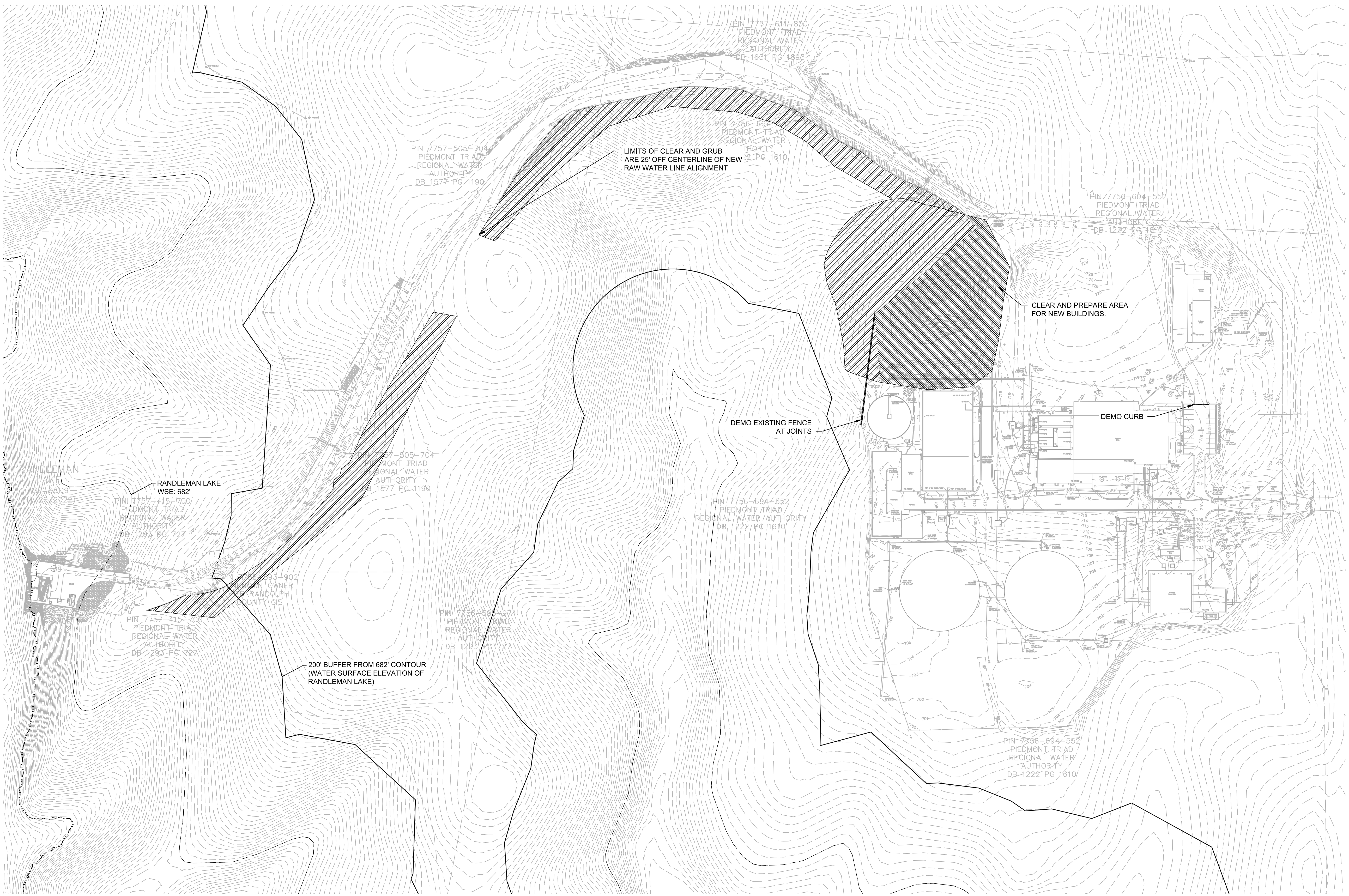
EXISTING CONDITIONS

0 1" 2"

FILENAME 10343268-01V-101.dwg

SCALE 1" = 100'

SHEET 01V-101



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8. NO NCGS OR USGS MONUMENTS LOCATED WITHIN 2000' OF SUBJECT PARCEL.

LEGEND

- CONTOUR (MAJOR)
- CONTOUR (MINOR)
- FENCE
- WATERLINE
- UNKNOWN UTILITY
- UNDERGROUND ELECTRIC
- UNDERGROUND COMM
- OVERHEAD ELECTRIC
- FLOODPLAIN
- TREELINE
- POWER POLE
- CLEAR AND GRUB
- CLEAR ONLY
- REMOVE FENCE

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DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

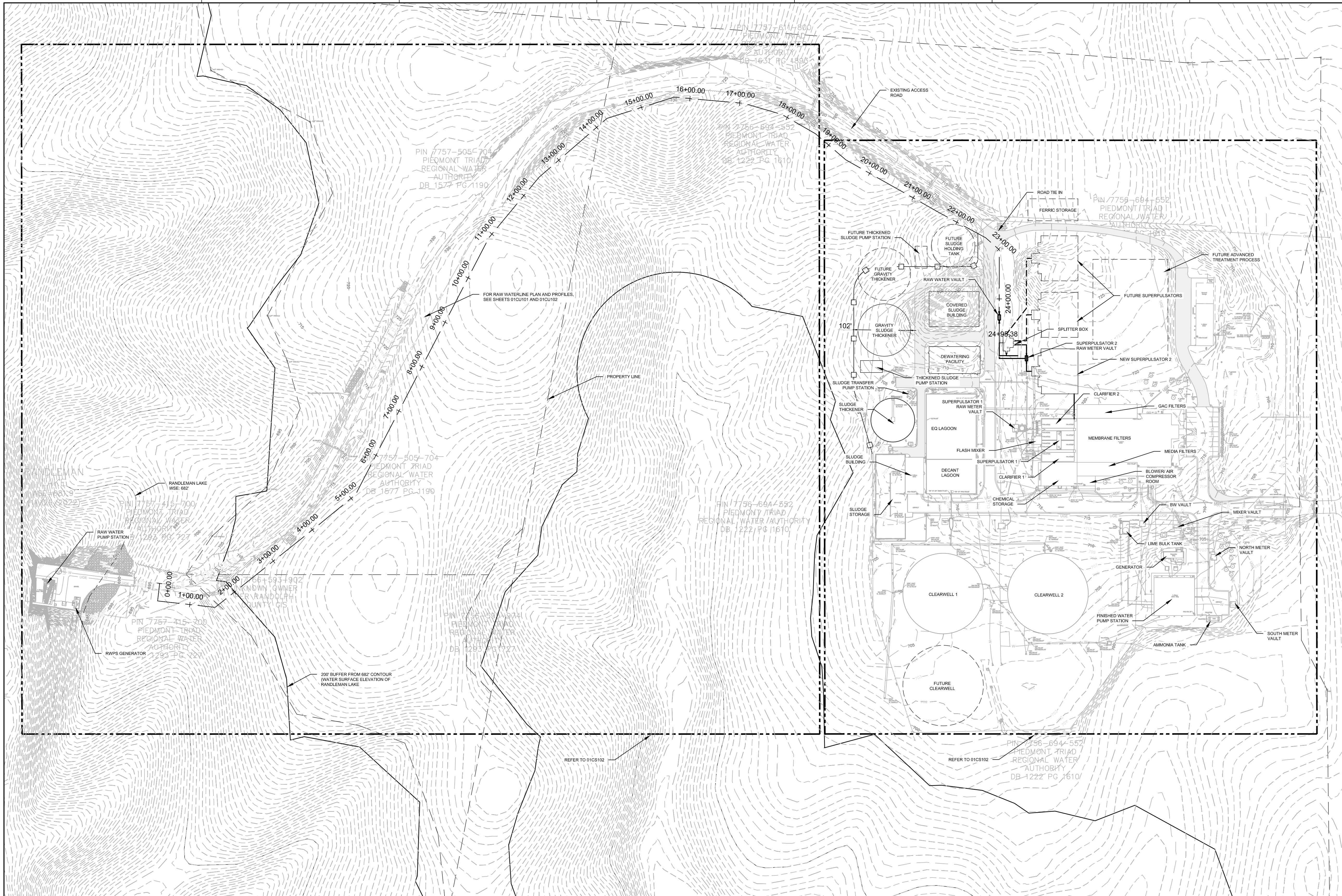
PRELIMINARY
NOT FOR
CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEMOLITION

0 1" 2"

FILENAME	10343268-01X101.dwg
SCALE	1" = 100'
SHEET	01X101



GENERAL NOTES:

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LEGEND

- EX. CONTOUR (MAJOR)
- EX. CONTOUR (MINOR)
- FENCE
- WATERLINE
- UNKNOWN UTILITY
- UNDERGROUND ELECTRIC
- UNDERGROUND COMM
- OVERHEAD ELECTRIC
- FLOODPLAIN
- TREELINE
- POWER POLE
- MAJOR CONTOUR
- MINOR CONTOUR

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DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

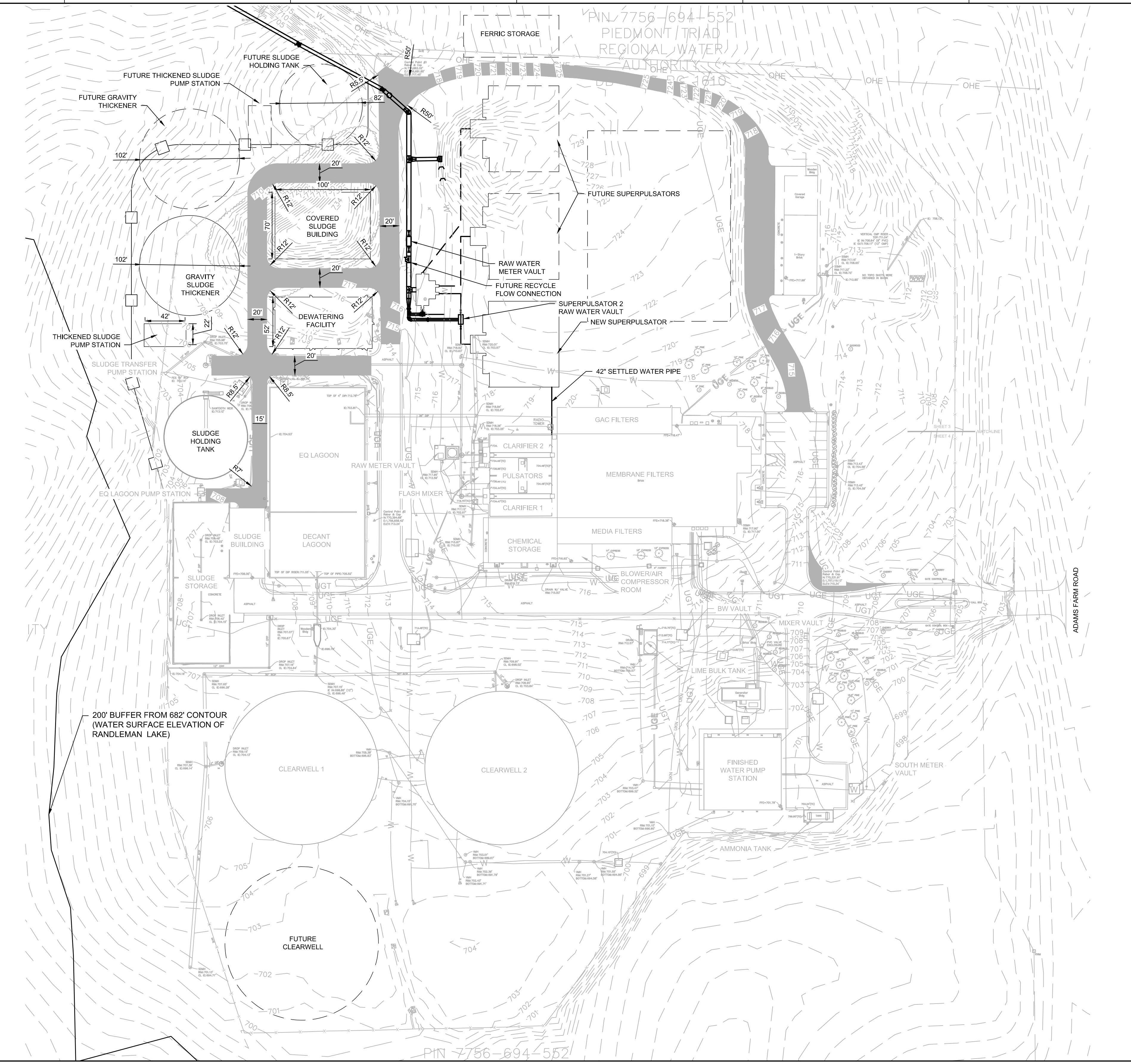
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

OVERALL SITE PLAN

0 1" 2"

FILENAME	10343268-01C102.DWG
SCALE	1" = 100'
SHEET	01C102



N

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LEGEND

	EX. CONTOUR (MAJOR)
	EX. CONTOUR (MINOR)
	FENCE
W	WATERLINE
UKN	UNKNOWN UTILITY
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND COMM
OHE	OVERHEAD ELECTRIC
	FLOODPLAIN
	TREELINE
	POWER POLE
	HEAVY DUTY ASPHALT PAVEMENT

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PROJECT NUMBER	10343268

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CONSTRUCTION
OR
RECORDING

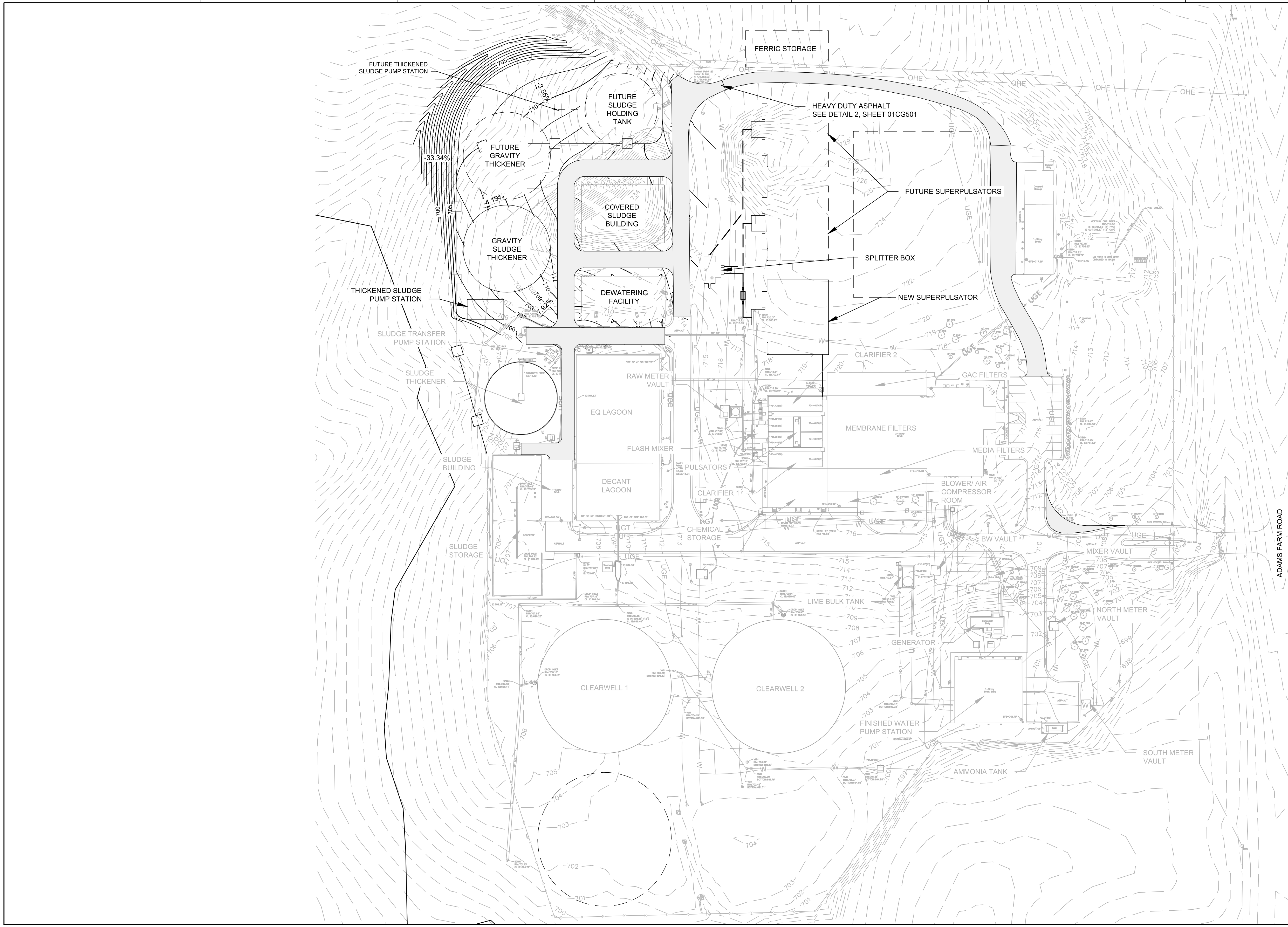
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SITE PLAN ENLARGEMENT

0 1" 2"

FILENAME	10343268-01C103.DWG
SCALE	1" = 60'

SHEET
01C103



N

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LEGEND

	EX. CONTOUR (MAJOR)
	EX. CONTOUR (MINOR)
	FENCE
W	WATERLINE
UKN UKN UKN	UNKNOWN UTILITY
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND COMM
OHE	OVERHEAD ELECTRIC
	FLOODPLAIN
	TREELINE
	POWER POLE
	MAJOR CONTOUR
	MINOR CONTOUR

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

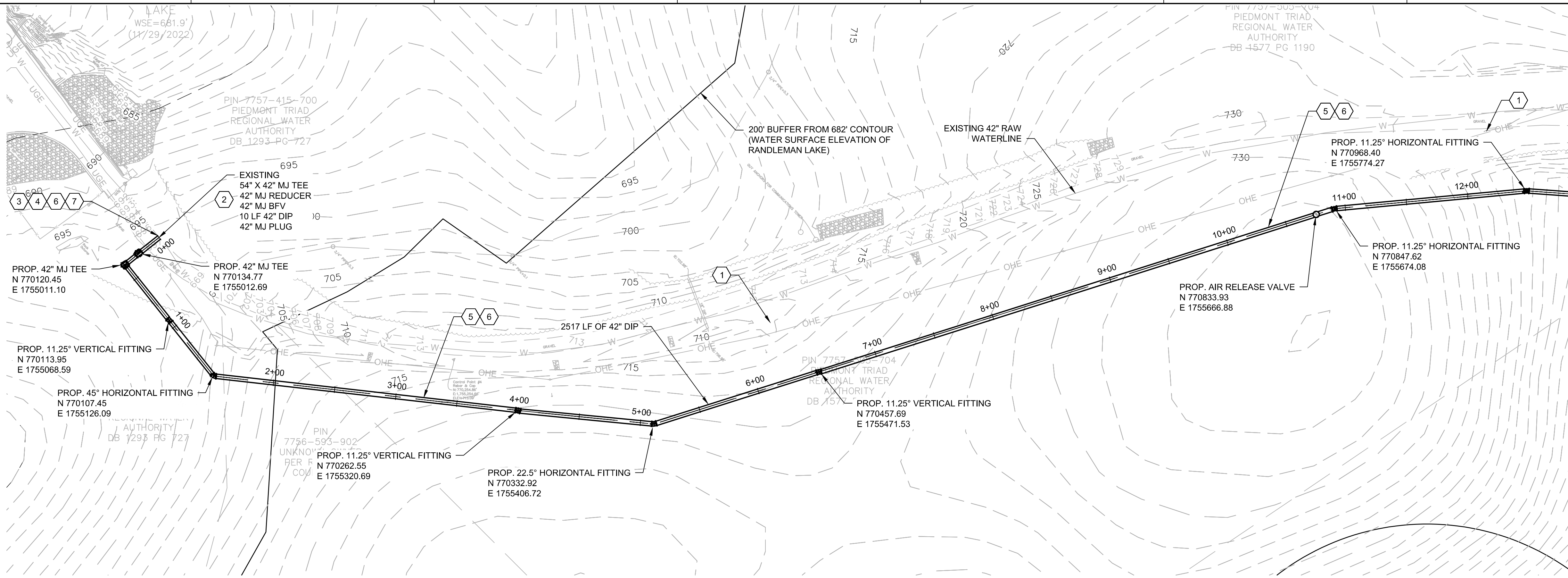
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

GRADING AND DRAINAGE PLAN 2

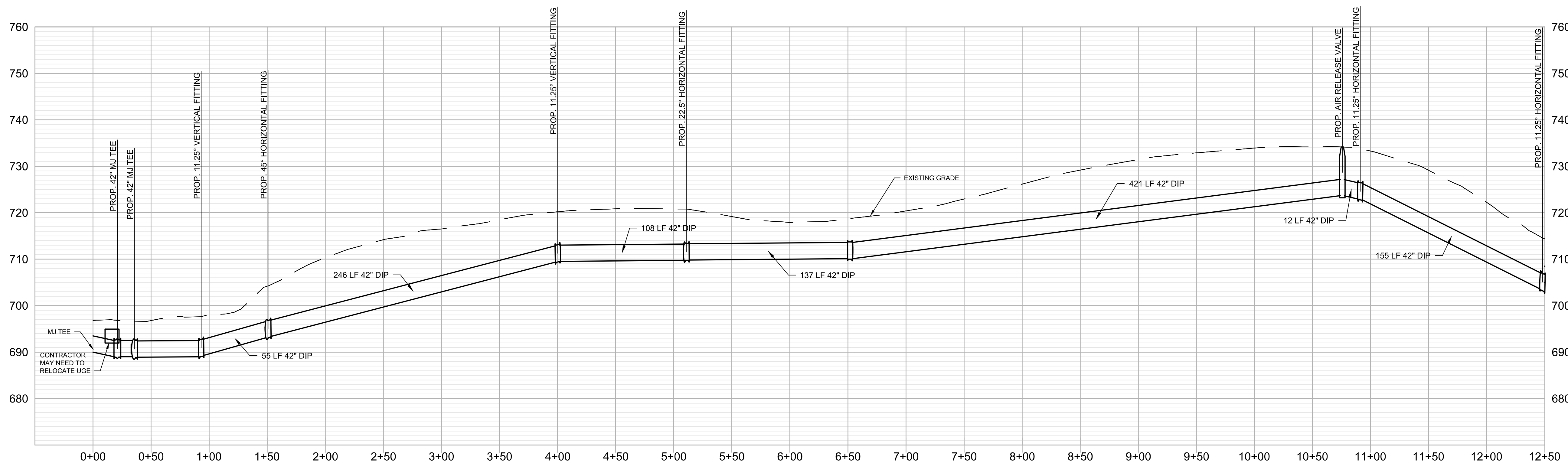
0 1" 2"

FILENAME	10343268-01C201.dwg
SCALE	1" = 60'
SHEET	01C201



KEYNOTES:

1. EXISTING CHEMICAL FEED LINES AND FIBER OPTIC LINES ARE IN THE VICINITY OF THE PROPOSED ALIGNMENT OF THE 42" DIP FORCE MAIN. THE CONTRACTOR SHALL FIELD LOCATE AND RELOCATE AS MAY BE NECESSARY TO ENSURE 10' OF HORIZONTAL SEPARATION IS MAINTAINED BETWEEN CHEMICAL FEED/FIBER OPTIC LINES AND THE PROPOSED FORCE MAIN.
2. EXISTING FITTINGS, VALVES AND PIPES ARE TO BE ROTATED 180° TO ALLOW INSTALLATION TO TAKE PLACE ON EAST SIDE OF THE EXISTING 42" DIP RAW WATER FORCE MAIN.
3. NEW POSITION OF EXISTING COMPONENTS.
4. ALL EXISTING M.J. FITTINGS ARE TO BE RESTRAINED WITH EBBA IRON SERIES 1100 DTM TANDEM MEGALUG OR APPROVED EQUAL.
5. ALL PIPES ARE TO BE FULLY RESTRAINED.
6. ALL RESTRAINED JOINTS SHALL BE COATED WITH TRENTON WAX - TAPE PRIMER (WHITED) AND WRAPPED WITH TRENTON WAX - TAPE NO. 1. EXTEND COMPLETE WAX SYSTEM MINIMUM OF 6 INCHES BEYOND EACH FACE OF M.J. RESTRAINT. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
7. CONNECTION FOR EMERGENCY DIESEL-DRIVE RAW WATER PUMP TO BE COORDINATED IN THE NEXT DESIGN PHASE



HDR

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CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY
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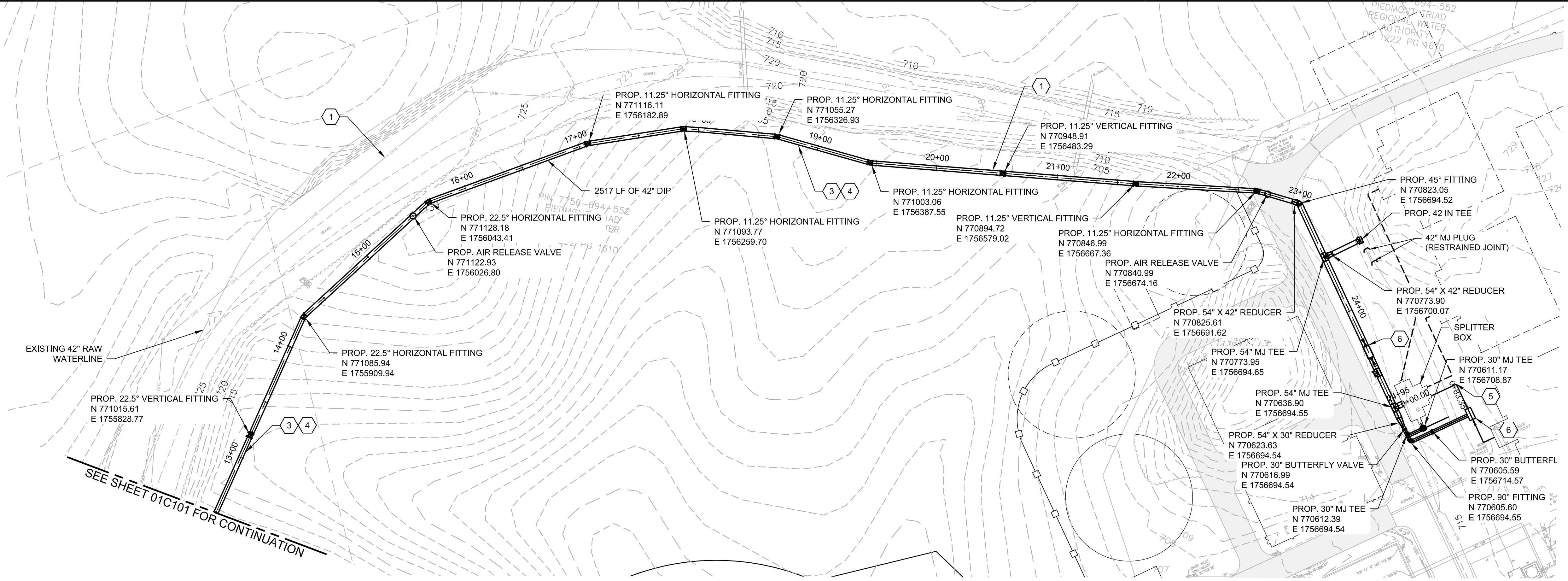
OR
RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

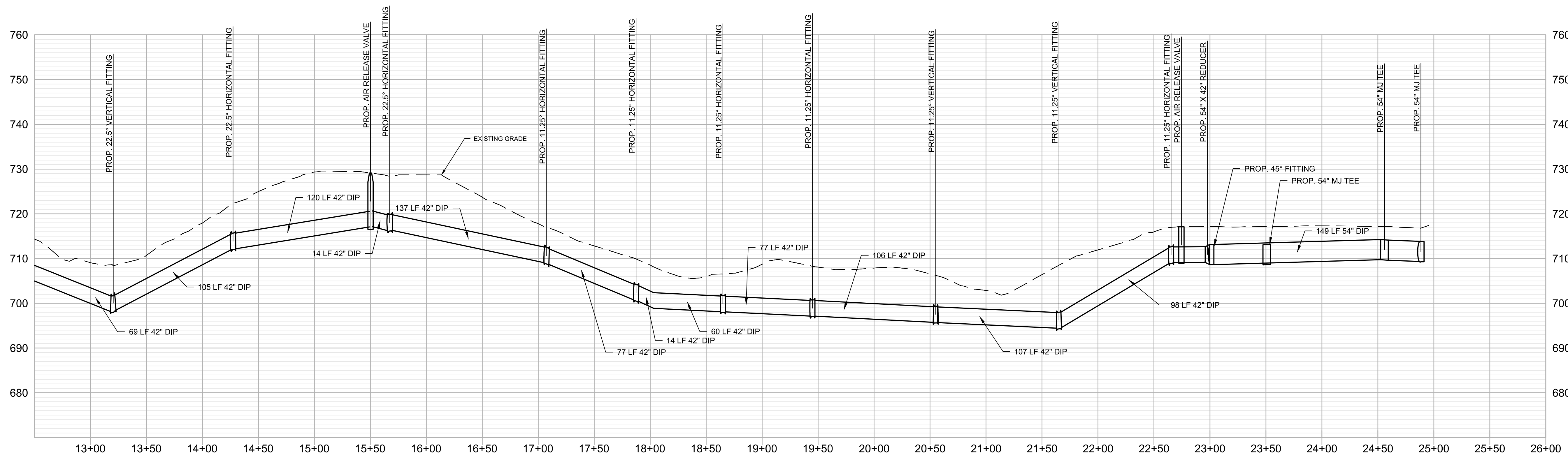
RAW WATERLINE PLAN AND PROFILE
STA: 0+00 TO 12+50

FILENAME 10343268-01C301.DWG
SCALE 1" = 50'
SHEET 01C301



KEYNOTES:

1. EXISTING CHEMICAL FEED LINES AND FIBER OPTIC LINES ARE IN THE VICINITY OF THE PROPOSED ALIGNMENT OF THE 42" DIP FORCE MAIN. THE CONTRACTOR SHALL FIELD LOCATE AND RELOCATE AS MAY BE NECESSARY TO ENSURE 10' OF HORIZONTAL SEPARATION IS MAINTAINED BETWEEN CHEMICAL FEED/FIBER OPTIC LINES AND THE PROPOSED FORCE MAIN.
2. NOT USED
3. ALL PIPE ARE TO BE FULLY RESTRAINED.
4. ALL RESTRAINED JOINTS SHALL BE COATED WITH TRENTON WAX - TAPE PRIMER (WHITED) AND WRAPPED WITH TRENTON WAX - TAPE NO. 1. EXTEND COMPLETE SYSTEM MINIMUM OF 6 INCHES BEYOND EACH FACE OF M.J. RESTRAINT. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
5. ADDITIONAL PIPING CONNECTIONS FOR RECYCLED WATER TO BE COORDINATED IN THE NEXT DESIGN PHASE. BYPASS PIPING TO ACCOMMODATE CONSTRUCTION ACTIVITIES TO BE COORDINATED IN THE NEXT DESIGN PHASE.
6. RAW WATER METER VAULT AND VALVES. EXACT LOCATION TO BE DETERMINED IN THE NEXT DESIGN PHASE



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DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

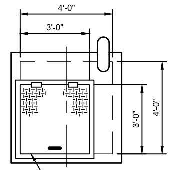
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

RAW WATERLINE PLAN AND PROFILE STA: 12+50 TO 25+00

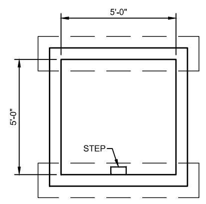
0 1" 2"

FILENAME	10343268-01C302.DWG
SCALE	1" = 50'

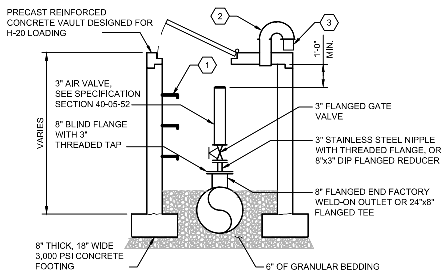
SHEET **01C302**



TOP PLAN



LOWER PLAN



GENERAL NOTE

1. ALL PIPE AND FITTINGS SHALL BE STAINLESS STEEL OR EPOXY LINED DIP.

KEY NOTE

1 INSTALL STEEL REINFORCED COPOLYMER POLYPROPYLENE STEPS, SPACED 16" O.C., CENTER ON HATCH OPENING.

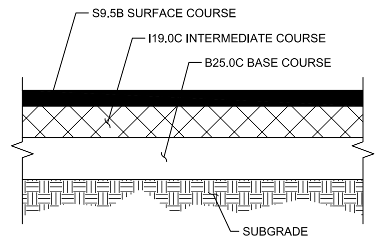
2 6" VENT PIPE WITH FLANGED DIP RETURN BEND WITH STAINLESS STEEL INSECT SCREEN, VENT PIPE SHALL BE EPOXY LINED DIP OR 316 STAINLESS STEEL WITH 1/4" WALL THICKNESS

3 INSTALL ODOR CONTROL VENT VALVE WHERE CALLED FOR IN THE PLANS.

AIR RELEASE VALVE DETAIL

NOT TO SCALE

1
-



NOTES:

1. ALL PAVEMENT TO BE CONSTRUCTED PER NORTH CAROLINA DEPARTMENT OF TRANSPORTATION SPECIFICATION REQUIREMENTS.

FULL DEPTH ASPHALT PAVEMENT SECTION

NOT TO SCALE

2
-

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DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY
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OR
RECORDING

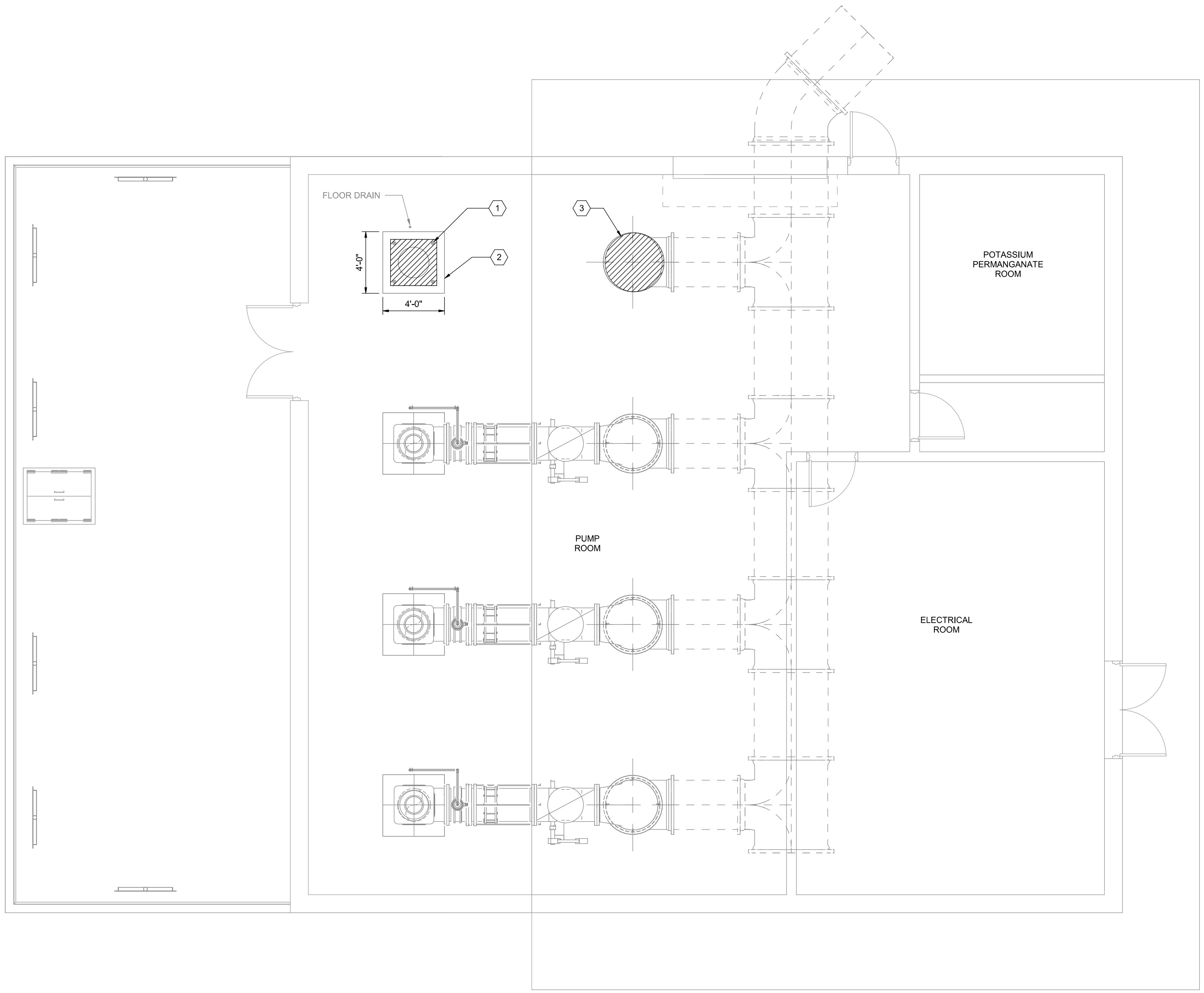
PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

CIVIL DETAILS

0 1" 2"

FILENAME	10343268-01CG501.DWG
SCALE	NOT TO SCALE

SHEET
01C501



DEMOLITION PLAN

1/4" = 1'-0"

GENERAL NOTES:

1. ALL STRUCTURES, EQUIPMENT, PIPING, ETC. SHOWN AS EXISTING AND/OR TO BE REMOVED IS REPRESENTATION OF EXISTING CONDITIONS BASED ON PS-RECORDED DRAWINGS. NOT ALL EXISTING PIPING AND EQUIPMENT IS SHOWN.
2. PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITIES, THE CONTRACTOR SHALL FIELD VERIFY LOCATIONS, DIMENSIONS, AND ELEVATIONS OF ALL EXISTING UTILITIES, EQUIPMENT AND STRUCTURES WHICH PERTAIN TO AND/OR AFFECT THIS PROJECT.
3. RAW WATER PUMP STATION IS OPERATIONAL 24/7, ANY AND ALL SHUTDOWNS SHALL BE COORDINATED WITH THE OWNER PER THE CONTRACT DOCUMENTS.
4. CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT ANY ITEMS, MATERIALS, ETC. FROM FALLING INTO THE RAW WATER SUMP. ALL PROTECTIVE COVERS/PLATES SHOWN REMAIN IN PLACE AND SECURED UNTIL THE FINAL COMPONENTS ARE INSTALLED.

KEYNOTES #

1 REMOVE 36IN SQUARE STEEL PLATE COVER.

2 FIELD VERIFY DIMENSIONS OF PUMP BASE.

3 REMOVE BLIND FLANGE.

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	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	S. BEROSET
CHECKED BY	C. CROTWELL
DRAWN BY	T. CASH
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

RAW WATER PUMP STATION DEMOLITION PLAN

0 1" 2"

FILENAME 10343268-10-D.rvt

SCALE 1/4" = 1'-0"

SHEET 10DX101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-10-D.rvt
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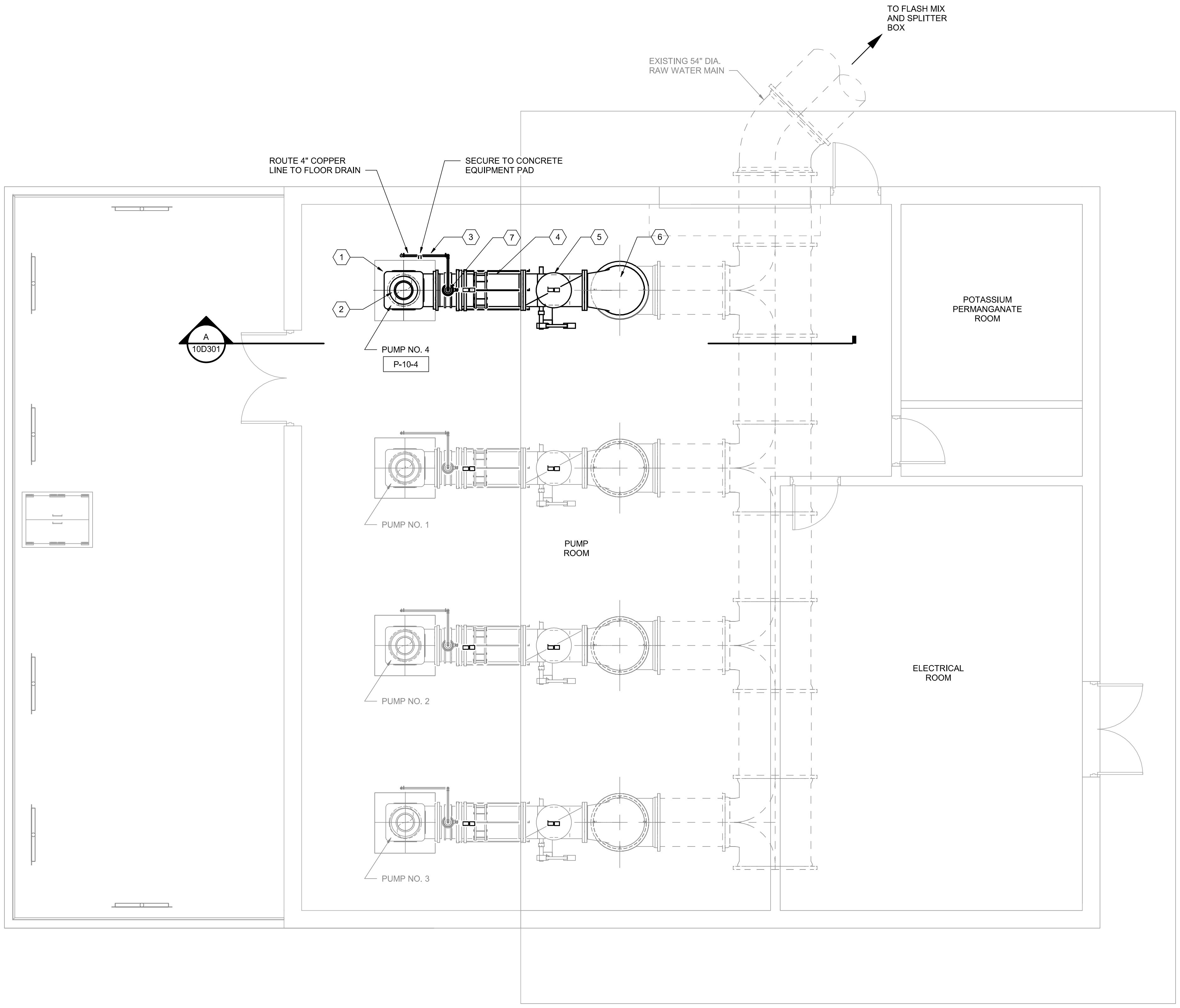

PLAN
1/4" = 1'-0"

N

GENERAL NOTES:

1. ALL STRUCTURES, EQUIPMENT, PIPING, ETC. SHOWN AS EXISTING AND/OR TO BE REMOVED IS REPRESENTATION OF EXISTING CONDITIONS BASED ON PS-RECORDED DRAWINGS. NOT ALL EXISTING PIPING AND EQUIPMENT IS SHOWN.
2. ALL PIPING SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 40 05 00 OF THE SPECIFICATIONS.
3. ALL PIPING UNDER PRESSURE SHALL BE INSTALLED WITH RESTRAINED JOINTS, FLANGES, AND FITTINGS.
4. COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 19 AND COATED PER SPECIFICATION SECTION 09 96 00.

KEYNOTES #

1 PUMP SOLEPLATE. CONFIGURATION DESIGNED TO MEET EXISTING HOLE PATTERN AND BOLT DIAMETER. MINIMUM THICKNESS SHALL BE 2 INCHES.

2 PUMP MOTOR.

3 1" COPPER AIR RELEASE LINE.

4 24" DISMANTLING JOINT (FULLY RESTRAINED).

5 24" AIR CUSHIONED SWING CHECK VALVE.

6 36" X 24" REDUCING 90° BEND.

7 4" AIR RELEASE VALVE.

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Raleigh, NC 27601
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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	S. BEROSET
CHECKED BY	C. CROTWELL
DRAWN BY	T. CASH
PROJECT NUMBER	10343268

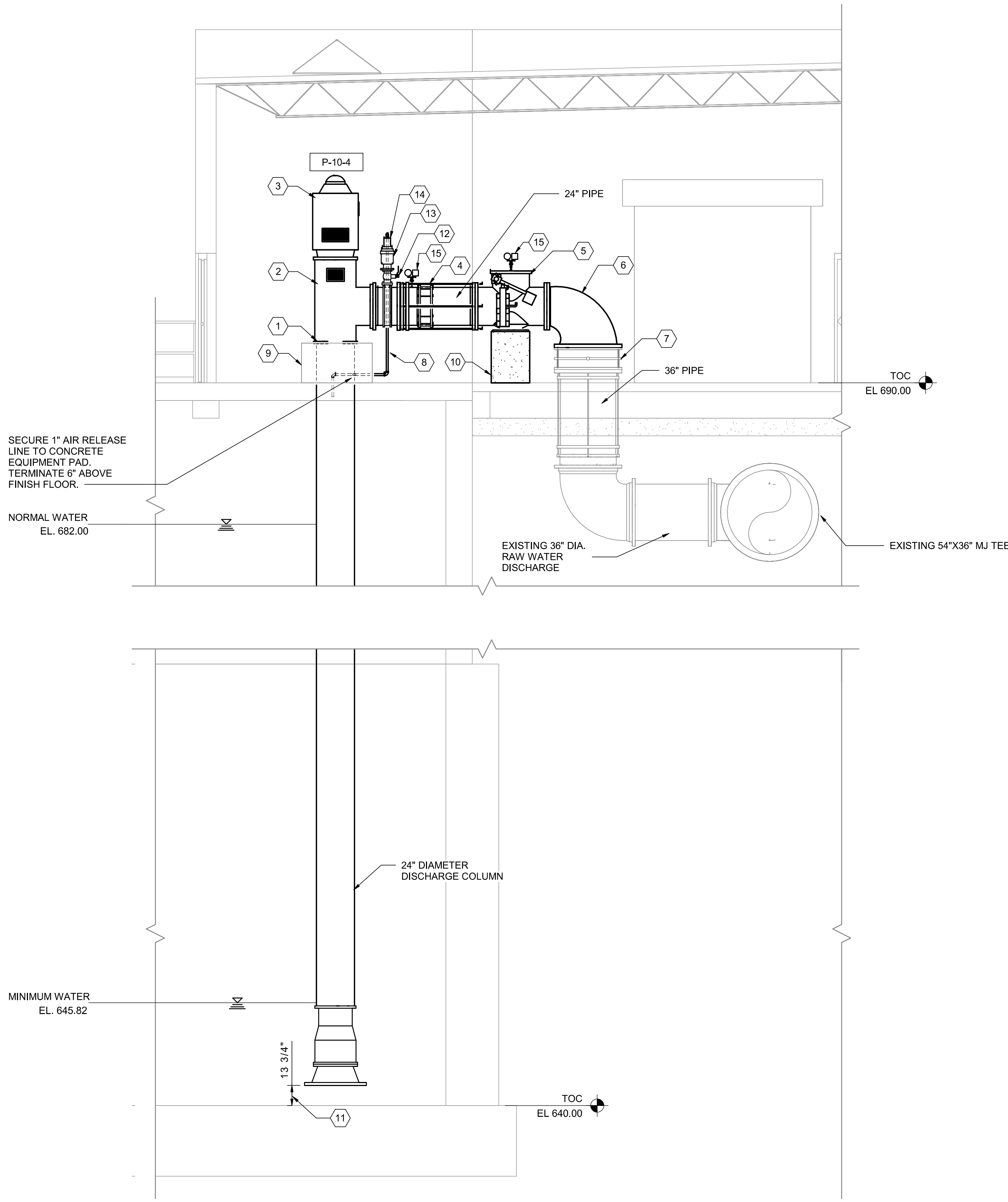
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

RAW WATER PUMP STATION PLAN

0 1" 2"

FILENAME	10343268-10-D.rvt
SCALE	1/4" = 1'-0"
SHEET	10D101



A SECTION
10D101 1/4" = 1'-0"

GENERAL NOTES:

1. ALL STRUCTURES, EQUIPMENT, PIPING, ETC. SHOWN AS EXISTING AND/OR TO BE REMOVED IS REPRESENTATION OF EXISTING CONDITIONS BASED ON PS-RECORDED DRAWINGS. NOT ALL EXISTING PIPING AND EQUIPMENT IS SHOWN.
2. ALL PIPING SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 40 05 00 OF THE SPECIFICATIONS.
3. ALL PIPING UNDER PRESSURE SHALL BE INSTALLED WITH RESTRAINED JOINTS, FLANGES, AND FITTINGS.
4. COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH SPECIFICATION SECTION 40 05 19 AND COATED PER SPECIFICATION SECTION 09 96 00.

KEYNOTES #

1 PUMP SOLEPLATE. CONFIGURATION DESIGNED TO MEET EXISTING HOLE PATTERN AND BOLT DIAMETER. MINIMUM THICKNESS SHALL BE 2 INCHES.

2 FABRICATED PUMP DISCHARGE HEAD WITH 24" DIA. DISCHARGE.

3 PUMP MOTOR.

4 24" DISMANTLING JOINT (FULLY RESTRAINED).

5 24" AIR CUSHIONED SWING CHECK VALVE.

6 36" X 24" REDUCING 90° BEND.

7 EXISTING 36" BUTTERFLY VALVE.

8 1" COPPER AIR RELEASE LINE.

9 EXISTING CONCRETE PUMP BASE. CONTRACTOR TO FEILD VERIFY HEIGHT AND DIMENSIONS.

10 CONCRETE EQUIPMENT SUPPORT COLUMN. SEE SHEET XX FOR DETAILS.

11 DIMENSION TO BE CONFIRMED AND APPROVED BY PUMP MANUFACTURER.

12 4" BALL VALVE.

13 4" AIR RELEASE VALVE.

14 4" NIPPLE.

15 PRESSURE GAUGE, PRESSURE SWITCH, AND SAMPLE LINE.

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DESIGNED BY	S. BEROSET
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DRAWN BY	T. CASH
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

RAW WATER PUMP STATION SECTION

0 1" 2"

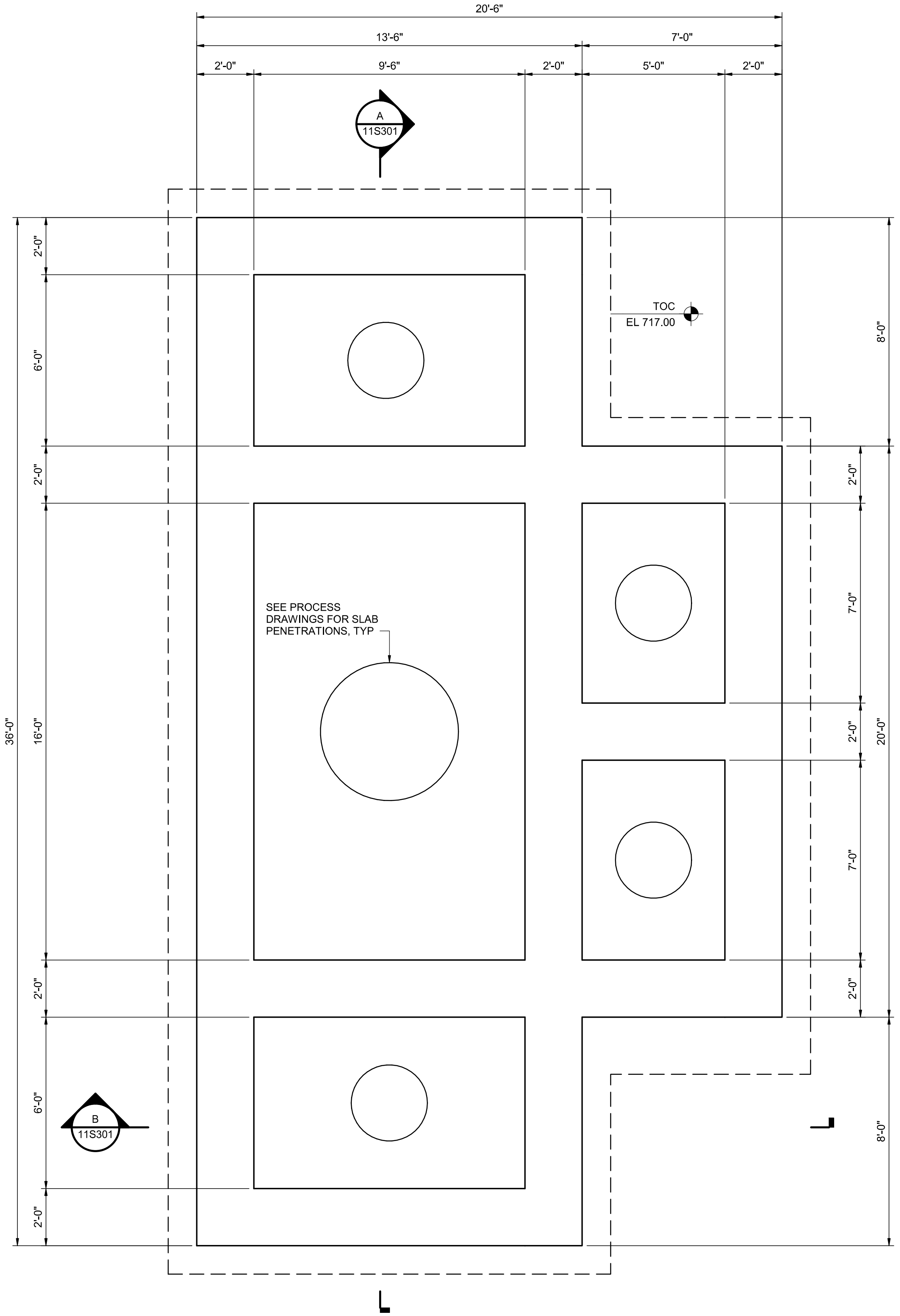
FILENAME 10343268-10-D.rvt
SCALE 1/4" = 1'-0"
SHEET 10D301

GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES. SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.
2. ACCESS LADDERS/STAIRS TO BE COORDINATED IN FUTURE SUBMITTAL

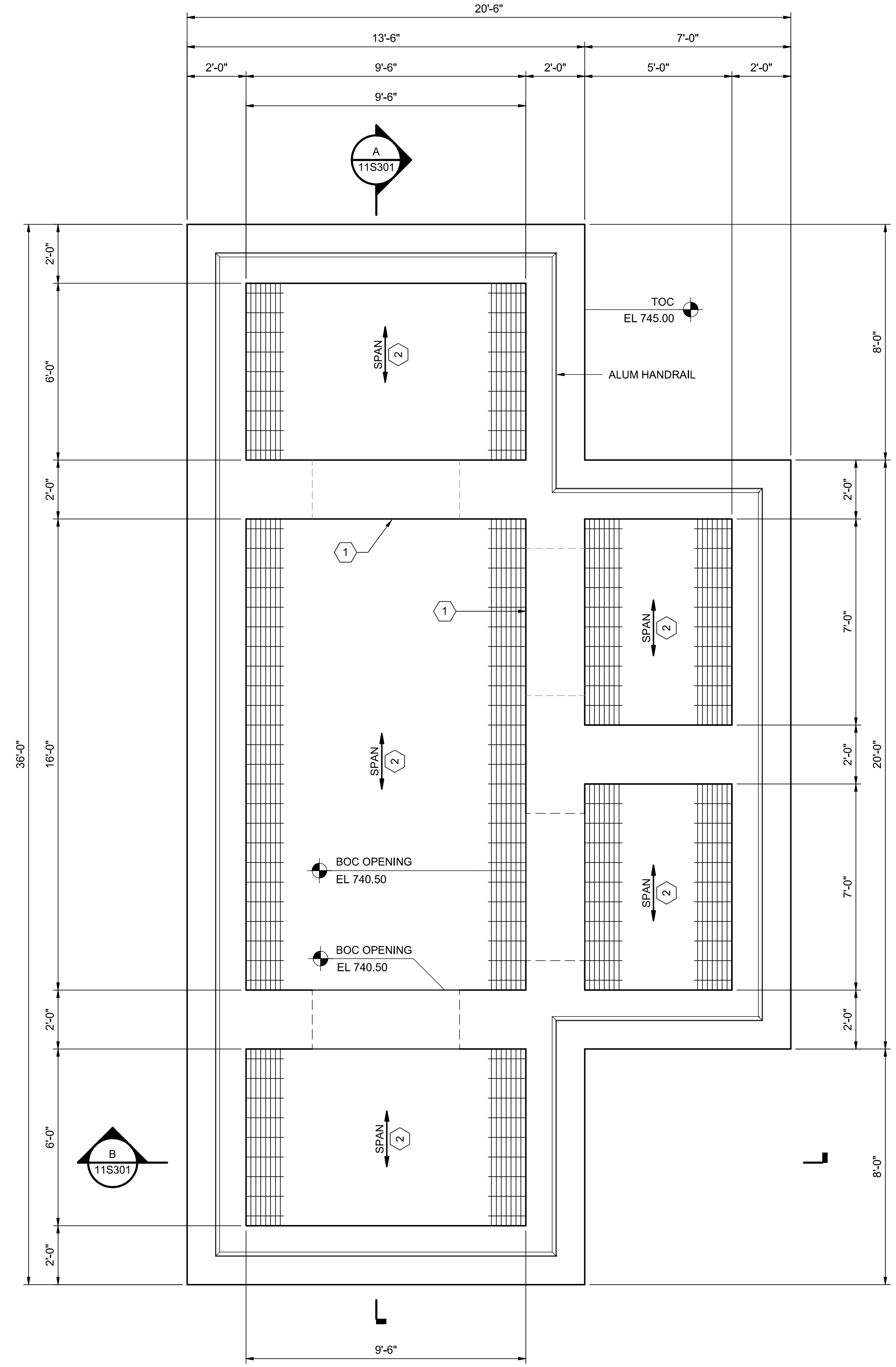
KEY NOTES: #

1. KNOCKOUT PANELS FOR FUTURE OPENINGS/GATES.
2. 2" ALUMINUM GRATING.



FOUNDATION PLAN

3/8" = 1'-0"



UPPER PLAN

3/8" = 1'-0"

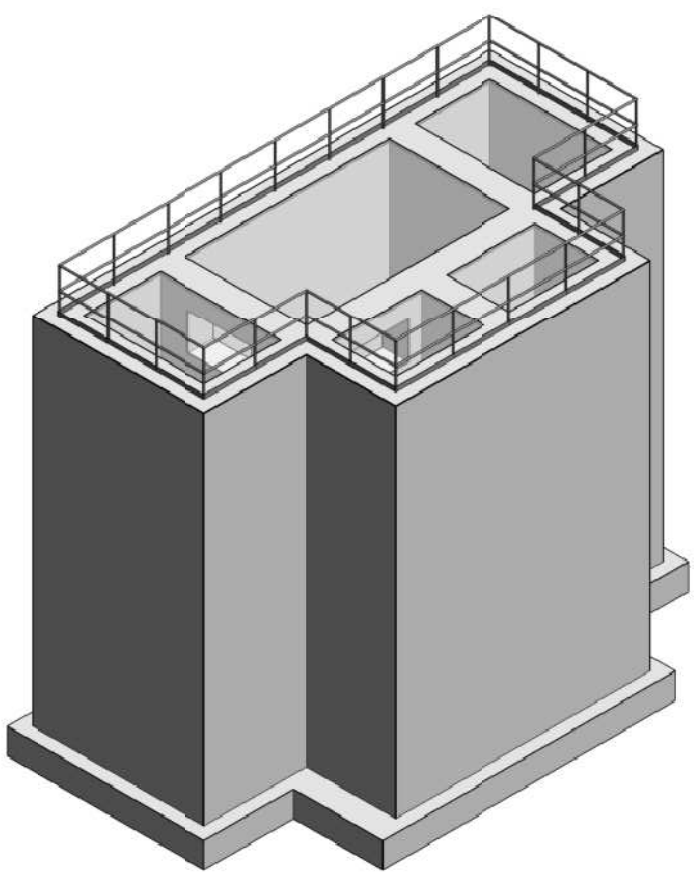


IMAGE OF SPLITTER BOX

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SPLITTER BOX FOUNDATION AND UPPER PLANS

0 1" 2"

FILENAME 10343268-11-S.rvt

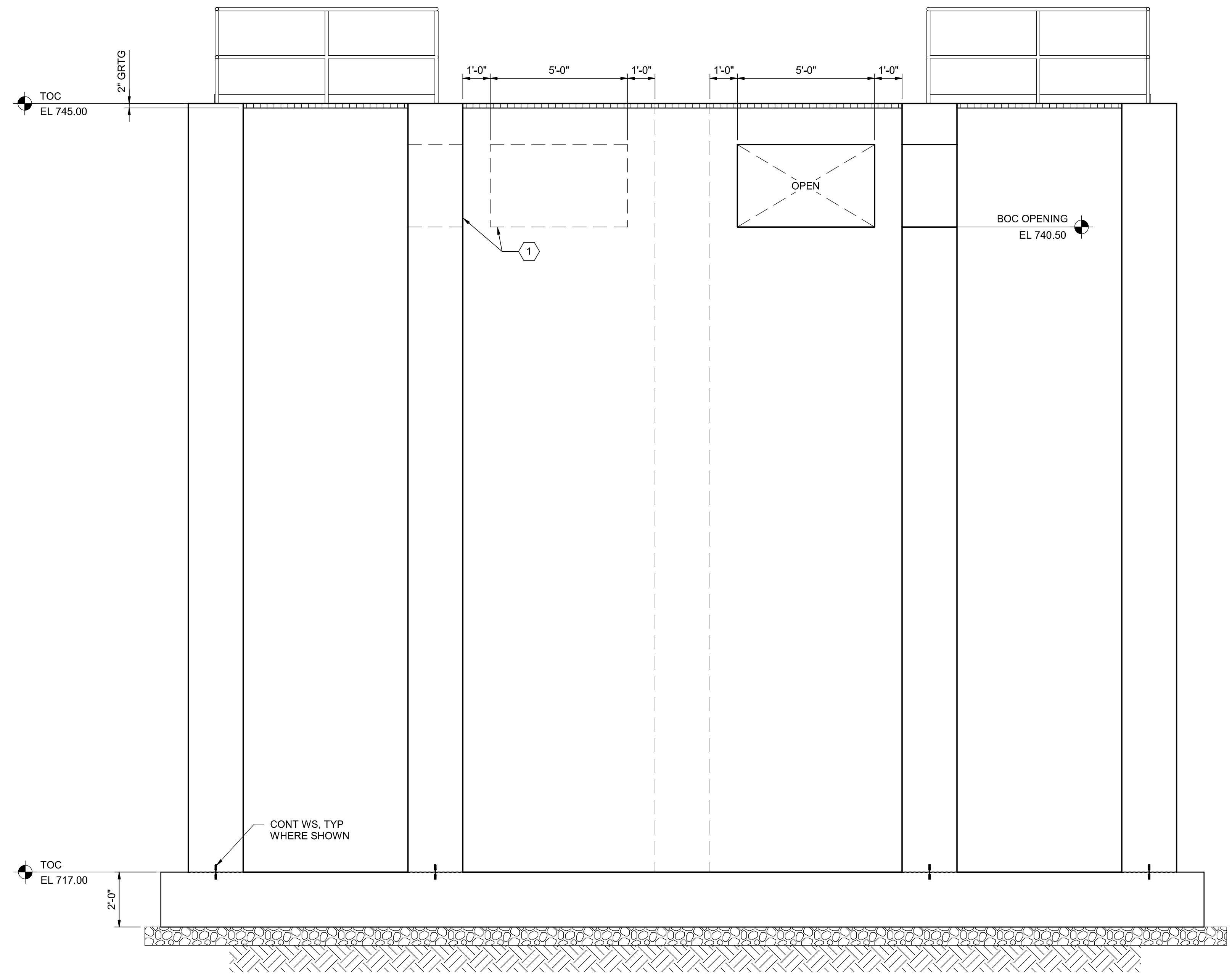
SCALE 3/8" = 1'-0"

SHEET 11S101

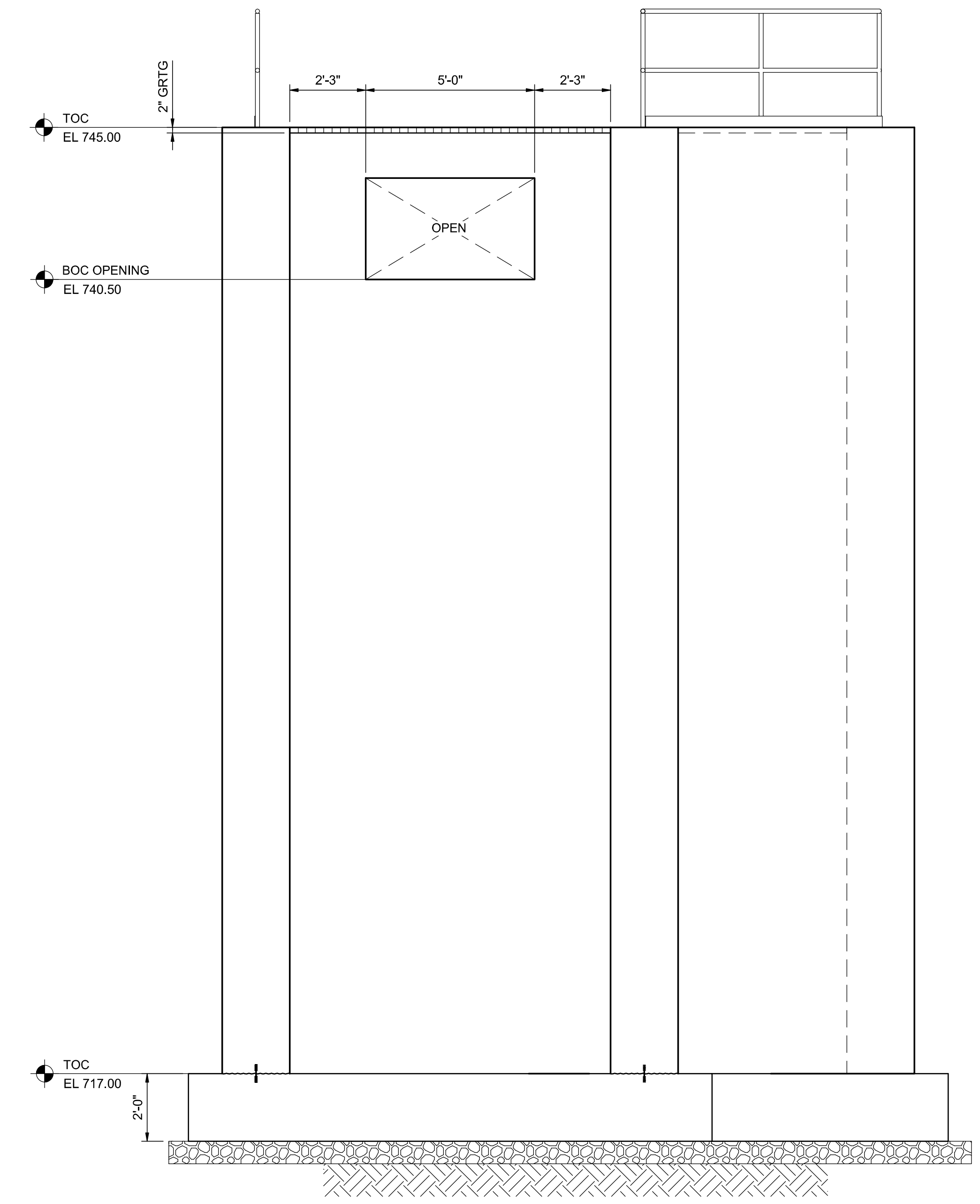
Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-11-S.rvt
9/8/2023 11:06:10 AM

KEY NOTES: #

1. KNOCKOUT PANELS FOR FUTURE OPENINGS/GATES.



A 11S101 SECTION
3/8" = 1'-0"



B 11S101 SECTION
3/8" = 1'-0"

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DESIGNED BY	J. LAVOIE
CHECKED BY	
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

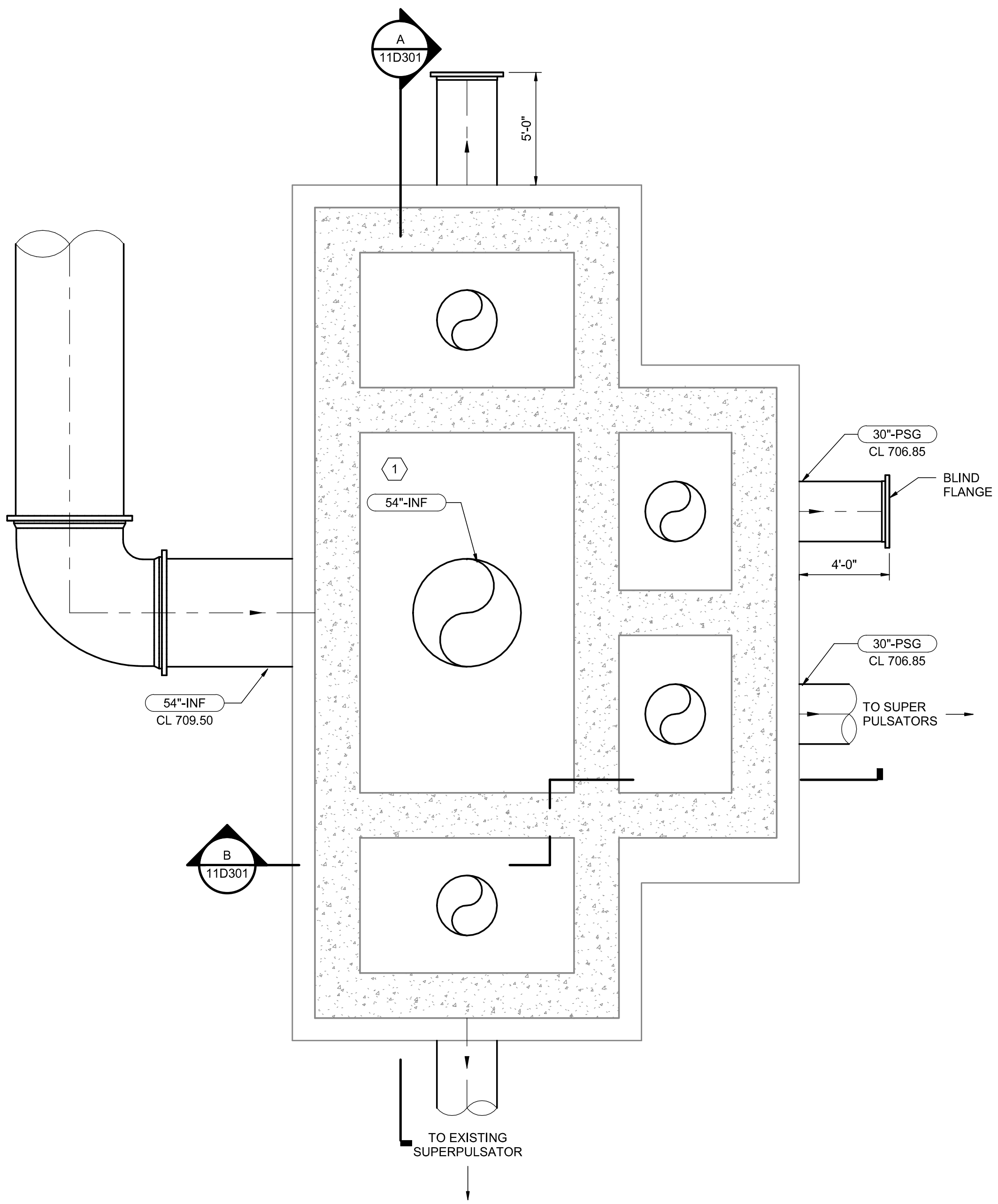
SPLITTER BOX
SECTIONS

0 1" 2"

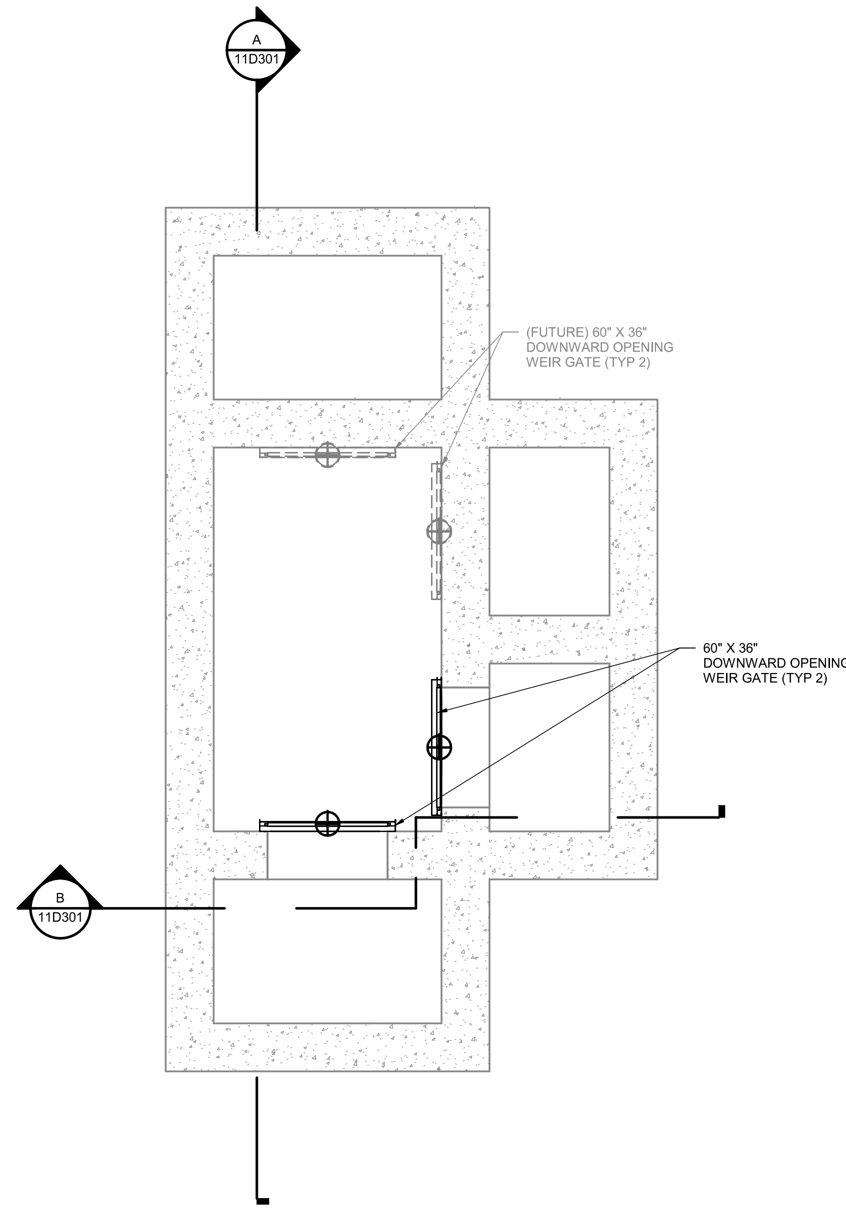
FILENAME 10343268-11-S.rvt

SCALE 3/8" = 1'-0"

SHEET 11S301



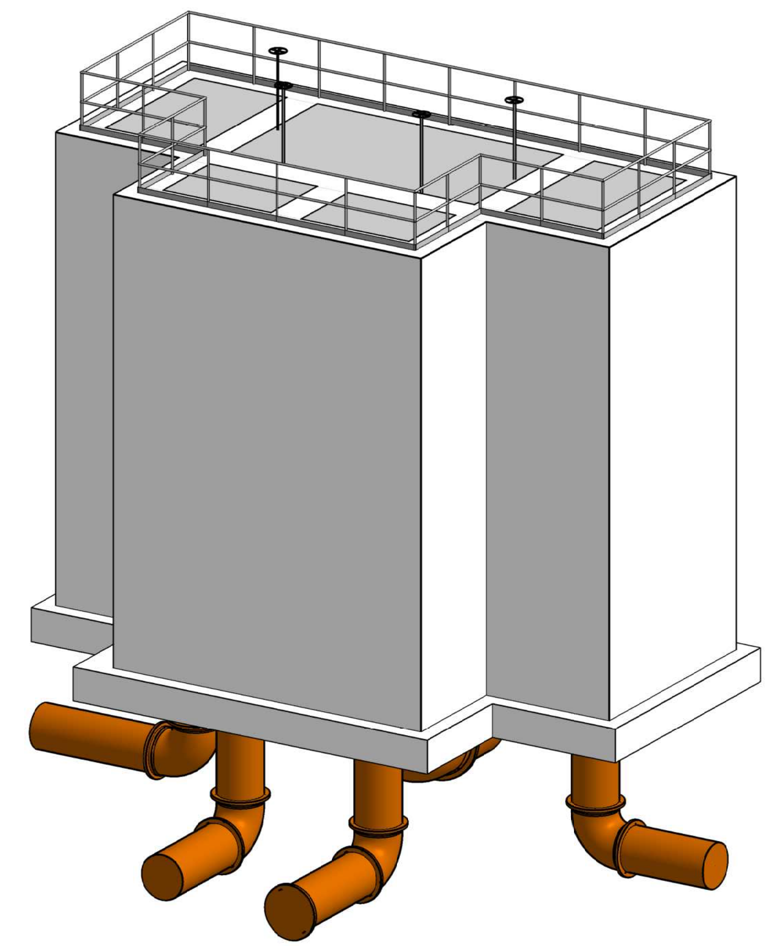
LOWER PLAN AT EL 717.00
1/4" = 1'-0"



UPPER PLAN AT EL 738.00
1/4" = 1'-0"

KEYNOTES #

1 SPLITTER BOX DRAIN TO BE COORDINATED IN FUTURE SUBMITTAL.



3D PERSPECTIVE

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9/12/2023 2:42:48 PM

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	K. WALKER
DRAWN BY	M. MITCHELL
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

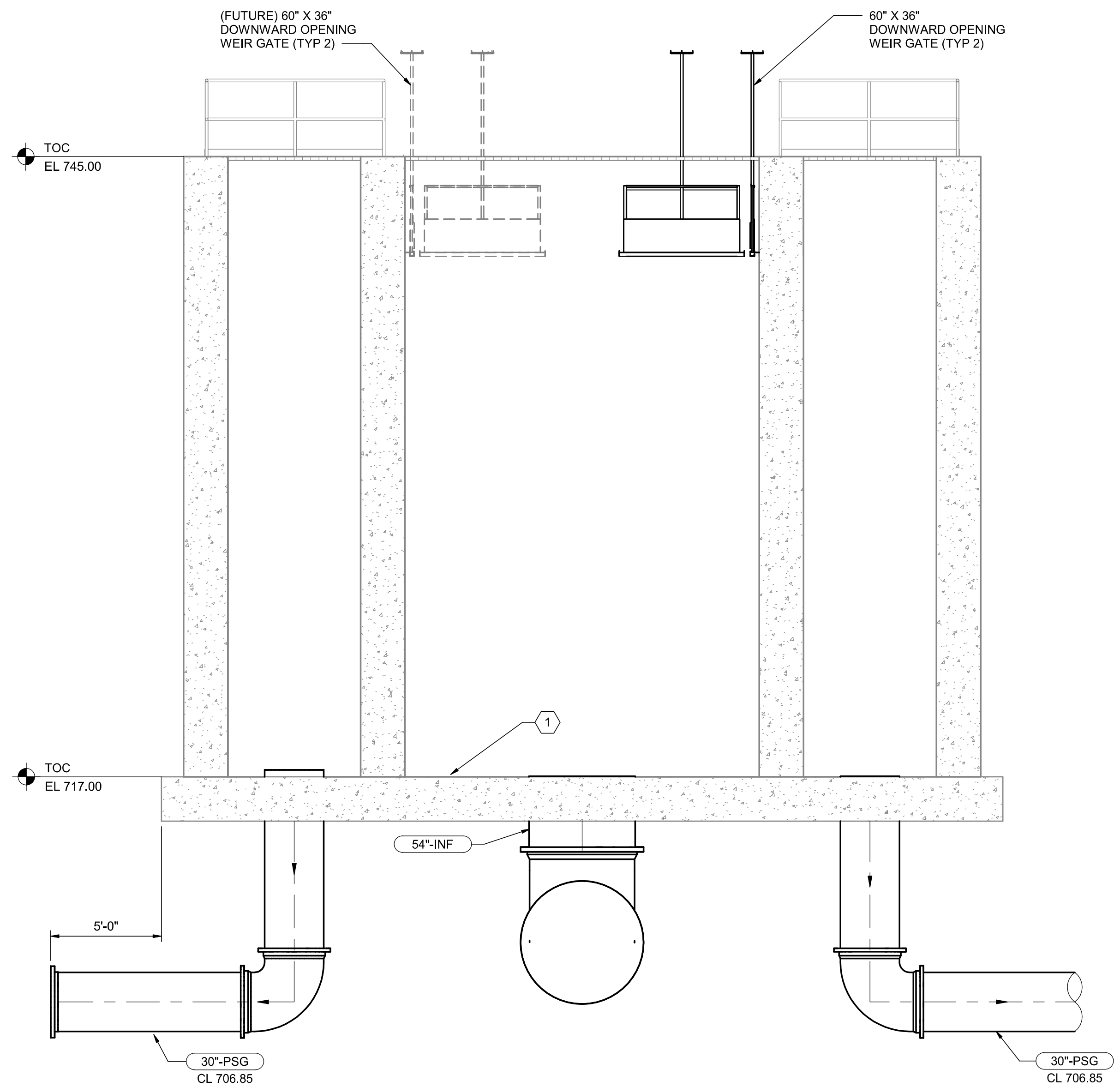
SPLITTER BOX PLANS

0 1" 2"

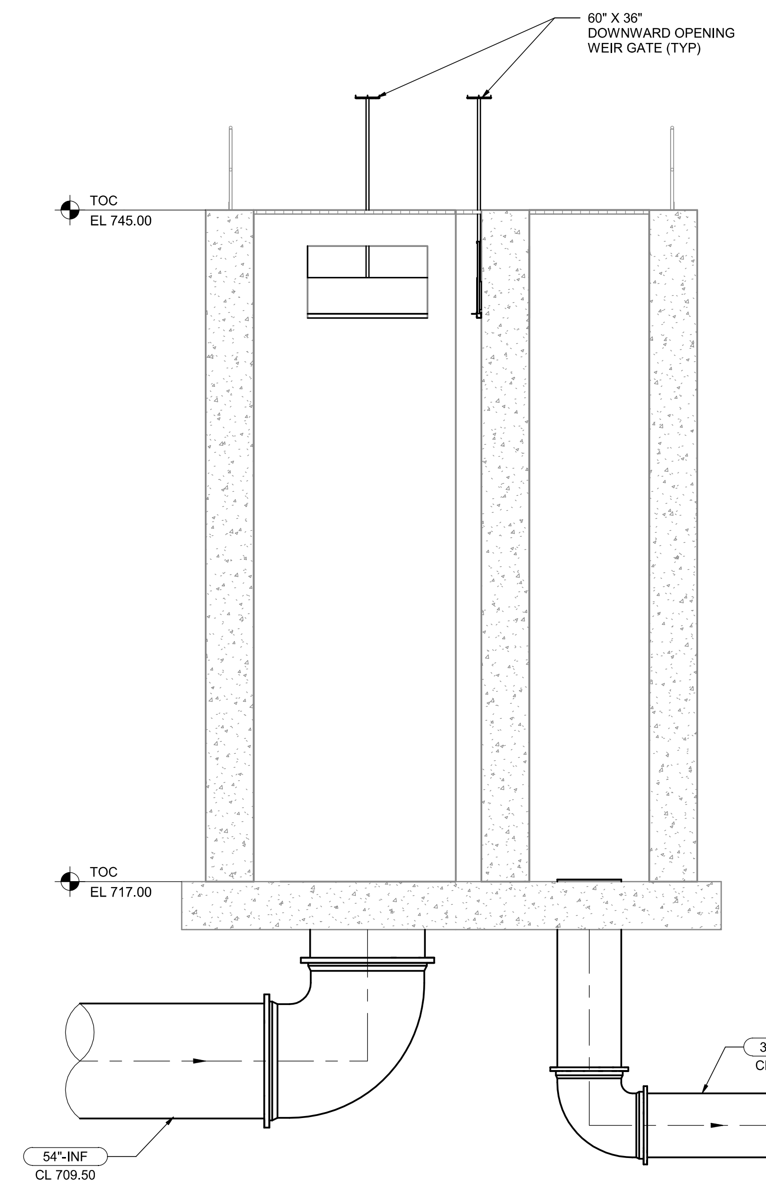
FILENAME	10343268-11-D.rvt
SCALE	1/4" = 1'-0"
SHEET	11D101

KEYNOTES #

1 SPLITTER BOX DRAIN TO BE COORDINATED IN FUTURE SUBMITTAL.



A
11D101
SECTION
1/4" = 1'-0"



B
11D101
SECTION
1/4" = 1'-0"

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	K. WALKER
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

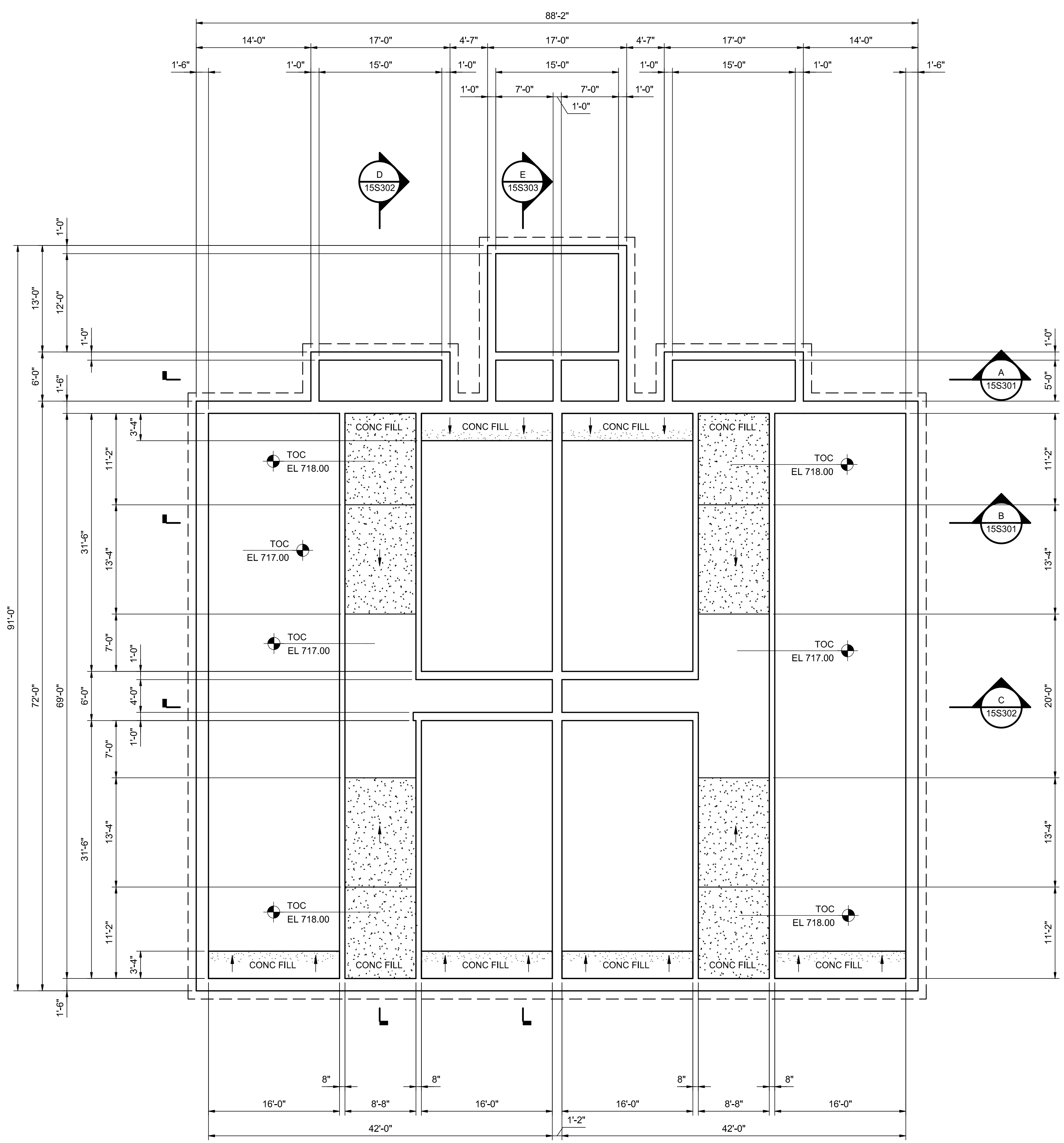
SPLITTER BOX SECTIONS

0 1" 2"

FILENAME 10343268-11-D.rvt

SCALE 1/4" = 1'-0"

SHEET **11D301**



FOUNDATION PLAN
1/8" = 1'-0"

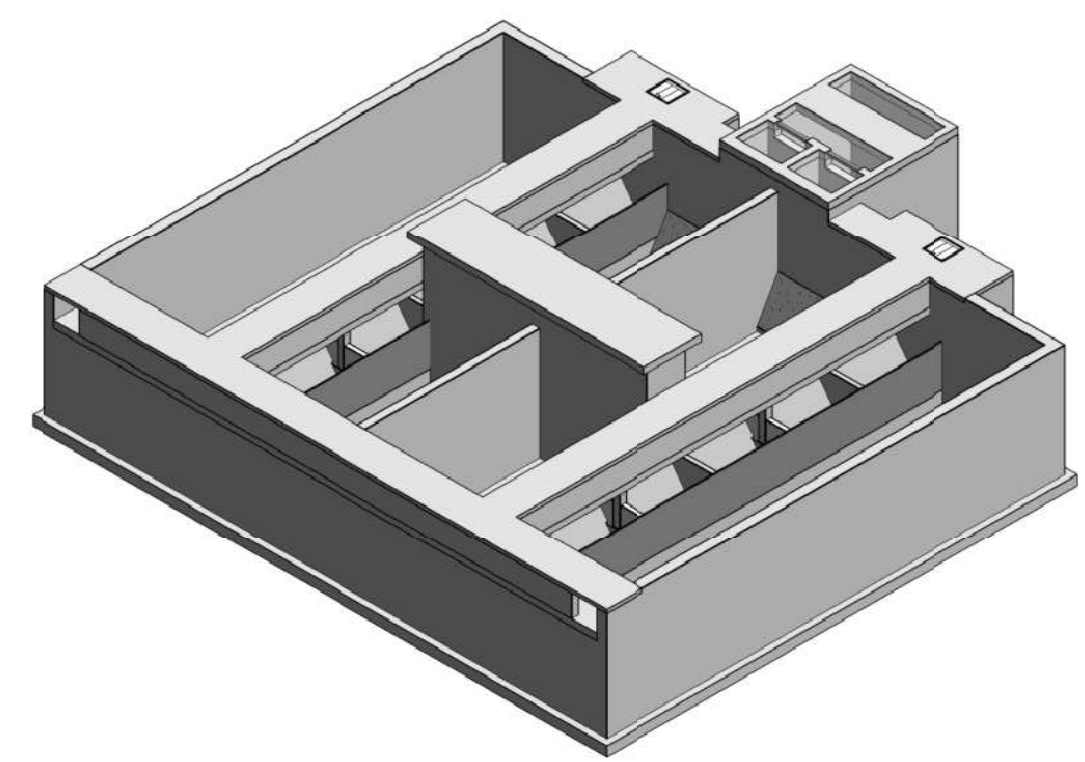


IMAGE OF STRUCTURE

GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES, SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.
2. ACCESS LADDERS/STAIRS TO BE COORDINATED IN FUTURE SUBMITTAL

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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WTP EXPANSION

SUPERPULSATOR
FOUNDATION PLAN

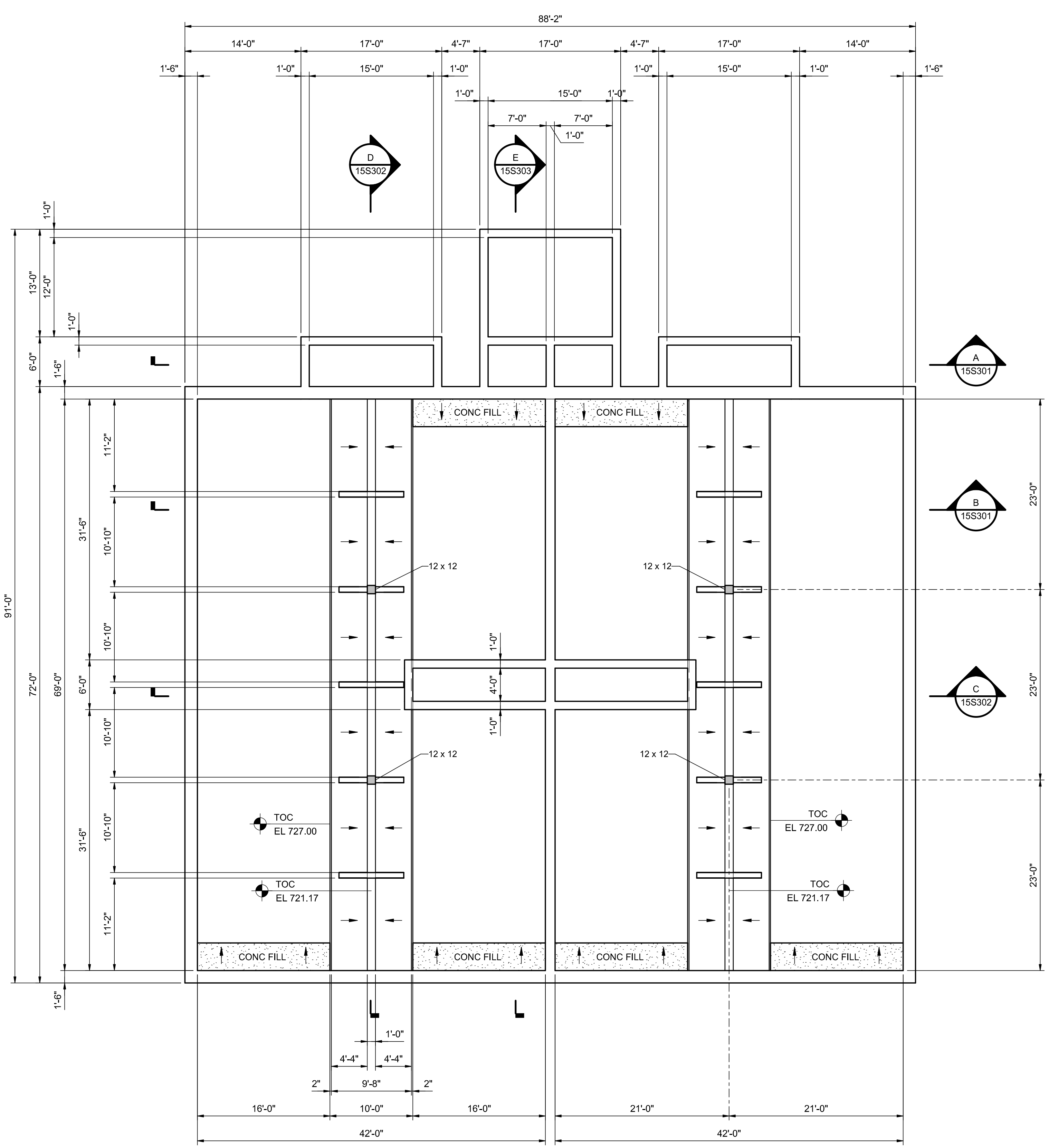
0 1" 2"

FILENAME 10343268-15-S.rvt
SCALE 1/8" = 1'-0"
SHEET 15S101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-S.rvt
9/8/2023 12:40:00 PM

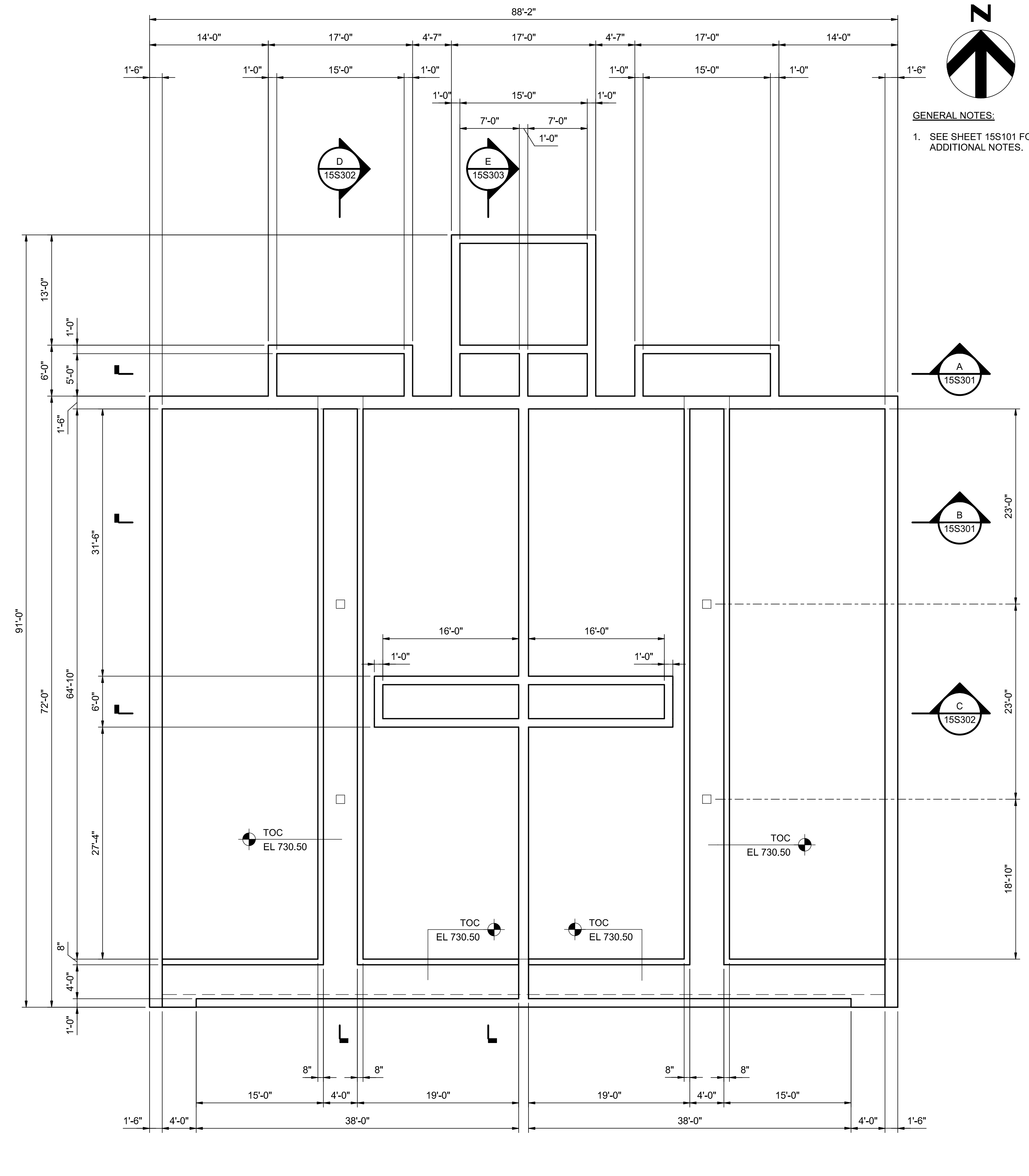
GENERAL NOTES:

1. SEE SHEET 15S101 FOR ADDITIONAL NOTES.



SECTIONAL PLAN AT EL 727.00

1/8" = 1'-0"



SECTIONAL PLAN AT EL 730.50

1/8" = 1'-0"

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SUPERPULSATOR
SECTIONAL PLANS

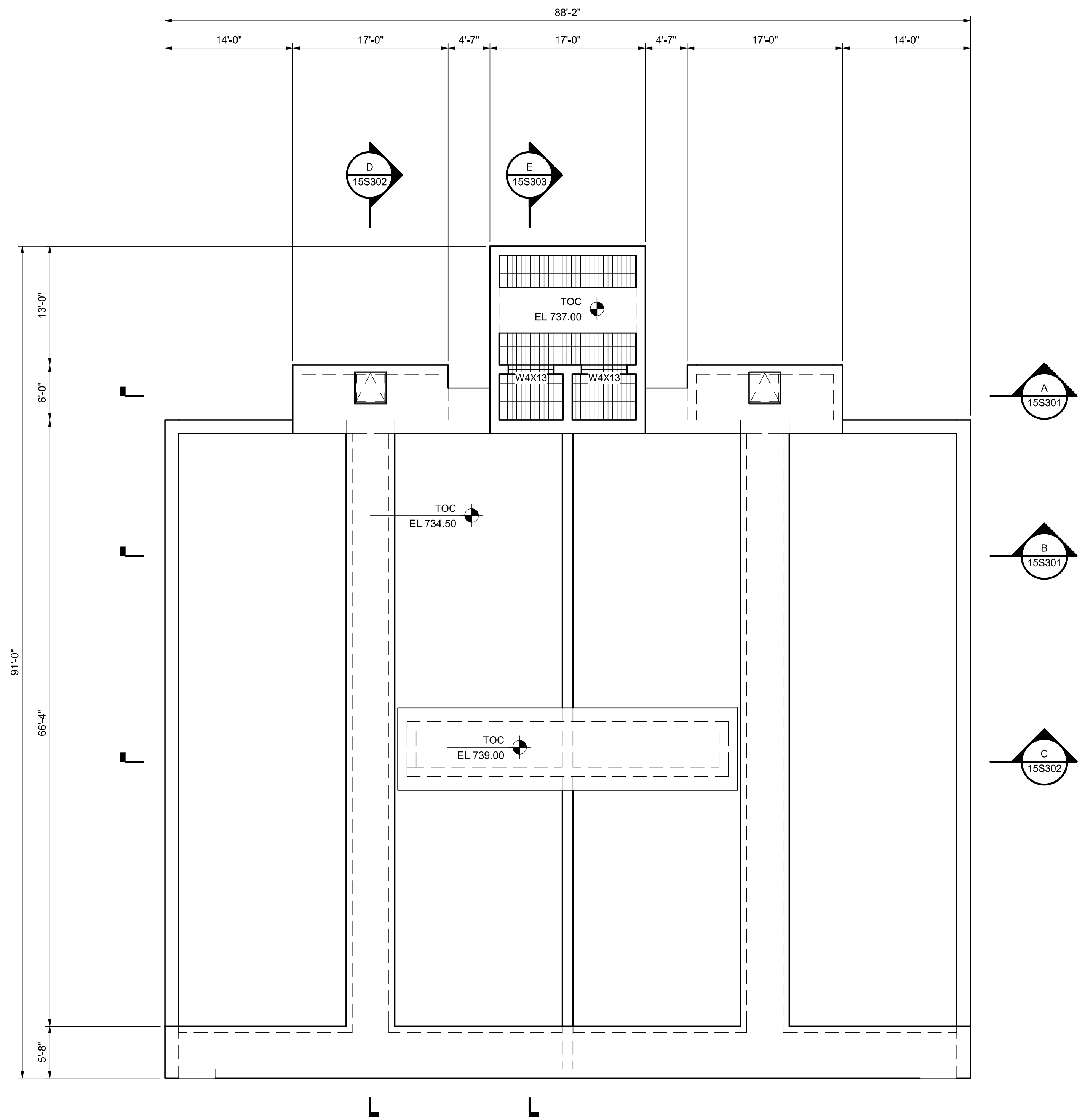
0 1" 2"

FILENAME 10343268-15-S.rvt

SCALE 1/8" = 1'-0"

SHEET 15S102

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-S.rvt
9/8/2023 12:40:00 PM



UPPER PLAN

1/8" = 1'-0"

GENERAL NOTES:

1. SEE SHEET 15S101 FOR ADDITIONAL NOTES.

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SUPERPULSATOR UPPER PLAN

0 1" 2"

FILENAME 10343268-15-S.rvt

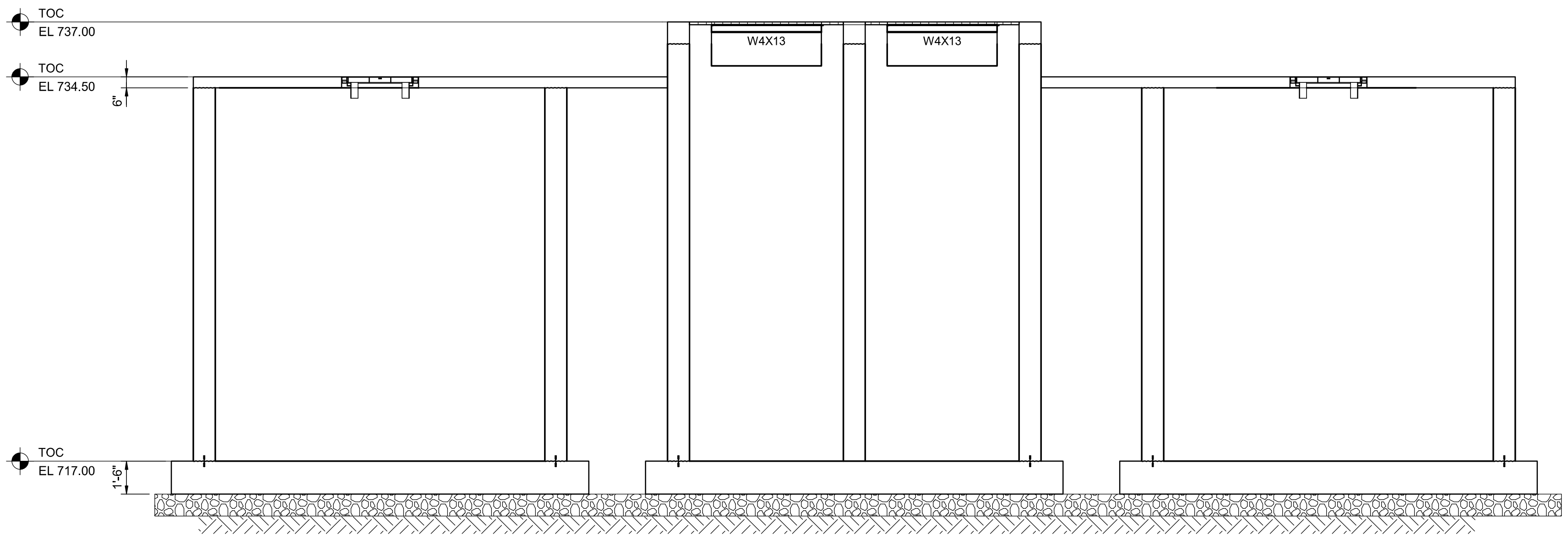
SCALE 1/8" = 1'-0"

SHEET 15S103

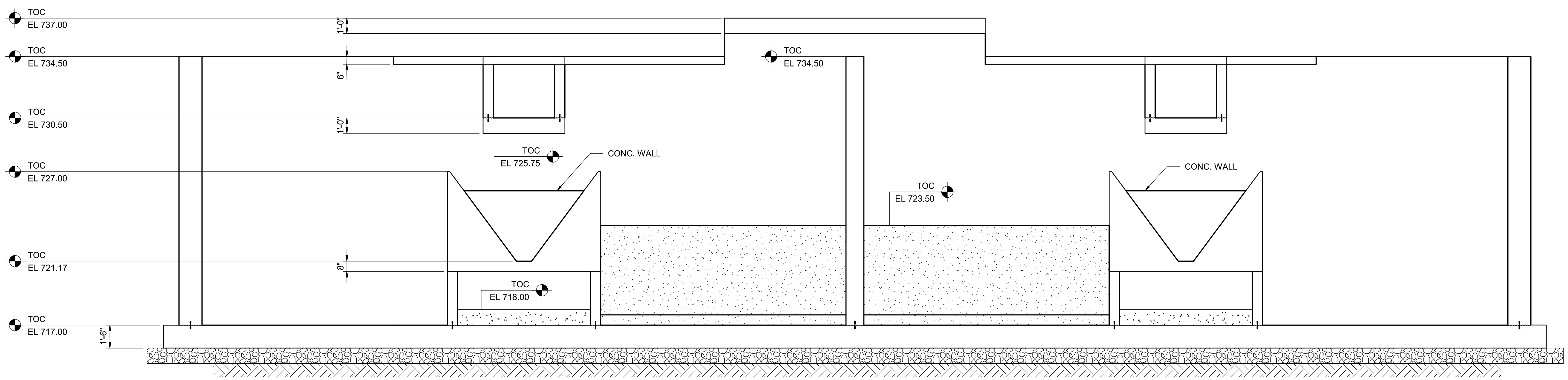
Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-S.rvt
9/8/2023 12:40:00 PM

GENERAL NOTES:

1. SEE SHEET 15S101 FOR ADDITIONAL NOTES.



A
15S101
SECTION
1/4" = 1'-0"



B
15S101
SECTION
1/4" = 1'-0"

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SUPERPULSATOR
SECTIONS

0 1" 2"

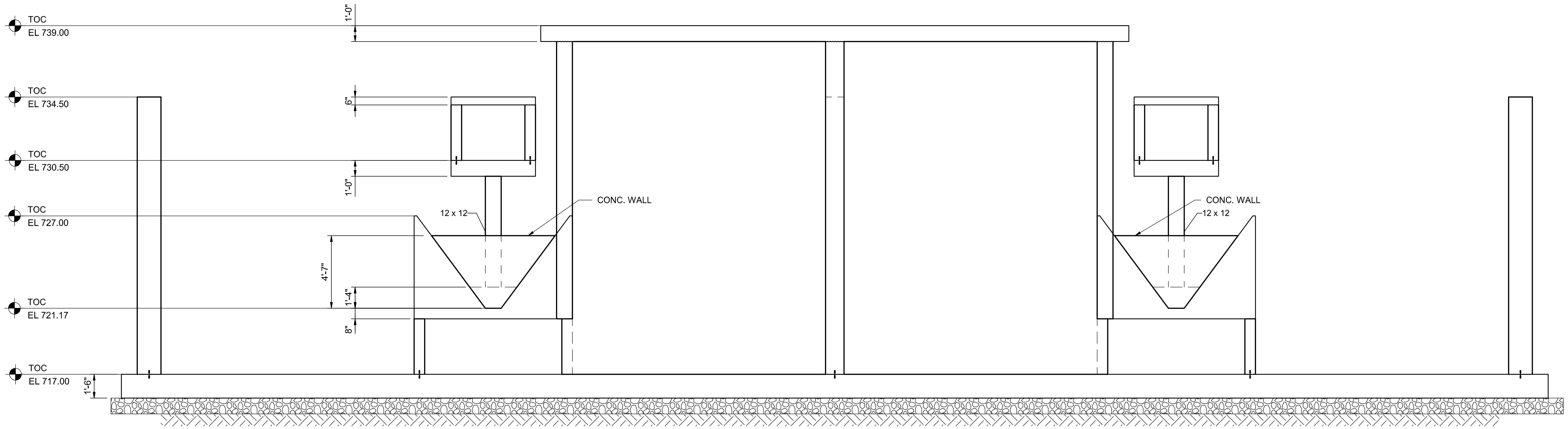
FILENAME 10343268-15-S.rvt
SCALE 1/4" = 1'-0"

SHEET
15S301

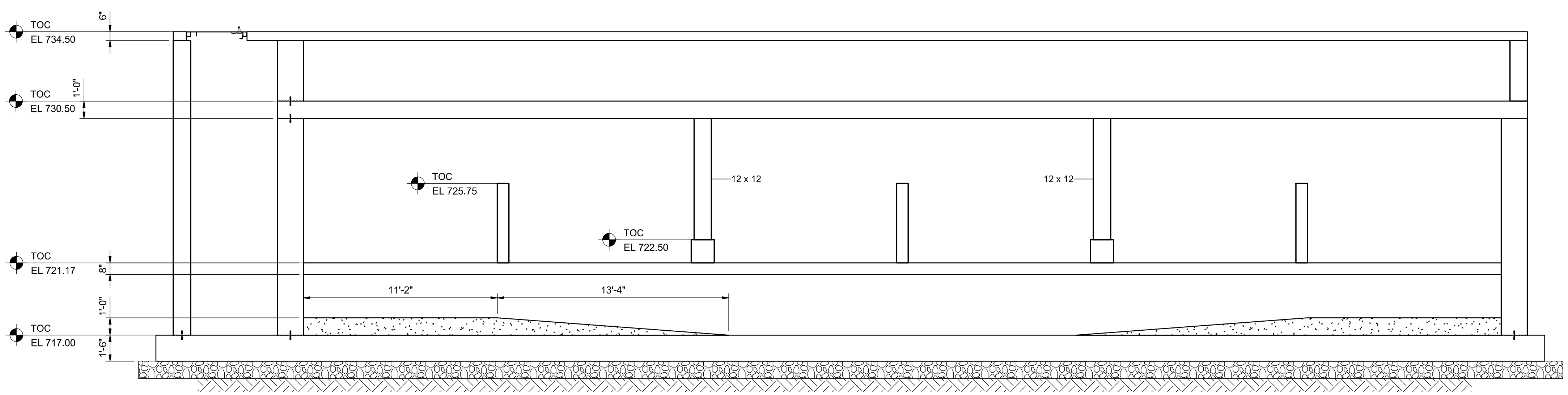
Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-S.rvt
9/8/2023 12:40:01 PM

GENERAL NOTES:

1. SEE SHEET 15S101 FOR ADDITIONAL NOTES.



C 15S101 SECTION
1/4" = 1'-0"



D 15S101 SECTION
1/4" = 1'-0"

HDR

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SUPERPULSATOR SECTIONS

0 1" 2"

FILENAME 10343268-15-S.rvt

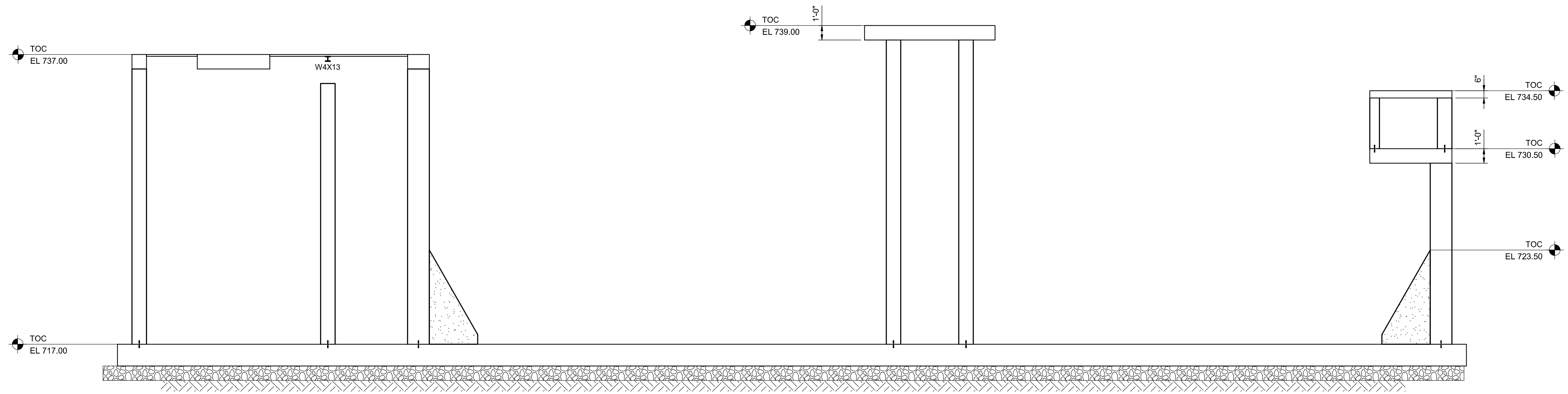
SCALE 1/4" = 1'-0"

SHEET 15S302

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-S.rvt
9/8/2023 12:40:01 PM

GENERAL NOTES:

1. SEE SHEET 15S101 FOR ADDITIONAL NOTES.



E
15S101
SECTION
1/4" = 1'-0"

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DESIGNED BY	J. LAVOIE
CHECKED BY	K. VILLELLA
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY
NOT FOR
CONSTRUCTION
OR
RECORDING

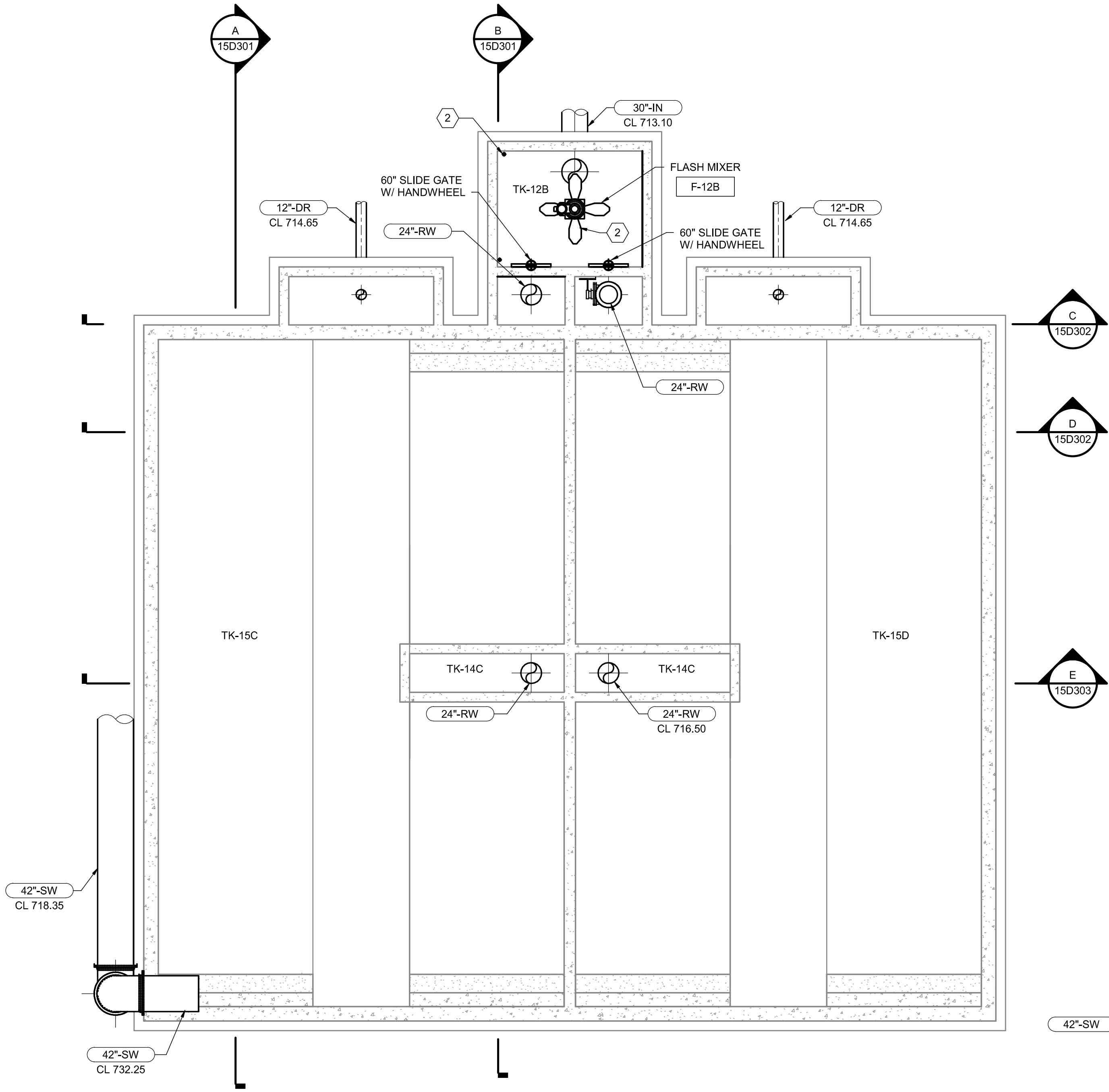
PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SUPERPULSATOR
SECTIONS

0 1" 2"

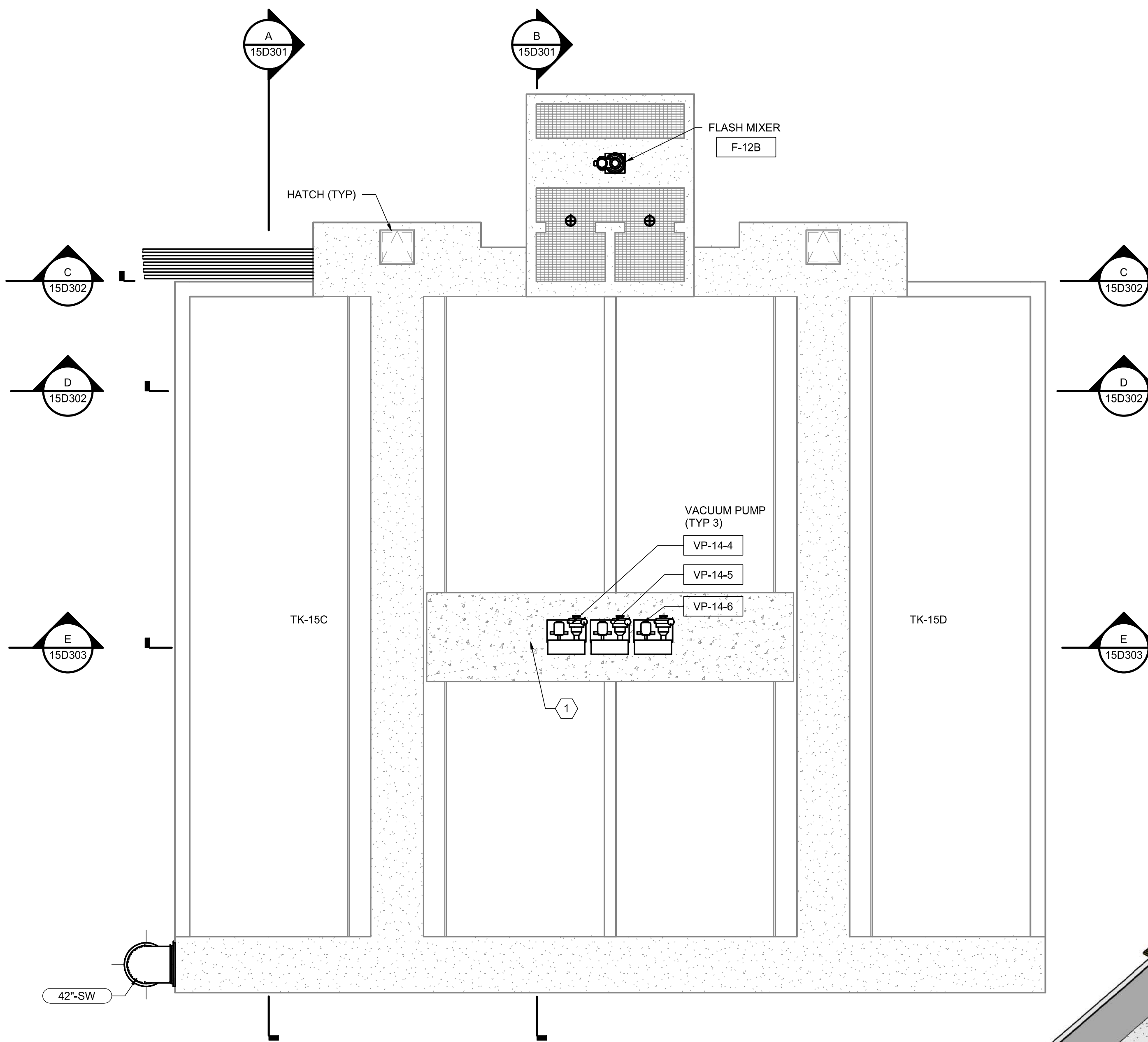
FILENAME 10343268-15-S.rvt
SCALE 1/4" = 1'-0"

SHEET
15S303



PLAN AT EL 717.00

1/8" = 1'-0"



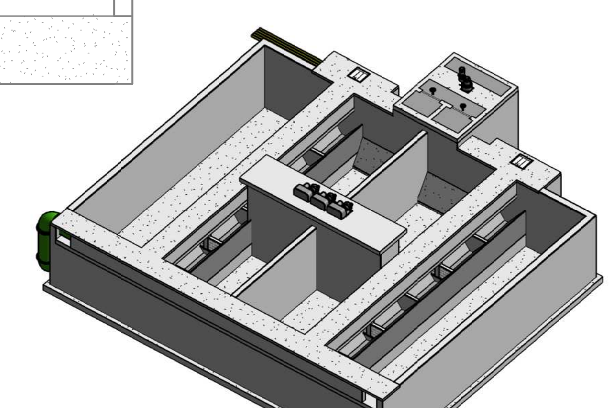
PLAN AT EL 734.50

1/8" = 1'-0"

KEY NOTES: #

1 DETAILED EQUIPMENT INFORMATION, INTERIOR PIPING, VALVES, AND OTHER APPURTENANCES TO BE ADDED IN A FUTURE SUBMITTAL.

2 FLASH MIX DRAIN TO BE COORDINATED IN A FUTURE SUBMITTAL.



3D PERSPECTIVE

HDR

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ISSUE	DATE	DESCRIPTION
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DESIGNED BY	K. WALKER
CHECKED BY	C. CROTWELL
DRAWN BY	M. MITCHELL
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

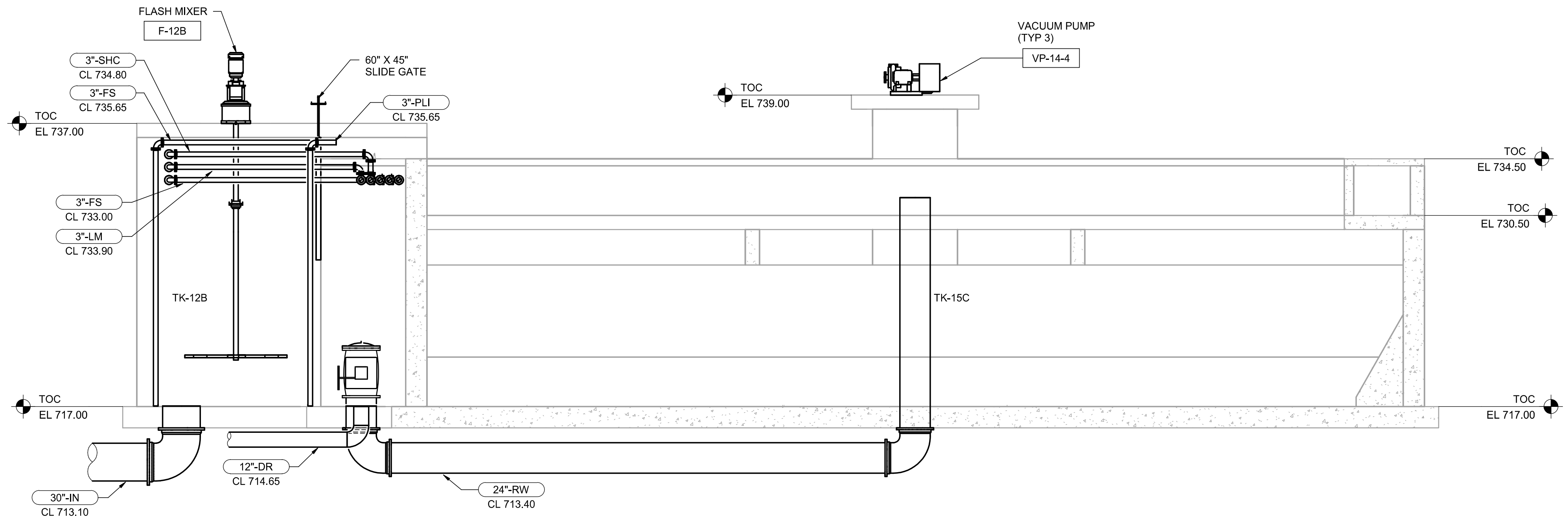
SUPERPULSATOR UPPER AND LOWER PLAN

0 1" 2"

FILENAME	10343268-15-D.rvt
SCALE	1/8" = 1'-0"
SHEET	15D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-D.rvt
9/12/2023 2:46:32 PM

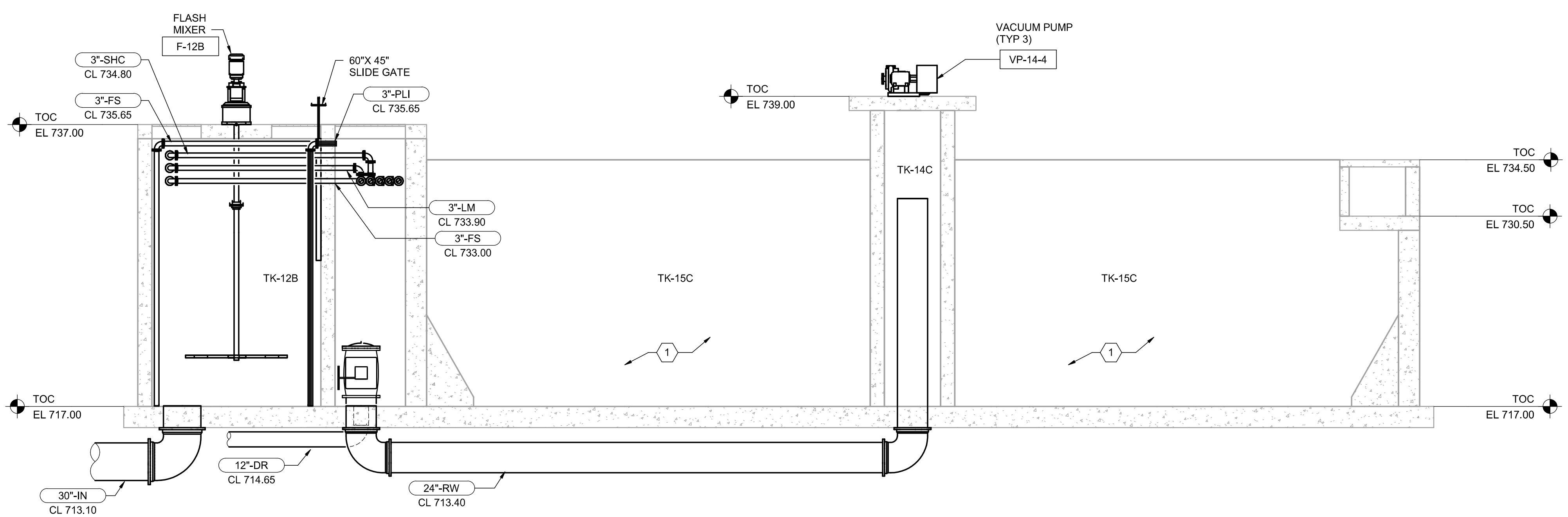
1 2 3 4 5 6 7 8



A SECTION
15D101 3/16" = 1'-0"

KEY NOTES: #

1 DETAILED EQUIPMENT INFORMATION, INTERIOR PIPING, VALVES, AND OTHER APPURTENANCES TO BE ADDED IN A FUTURE SUBMITTAL.



B SECTION
15D101 3/16" = 1'-0"

D C B A

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DESIGNED BY	K. WALKER
CHECKED BY	C. CROTWELL
DRAWN BY	M. MITCHELL
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SUPERPULSATOR SECTIONS 1

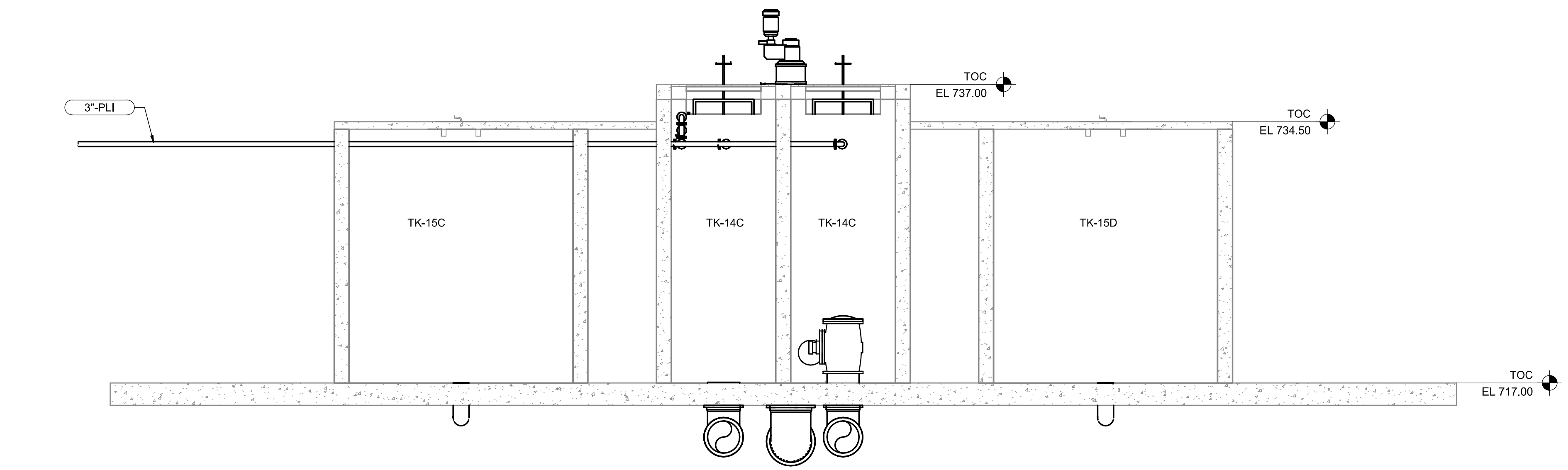
0 1" 2"

FILENAME 10343268-15-D.rvt

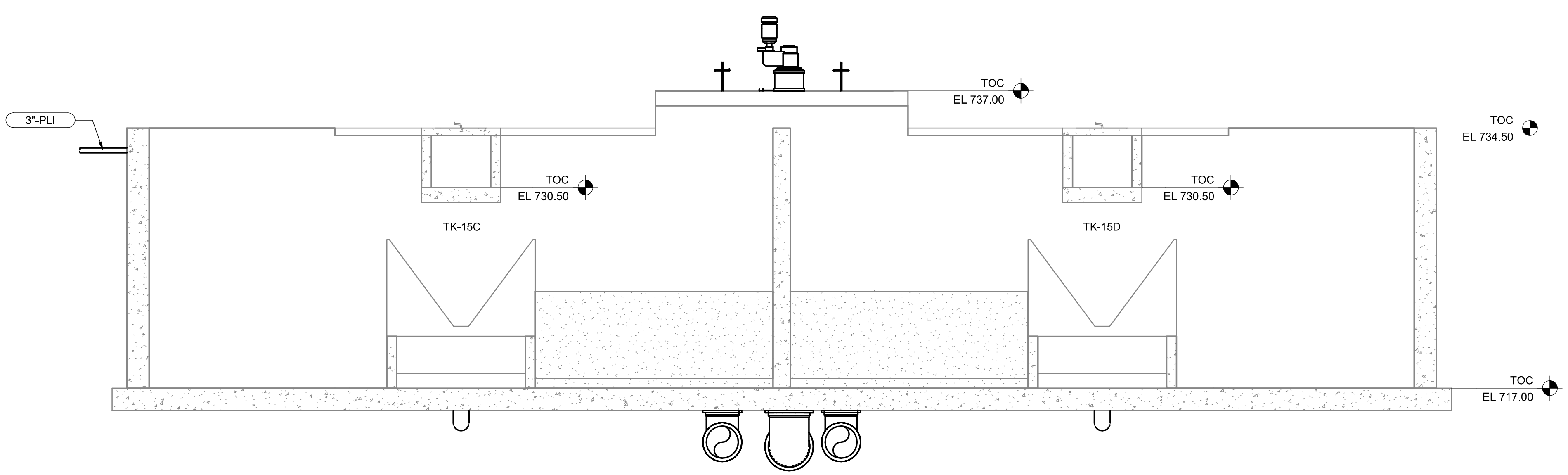
SCALE 3/16" = 1'-0"

SHEET **15D301**

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-15-D.rvt
9/12/2023 2:46:33 PM



C
15D101
SECTION
3/16" = 1'-0"



D
15D101
SECTIONS
3/16" = 1'-0"

HDR

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Raleigh, NC 27601
919.232.6600
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	C. CROTWELL
DRAWN BY	M. MITCHELL
PROJECT NUMBER	10343268

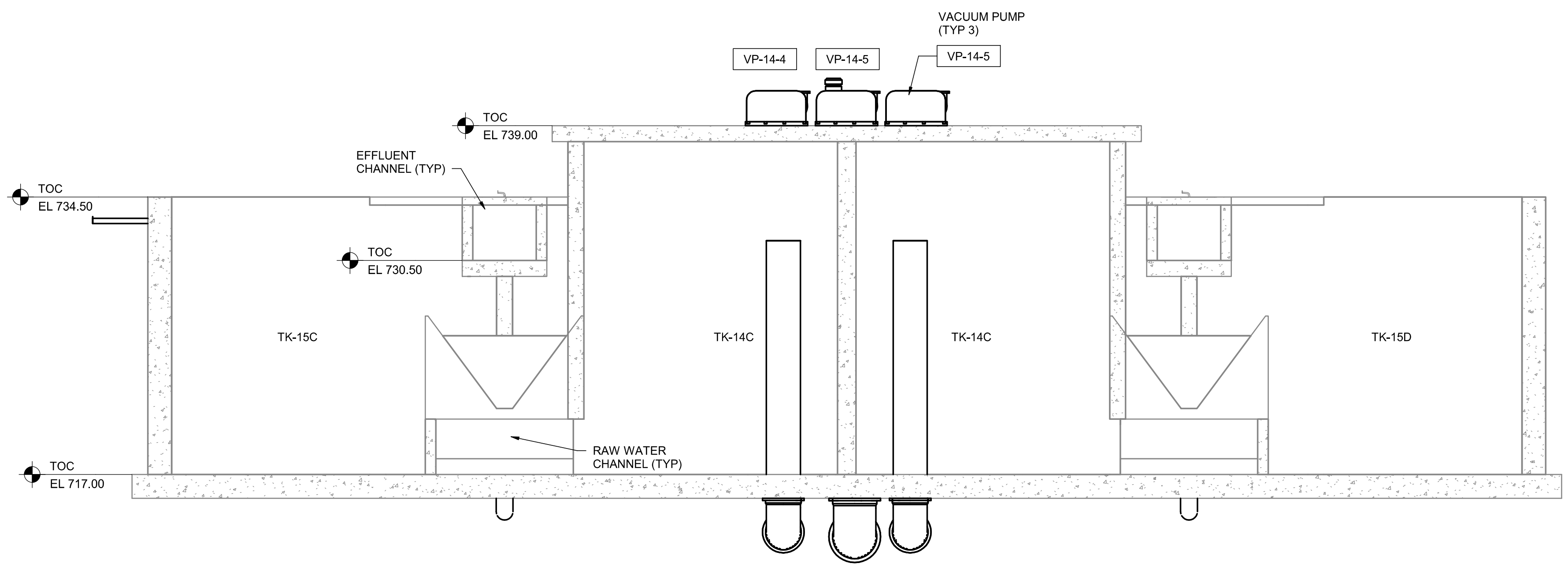
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

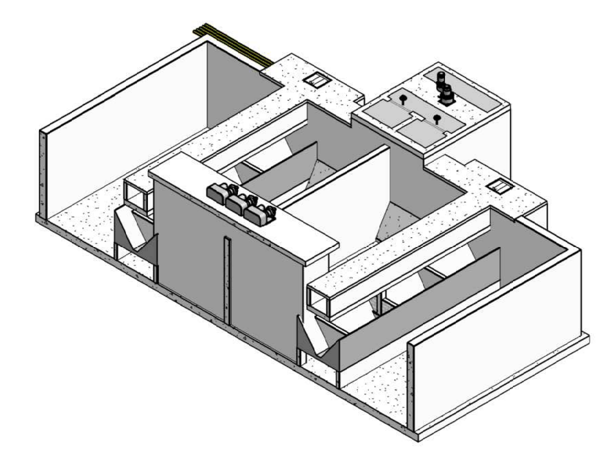
SUPERPULSATOR SECTIONS 2

0 1" 2"

FILENAME	10343268-15-D.rvt
SCALE	3/16" = 1'-0"
SHEET	15D302



E
15D101
SECTION
3/16" = 1'-0"



3D SECTION PERSPECTIVE

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OR
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PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SUPERPULSATOR
SECTIONS 3

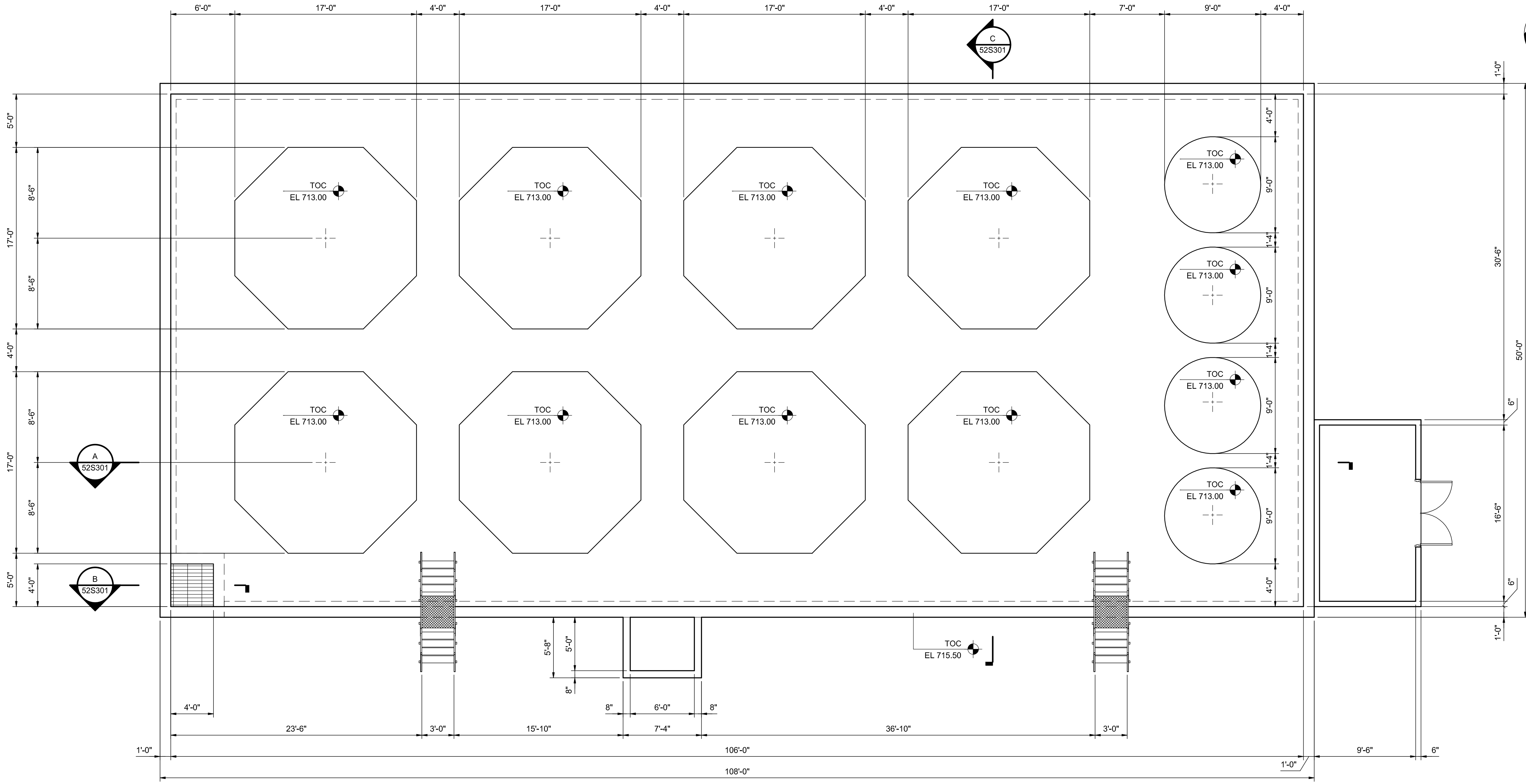
0 1" 2"

FILENAME 10343268-15-D.rvt
SCALE 3/16" = 1'-0"

SHEET
15D303

GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES, SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.



FOUNDATION PLAN

3/16" = 1'-0"

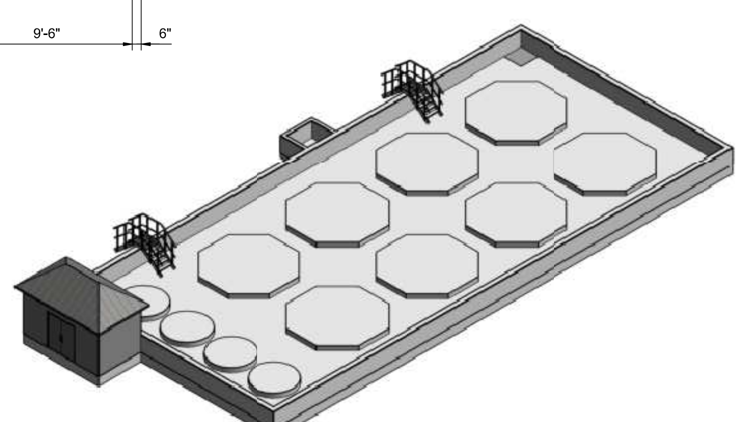


IMAGE OF FERRIC SULFATE STORAGE

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

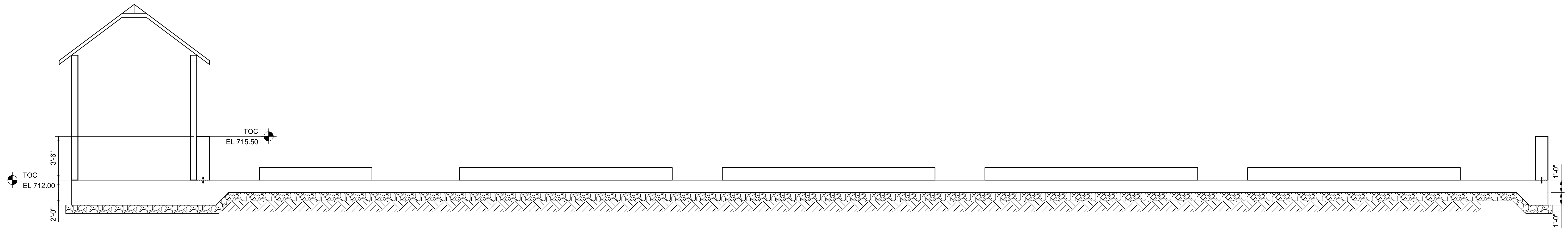
FERRIC SULFATE STORAGE FOUNDATION PLAN

0 1" 2"

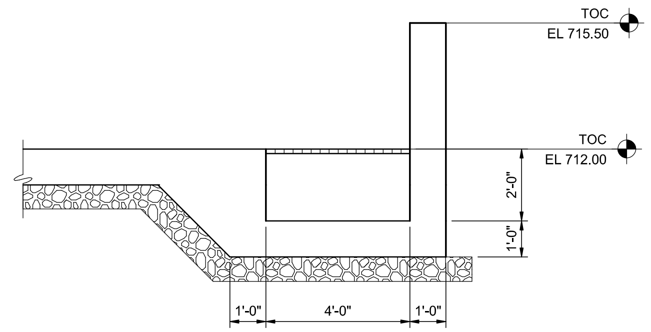
FILENAME 10343268-52-S.rvt

SCALE 3/16" = 1'-0"

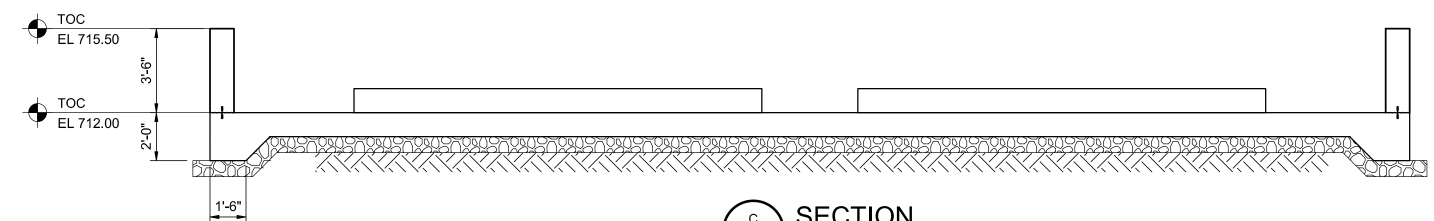
SHEET 52S101



A
52S101
SECTION
1/4" = 1'-0"



B
52S101
SECTION
3/8" = 1'-0"



C
52S101
SECTION
1/4" = 1'-0"

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CHECKED BY	
DRAWN BY	W. MALACHIN
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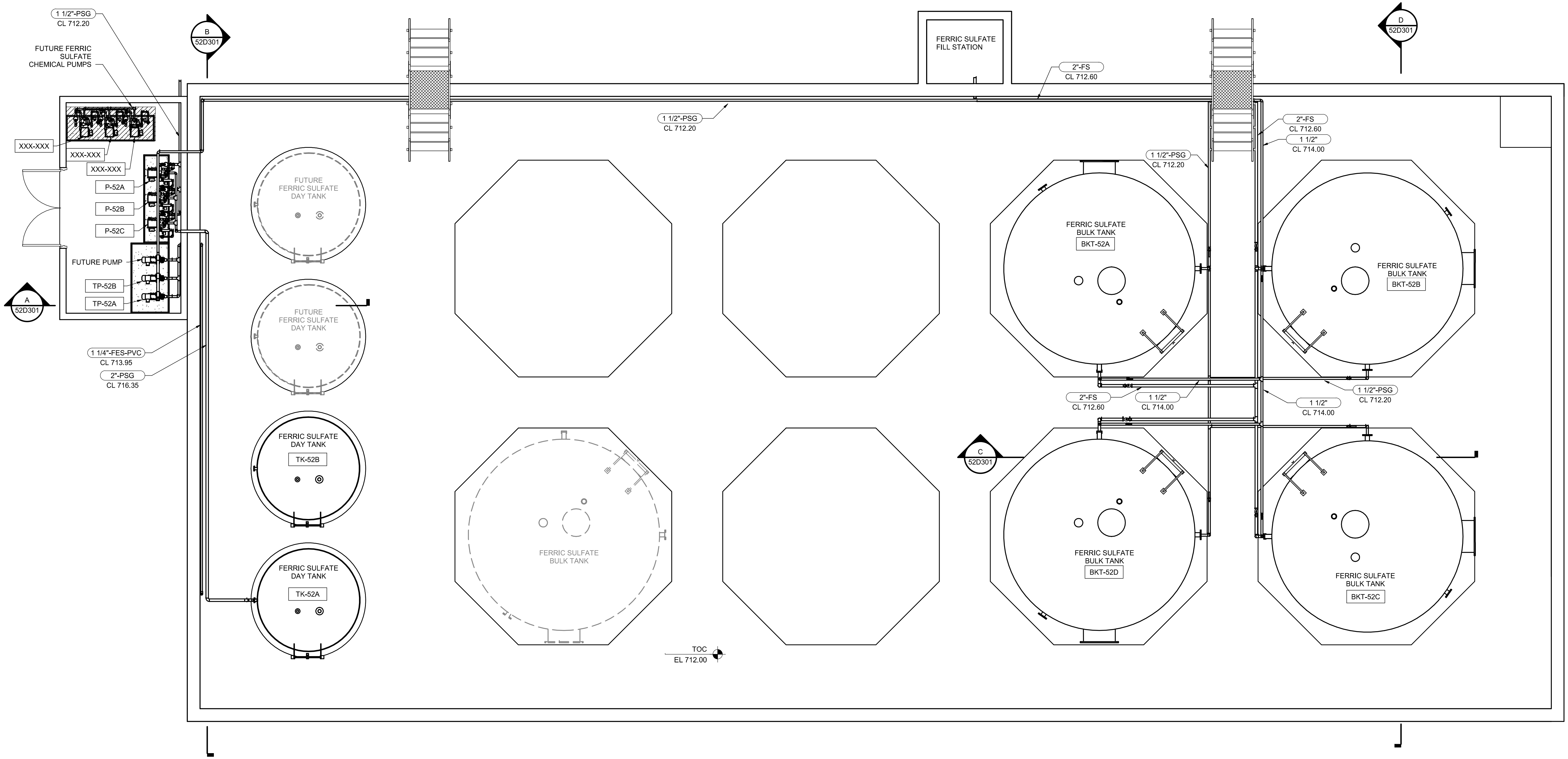
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

FERRIC SULFATE STORAGE SECTIONS

0 1" 2"

FILENAME	10343268-52-S.rvt
SCALE	As indicated
SHEET	52S301



PLAN AT EL 712.00
1/4" = 1'-0"

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	K. WALKER
CHECKED BY	K. WALKER
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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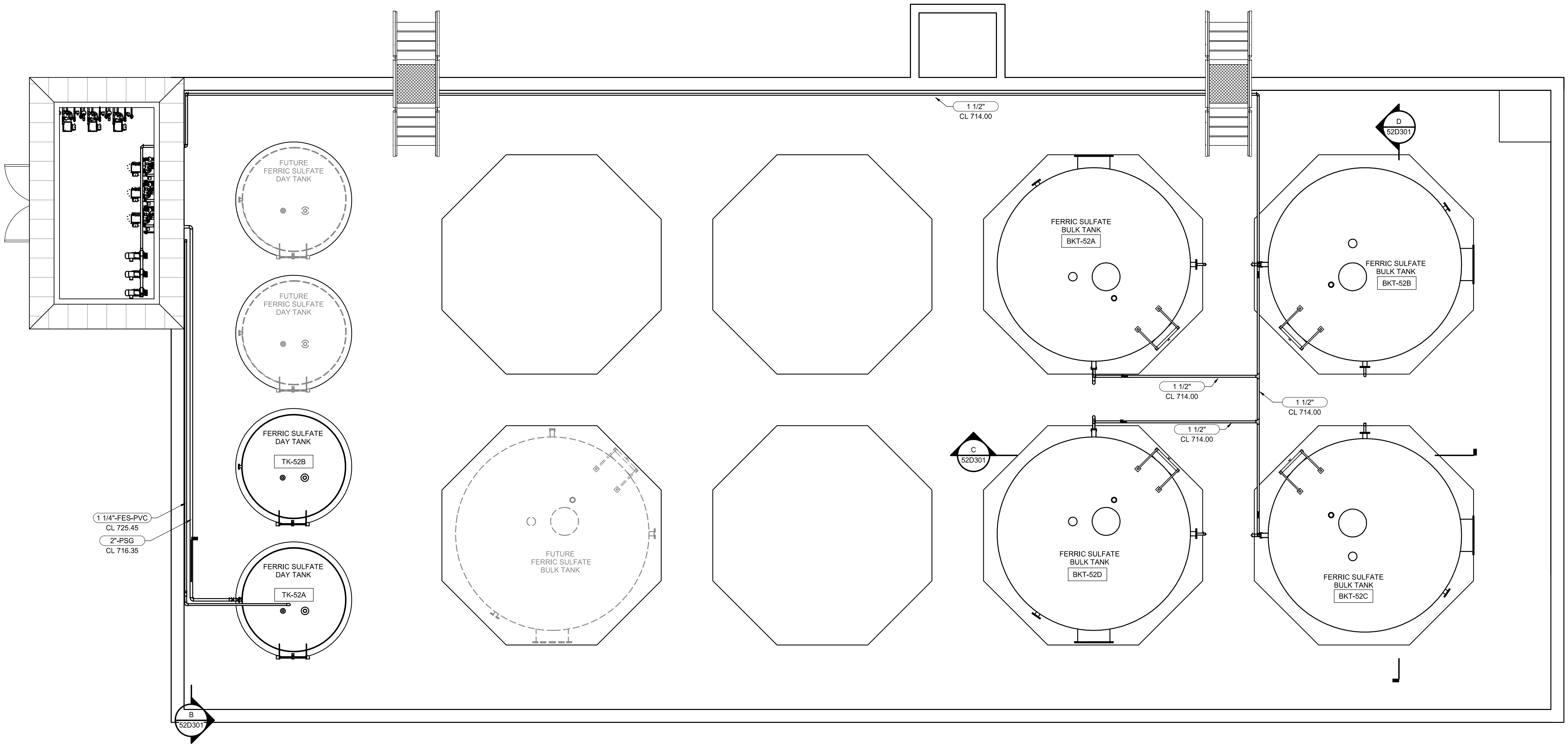
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

FERRIC SULFATE STORAGE PLAN AT EL 712.00

0 1" 2"

FILENAME	10343268-52-D.rvt
SCALE	1/4" = 1'-0"
SHEET	52D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-52-D.rvt
9/12/2023 7:10:38 PM



PLAN AT EL 722.00
1/4" = 1'-0"

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DESIGNED BY	K. WALKER
CHECKED BY	K. WALKER
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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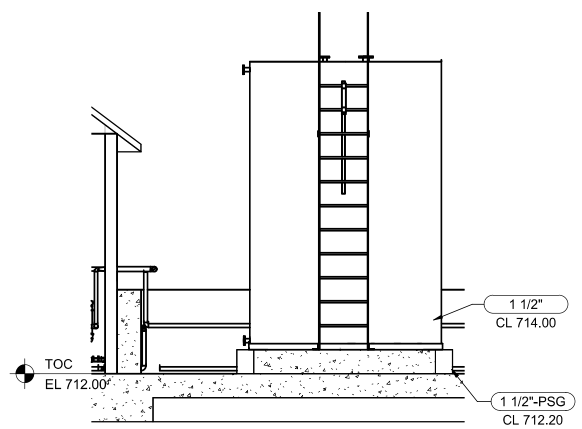
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

FERRIC SULFATE STORAGE PLAN AT EL 722.00

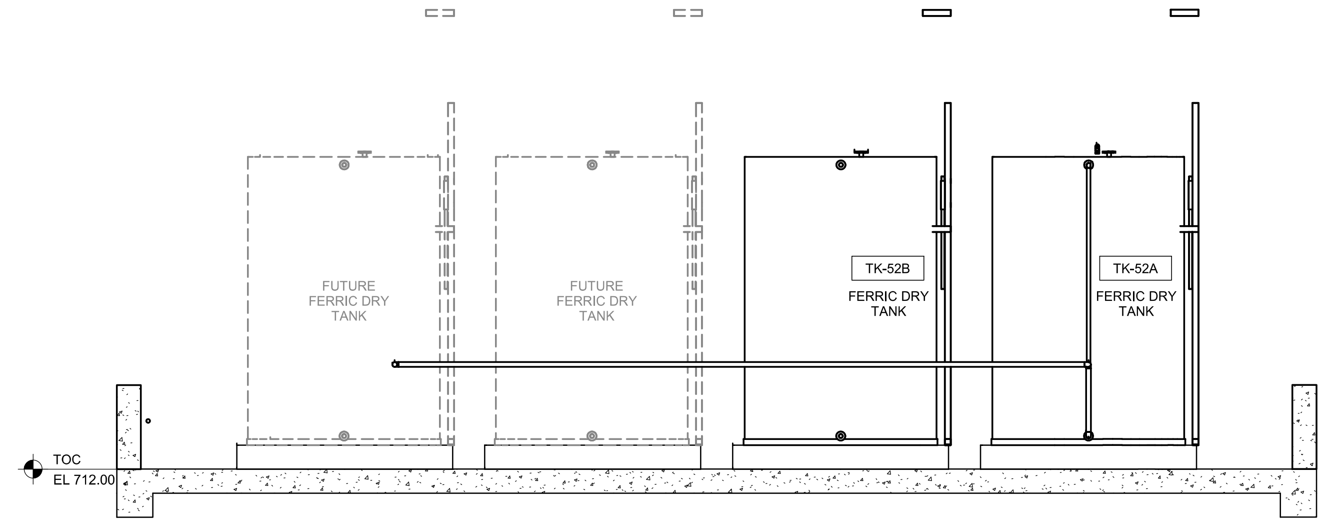
0 1" 2"

FILENAME 10343268-52-D.rvt
SCALE 1/4" = 1'-0"
SHEET **52D102**

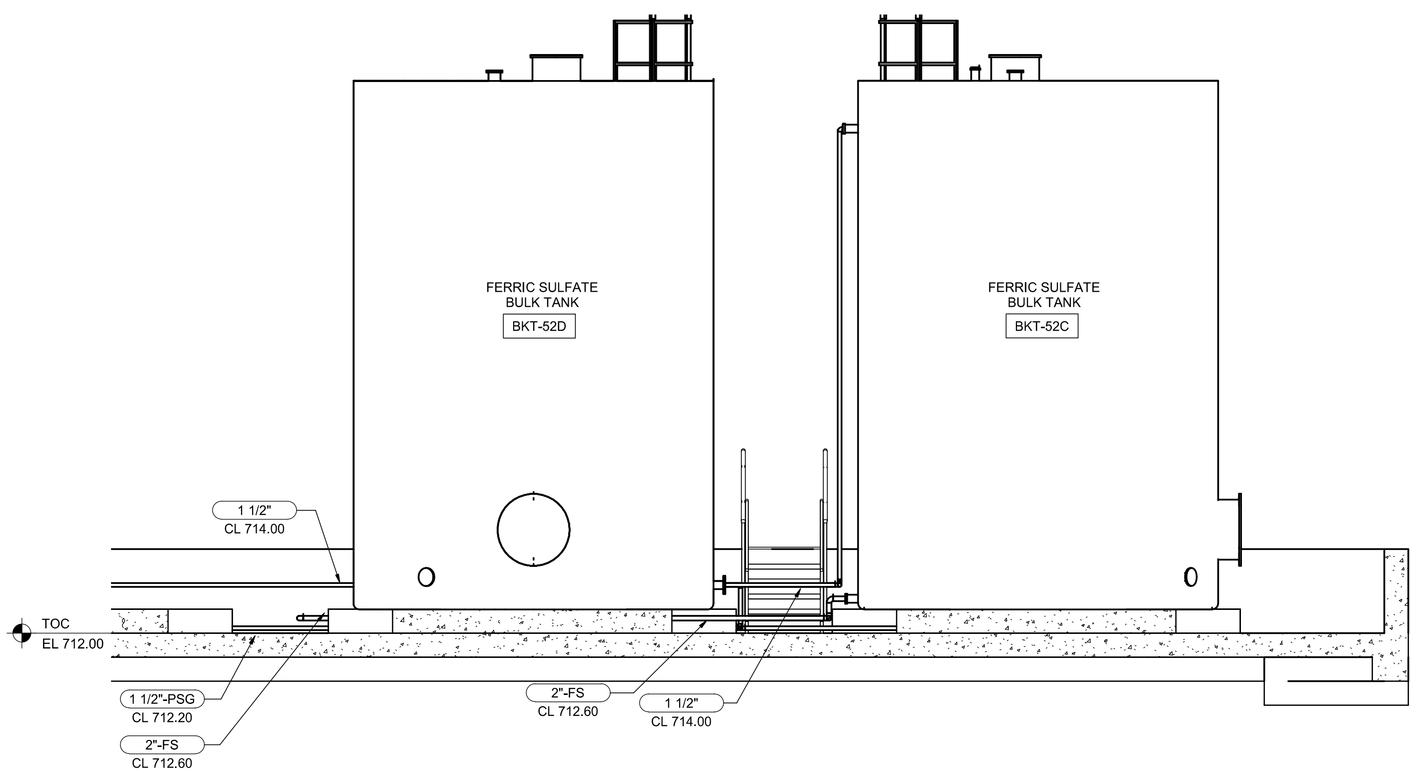
Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-52-D.rvt
9/12/2023 7:10:39 PM



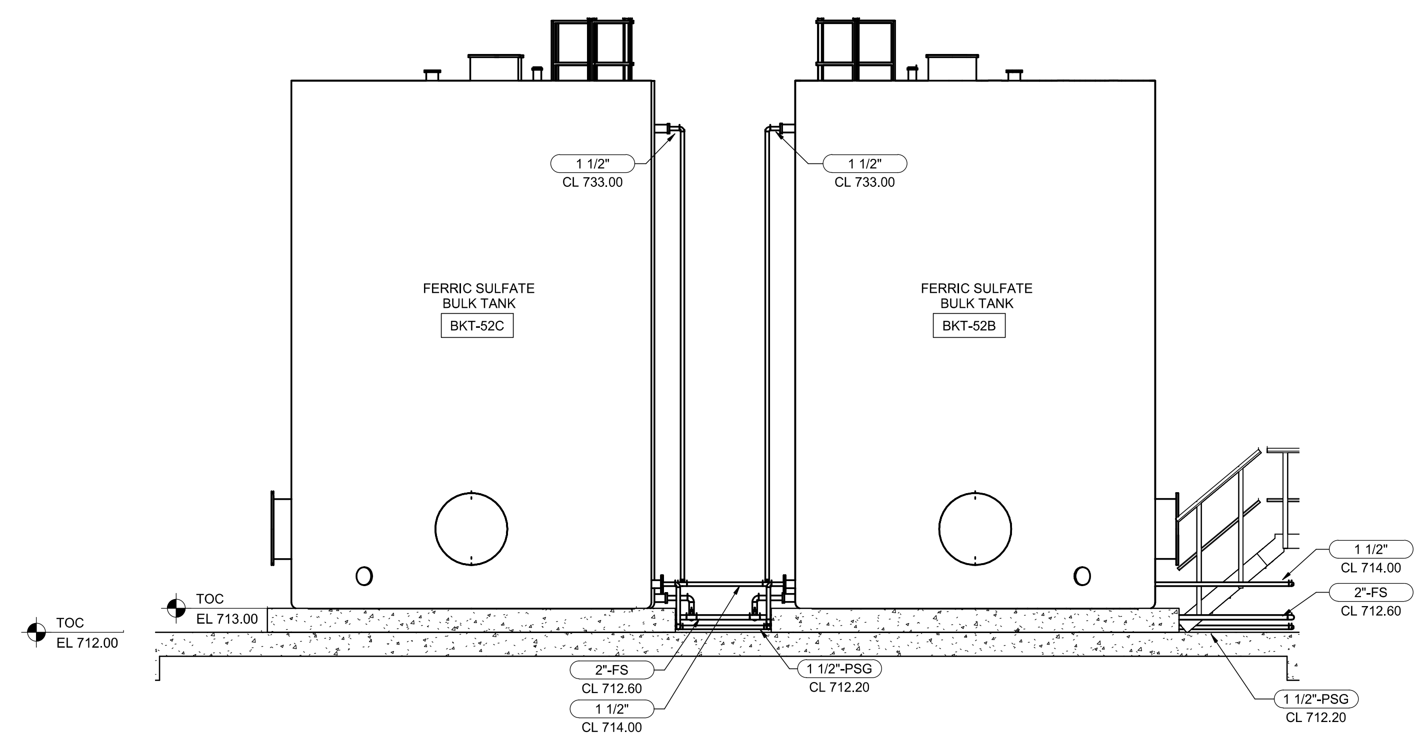
A SECTION 52D101 1/4" = 1'-0"



B SECTION 52D101 1/4" = 1'-0"



C SECTION 52D101 1/4" = 1'-0"



D SECTION 52D101 1/4" = 1'-0"

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DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

FERRIC SULFATE STORAGE SECTIONS

0 1" 2"

FILENAME 10343268-52-D.rvt

SCALE 1/4" = 1'-0"

SHEET 52D301

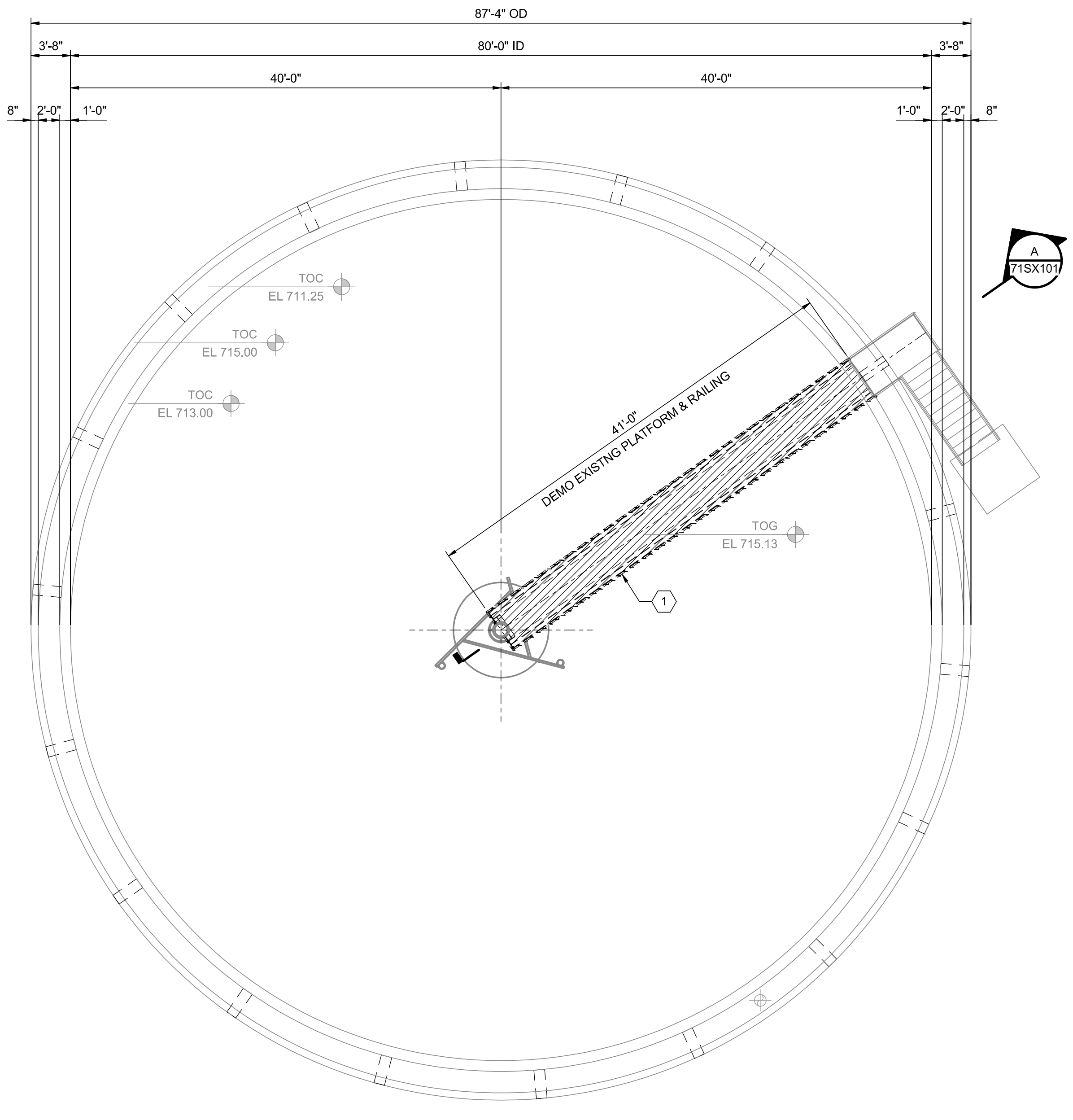
Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-52-D.rvt
9/12/2023 7:10:40 PM

GENERAL NOTES:

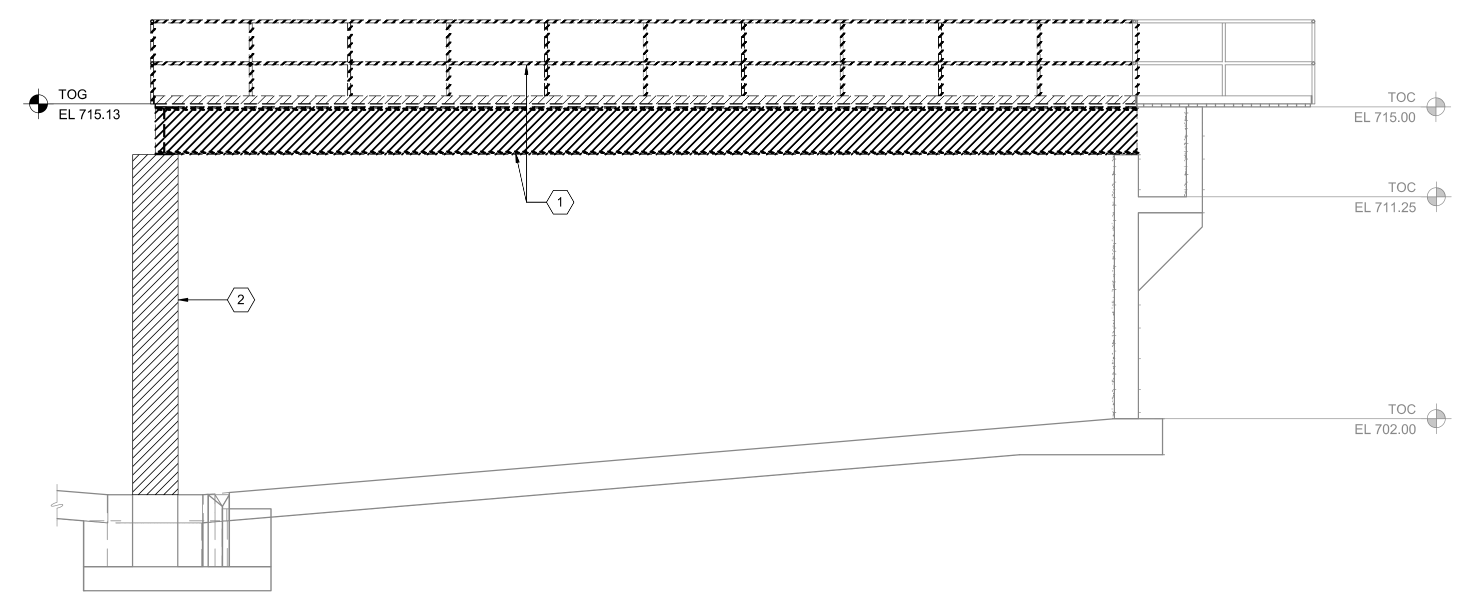
1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES. SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.

KEY NOTES: #

1. DEMO EXISTING PLATFORM WALKWAY, RAILING AND SUPPORTS.
2. SEE PROCESS DWG FOR ADDITIONAL INFORMATION REGARDING EQUIPMENT SUPPORTING WALKWAY.



DEMOLITION PLAN
1/8" = 1'-0"



A - SECTION
1/4" = 1'-0"

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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	M. BHANDARI
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

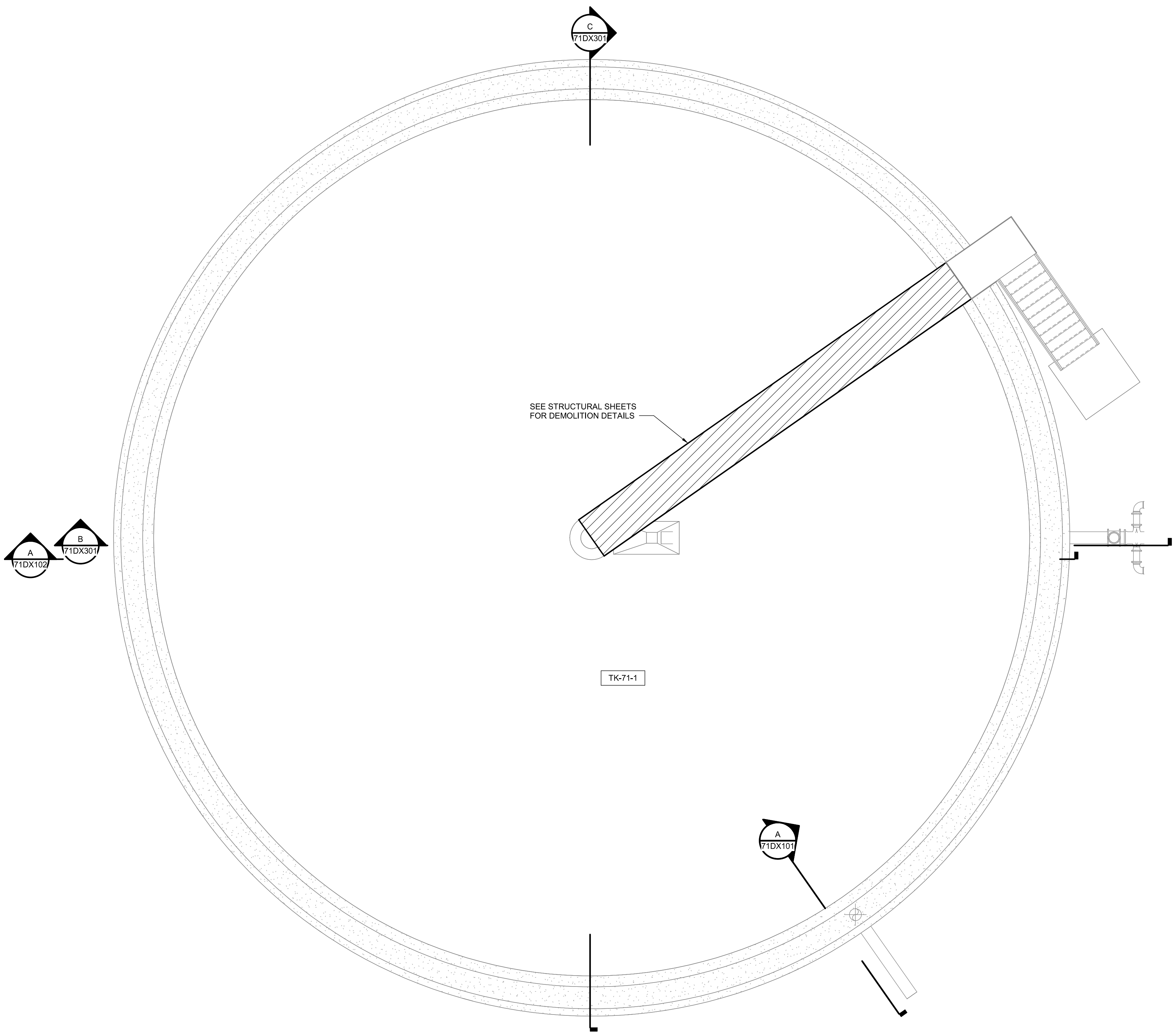
SLUDGE HOLDING TANK DEMOLITION PLAN AND SECTION

0 1" 2"

FILENAME 10343268-71-S.rvt

SCALE AS NOTED

SHEET 71SX101

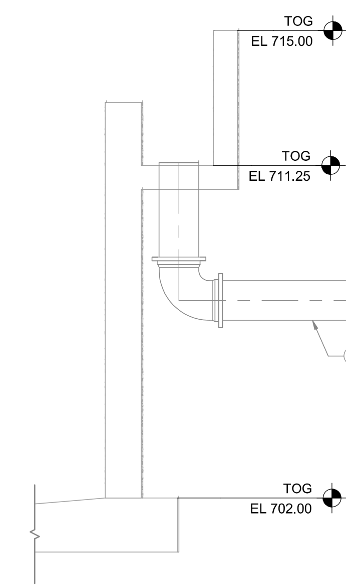


UPPER PLAN AT 711.25

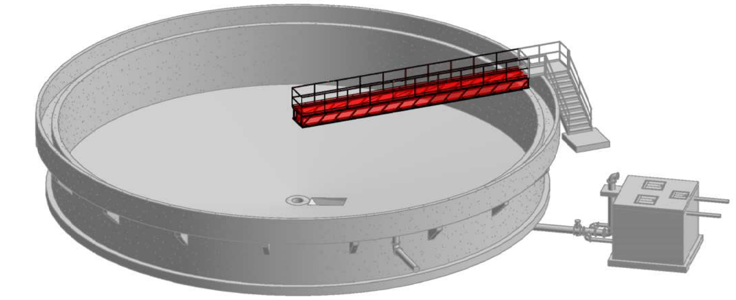
3/16" = 1'-0"

GENERAL NOTES:

1. THE EXISTING CONDITION/DEMOLITION DRAWINGS ARE INTENDED AS A GENERAL GUIDE TO THE DEMOLITION REQUIRED FOR THIS PROJECT. DEMOLITION IS NOT SHOWN IN COMPLETE DETAIL AND IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE EXISTING CONSTRUCTION AS REQUIRED TO ACCOMPLISH THE NEW DESIGN INTENT AND/OR WORK SHOWN OR REASONABLY IMPLIED FOR CONSTRUCTION OF THE PROJECT.
2. ALL EXISTING ELEVATIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO START OF WORK AND DISCREPANCIES IMMEDIATELY BROUGHT TO ENGINEER'S ATTENTION.
3. PROTECT PIPES FROM CLOGGING THROUGHOUT CONSTRUCTION AND CLEAN GRATES, INLETS, AND PIPES BEFORE TESTING OR PUTTING THEM IN SERVICE TO ENSURE ALL ARE FREE FROM DEBRIS AND BLOCKAGES.
4. ANY DAMAGES TO ADJACENT CONCRETE SURFACES SHALL BE REPAIRED TO LIKE NEW CONDITION.
5. CONTRACTOR TO PROVIDE ADDITIONAL VENTILATION FOR WORK IN CONFINED SPACE AS NEEDED PER OSHA CONFINED SPACE REQUIREMENTS.
6. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.



A
-
SECTION
3/8" = 1'-0"



3D PERSPECTIVE DEMOLITION

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

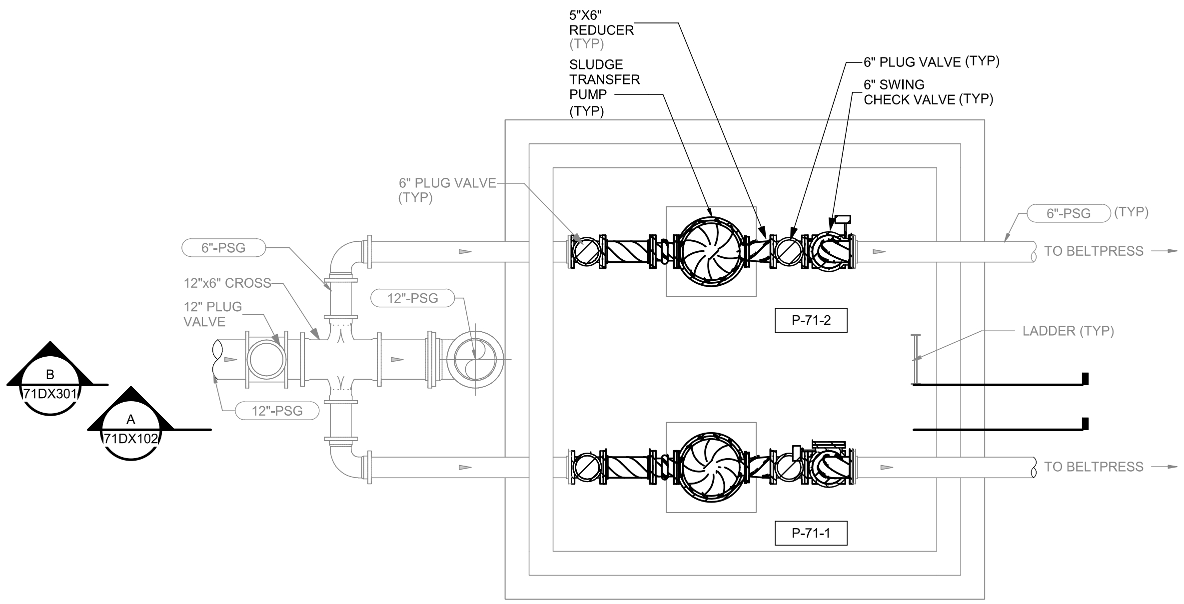
SLUDGE HOLDING TANK
UPPER AND LOWER DEMOLITION PLAN

0 1" 2"

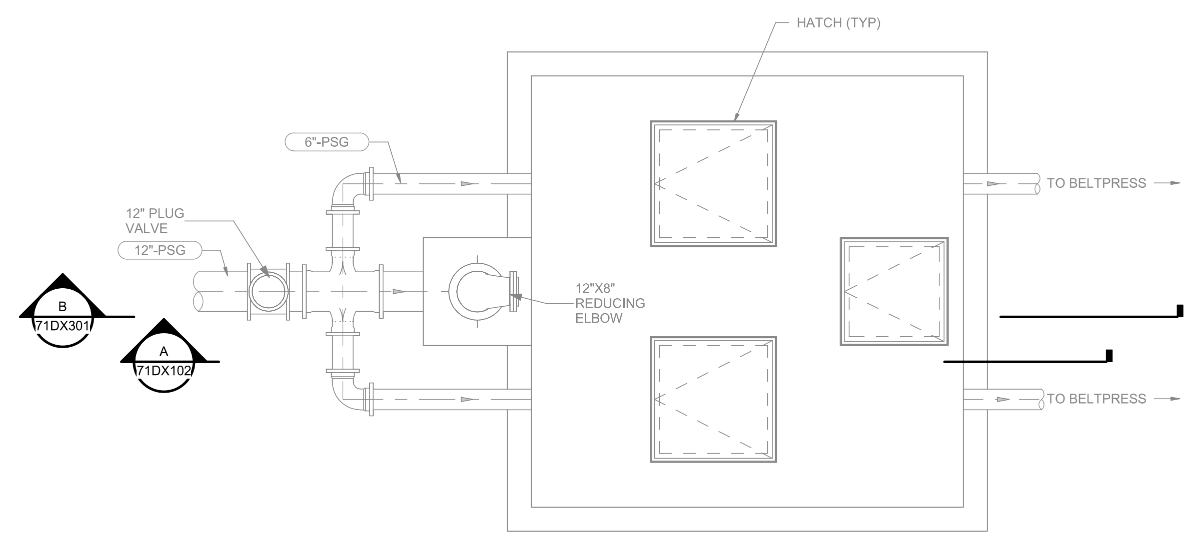
FILENAME 10343268-71-D.rvt
SCALE AS NOTED

SHEET
71DX101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-71-D.rvt
9/12/2023 6:39:22 PM



SLUDGE TRANSFER PUMP STATION LOWER PLAN
3/8" = 1'-0"



SLUDGE TRANSFER PUMP STATION UPPER PLAN
3/8" = 1'-0"

GENERAL NOTES:

1. THE EXISTING CONDITION/DEMOLITION DRAWINGS ARE INTENDED AS A GENERAL GUIDE TO THE DEMOLITION REQUIRED FOR THIS PROJECT. DEMOLITION IS NOT SHOWN IN COMPLETE DETAIL AND IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO REMOVE EXISTING CONSTRUCTION AS REQUIRED TO ACCOMPLISH THE NEW DESIGN INTENT AND/OR WORK SHOWN OR REASONABLY IMPLIED FOR CONSTRUCTION OF THE PROJECT.
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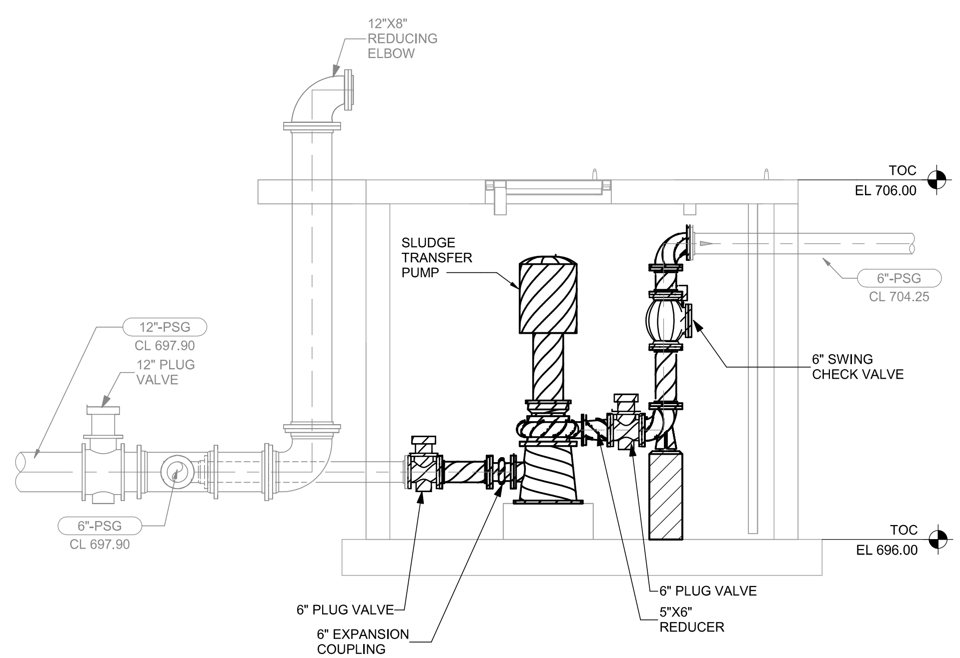
5. CONTRACTOR TO PROVIDE ADDITIONAL VENTILATION FOR WORK IN CONFINED SPACE AS NEEDED PER OSHA CONFINED SPACE REQUIREMENTS.
6. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.



A
-
SECTION
3/8" = 1'-0"

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Raleigh, NC 27601
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DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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OR
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PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SLUDGE HOLDING TANK
SLUDGE TRANSFER PUMP STATION DEMOLITION
PLANS AND SECTION

0 1" 2"

FILENAME	10343268-71-D.rvt
SCALE	3/8" = 1'-0"

SHEET
71DX102

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-71-D.rvt
9/12/2023 6:39:22 PM

GENERAL NOTES:

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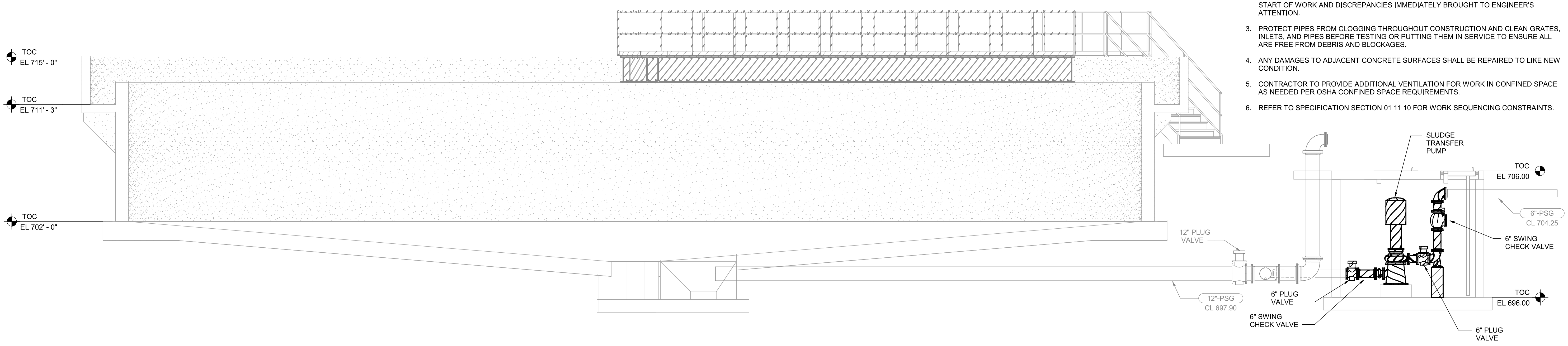
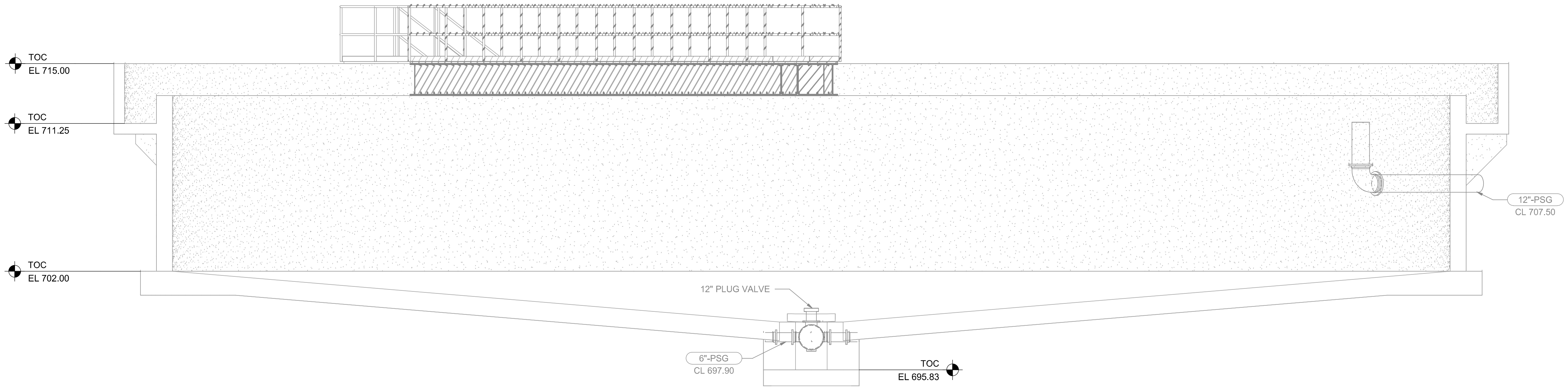


B / 71DX101 SECTION
1/4" = 1'-0"



C / 71DX101 SECTION
1/4" = 1'-0"

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DESIGNED BY	N. HERINGER
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DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

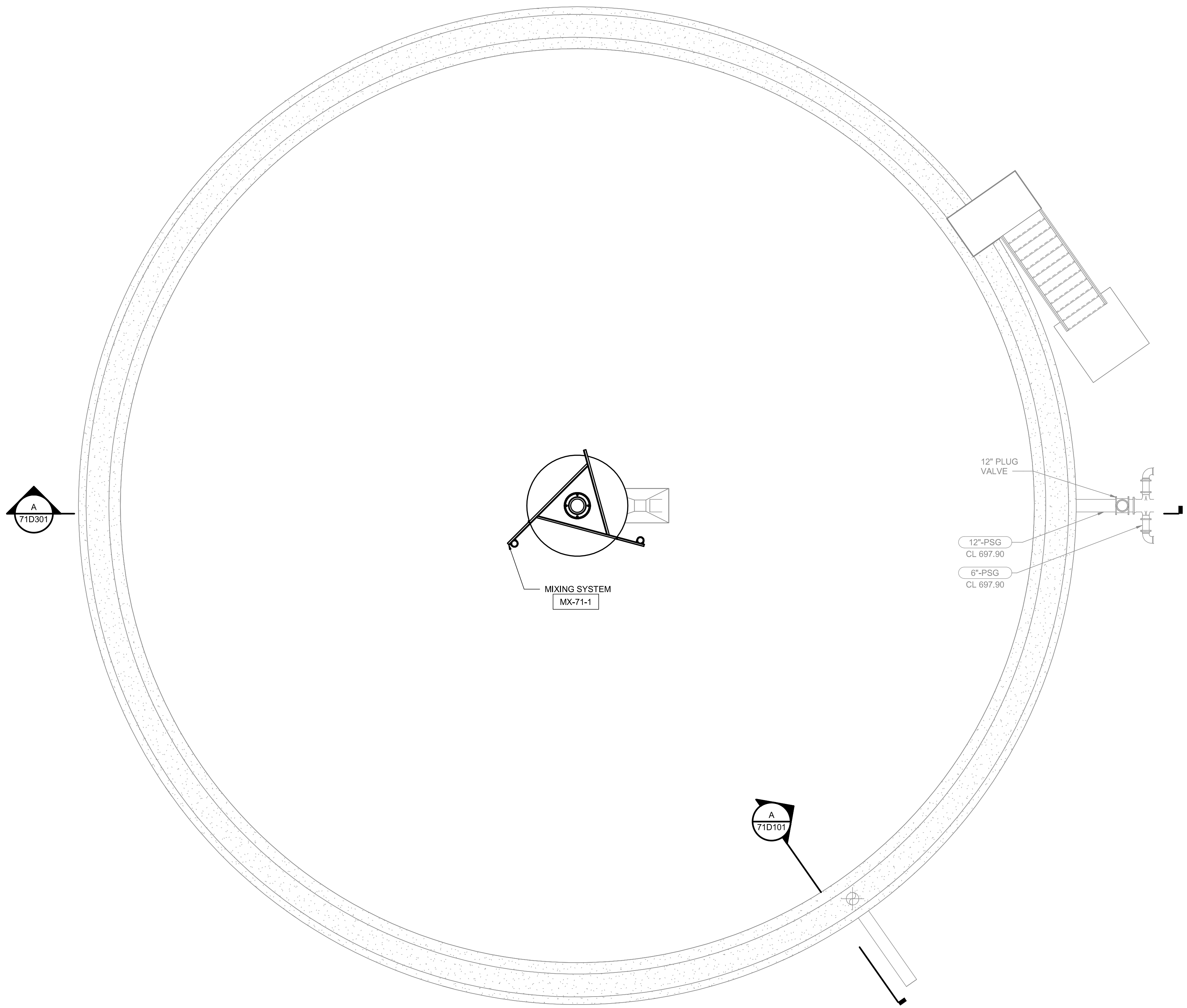
SLUDGE HOLDING TANK DEMOLITION SECTIONS

0 1" 2"

FILENAME 10343268-71-D.rvt
SCALE 1/4" = 1'-0"
SHEET 71DX301

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-71-D.rvt
9/12/2023 6:39:23 PM

1 2 3 4 5 6 7 8



UPPER PLAN AT 711.25
3/16" = 1'-0"

GENERAL NOTES:

1. ALL EXISTING ELEVATIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO START OF WORK AND DISCREPANCIES IMMEDIATELY BROUGHT TO ENGINEER'S ATTENTION.
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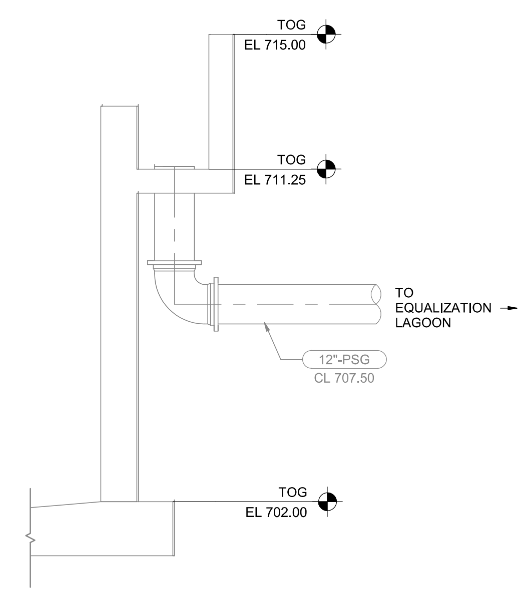
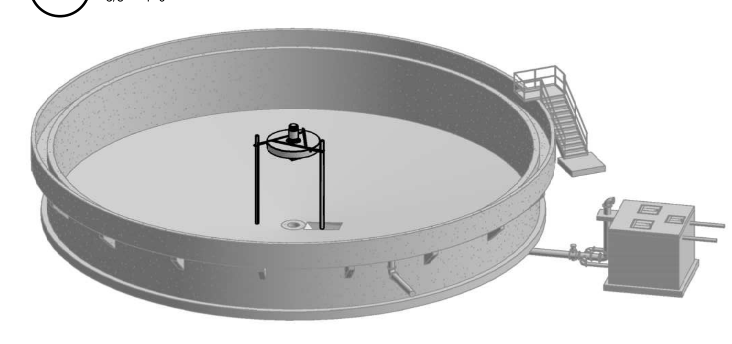
3. REFER TO P&ID DRAWINGS FOR ADDITIONAL INSTALLATION DETAIL ON EQUIPMENT.
4. ANY DAMAGES TO ADJACENT CONCRETE SURFACES SHALL BE REPAIRED TO LIKE NEW CONDITION.
5. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.



A
\-
SECTION
3/8" = 1'-0"



3D PERSPECTIVE

D C B A

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PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SLUDGE HOLDING TANK
UPPER AND LOWER PLAN

0 1" 2"

FILENAME 10343268-71-D.rvt
SCALE AS NOTED
SHEET 71D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-71-D.rvt
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1	2	3	4	5	6	7	8

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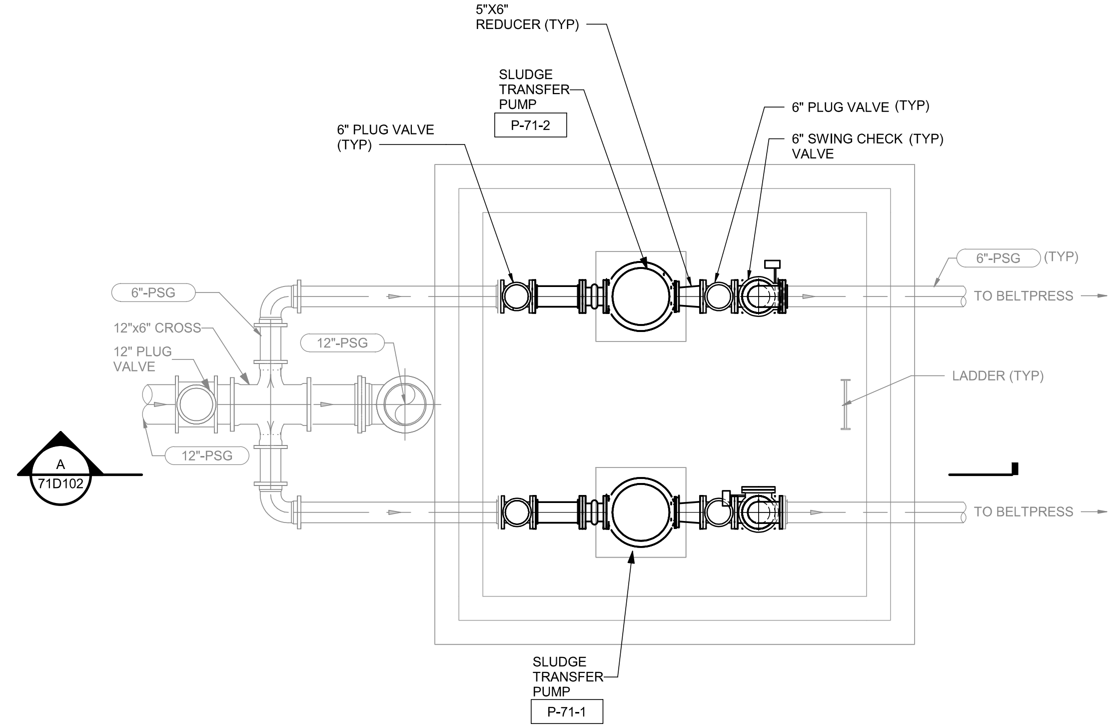
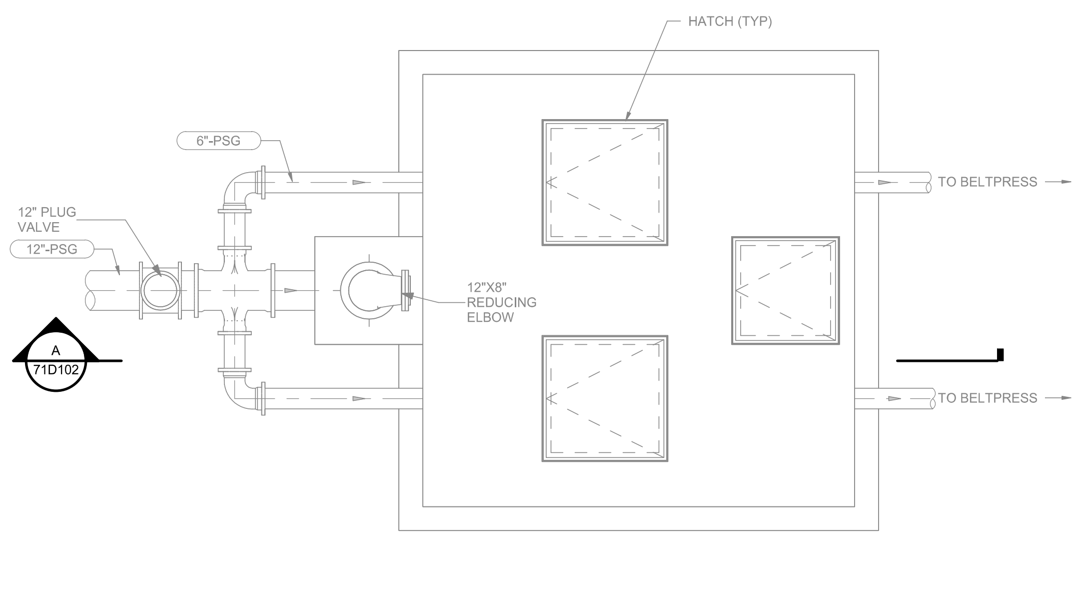


SLUDGE PUMP STATION LOWER PLAN

3/8" = 1'-0"

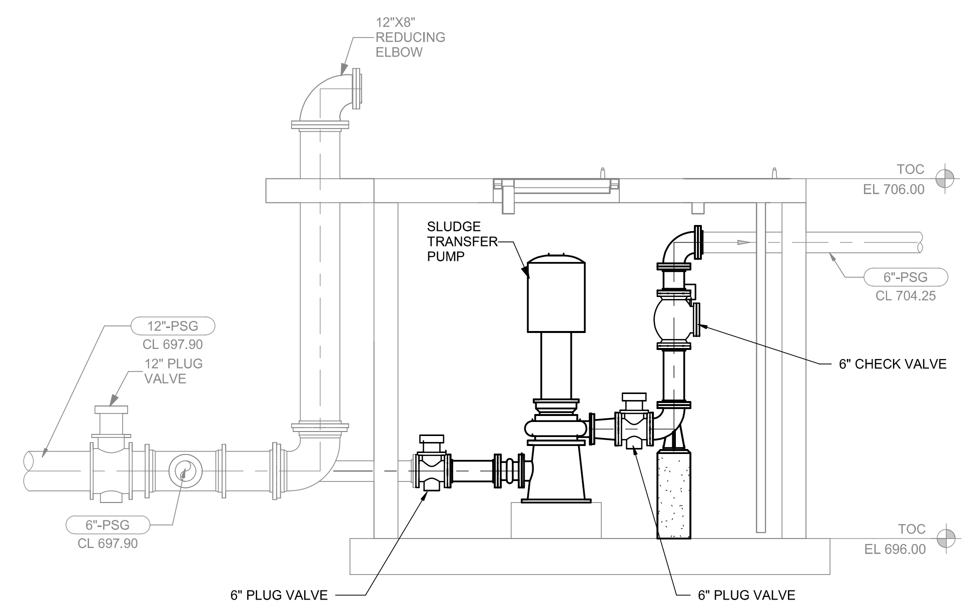
GENERAL NOTES:

1. ALL EXISTING ELEVATIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO START OF WORK AND DISCREPANCIES IMMEDIATELY BROUGHT TO ENGINEER'S ATTENTION.
2. PROTECT PIPES FROM CLOGGING THROUGHOUT CONSTRUCTION AND CLEAN GRATES, INLETS, AND PIPES BEFORE TESTING OR PUTTING THEM IN SERVICE TO ENSURE ALL ARE FREE FROM DEBRIS AND BLOCKAGES.
3. REFER TO P&ID DRAWINGS FOR ADDITIONAL INSTALLATION DETAIL ON EQUIPMENT.
4. ANY DAMAGES TO ADJACENT CONCRETE SURFACES SHALL BE REPAIRED TO LIKE NEW CONDITION.
5. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.



SLUDGE PUMP STATION UPPER PLAN

3/8" = 1'-0"



A
-
SECTION

3/8" = 1'-0"

B	C	D	

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ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE HOLDING TANK SLUDGE TRANSFER PUMP STATION PLANS AND SECTION

0 1" 2"

FILENAME	10343268-71-D.rvt
SCALE	3/8" = 1'-0"
SHEET	71D102

GENERAL NOTES:

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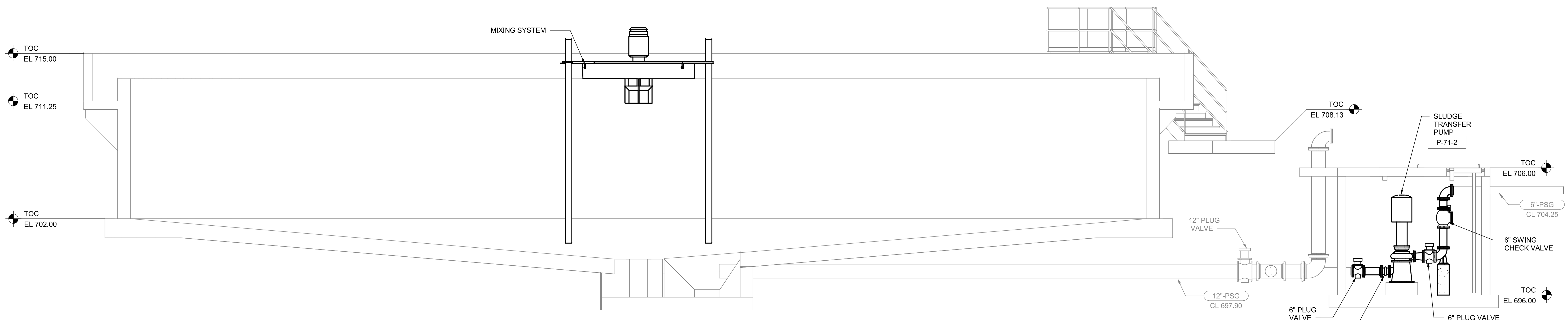

A SECTION
71D101 1/4" = 1'-0"

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PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

SLUDGE HOLDING TANK
SECTION

0 1" 2"

FILENAME 10343268-71-D.rvt
SCALE 1/4" = 1'-0"
SHEET 71D301

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CODE REVIEW ANALYSIS

1.0 INTRODUCTION

THE FOLLOWING CODE REVIEW NARRATIVE IS PROVIDED TO SERVE AS A BASIS OF UNDERSTANDING FOR THE DEVELOPMENT OF THE DESIGN, DRAWINGS AND SPECIFICATIONS FOR THE PLANNED EXPANSION OF THE PIEDMONT TRIAD REGIONAL WATER AUTHORITY (PTRWA) WATER TREATMENT PLANT (WTP) IN RURAL RANDOLPH COUNTY NEAR RANDLEMAN, NORTH CAROLINA. THE FOLLOWING ANALYSIS REVIEWS THE APPLICABLE BUILDING AND LIFE SAFETY CODES.

THE AUTHORITIES HAVING JURISDICTION (AHJ'S) FOR THIS PROJECT INCLUDE THE RANDOLPH COUNTY BUILDING INSPECTIONS DEPARTMENT AND THE NORTH CAROLINA DEPARTMENT OF INSURANCE OFFICE OF THE STATE FIRE MARSHAL.

1.1 DESIGN CODES

BUILDING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: BUILDING CODE (BASED ON 2015 IBC)
EXISTING BUILDING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: EXISTING BUILDING CODE (BASED ON 2015 IEBC)
FIRE CODE	2018 NORTH CAROLINA STATE BUILDING CODE: FIRE PREVENTION CODE (BASED ON 2015 IBC)
PLUMBING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: PLUMBING CODE (BASED ON 2015 IPC)
ENERGY CONSERVATION CODE	2018 NORTH CAROLINA STATE BUILDING CODE: ENERGY CONSERVATION CODE (BASED ON 2015 IECC)
MECHANICAL CODE	2018 NORTH CAROLINA STATE BUILDING CODE: MECHANICAL CODE (BASED ON 2015 IMC)
FUEL GAS CODE	2018 NORTH CAROLINA STATE BUILDING CODE: FUEL GAS CODE (BASED ON 2015 IFGC)
ELECTRICAL CODE	2020 NATIONAL ELECTRICAL CODE (NEC), NFPA 70

CODE DATA TABLE

2.0 PIEDMONT TRIAD REGIONAL WATER AUTHORITY - DEWATERING BUILDING [72]

2.1 DESCRIPTION

THE FOLLOWING CODE REVIEW NARRATIVE IS PROVIDED TO SERVE AS A BASIS OF UNDERSTANDING FOR THE DEVELOPMENT OF THE DESIGN, DRAWINGS AND SPECIFICATIONS FOR THE DEWATERING BUILDING TO BE BUILT AS PART OF THE PEDIMONT TRIAD REGIONAL WATER AUTHORITY (WTP) EXPANSION.

2.2 GENERAL BUILDING DATA SUMMARY

OCCUPANCY CLASSIFICATION(S)	GROUP F-1 OCCUPANCY
BUILDING AREA	4,895 SF
FIRE AREA	4,895 SF
HEIGHT	23'-9" (1 STORY ABOVE GRADE)
TYPE OF CONSTRUCTION	II-B (NON-COMBUSTIBLE)
FIRE SEPARATION DISTANCE	10' ≤ X < 30'
FIRE PROTECTION SYSTEMS	FIRE EXTINGUISHERS FIRE HYDRANT
OCCUPANT LOAD (TOTAL)	17 (SEE 2.10 FOR CALCULATION)

2.3 USE & OCCUPANCY CLASSIFICATION:		NCSBC	NCSFC
OCCUPANCY GROUP(S):	GROUP F-1 MODERATE-HAZARD FACTORY INDUSTRIAL	§306	-
ACCESS. OCCUPANCY (<10%)	N/A	§508.2	-
HAZARDOUS MATERIALS	N/A	§307	-
CLASSIFICATION OF HAZARDS	N/A	§307	

2.4 SPECIAL REQUIREMENTS:		NCSBC	NCSFC
AREAS WITH HAZARDOUS MATERIALS	N/A	§414	-
EMERGENCY EYE WASH / EMERGENCY SHOWER (EEW/ES) STATIONS	N/A	[29 CODE OF FEDERAL REGULATIONS, OSHA 1910.151]	-

2.5 BUILDING HEIGHTS & AREAS:		NCSBC	NCSFC
ACTUAL HEIGHT & AREA	23'-9" AND ONE STORY TOTAL AREA OF 4,895 SF (MEZZANINE DOES NOT COUNT TOWARDS BUILDING AREA PER §505.3)	-	-
FIRE AREA	4,895 SF	-	-
ALLOWABLE AREA/STORY;	GROUP F-1: 15,500 SF	TABLE 506.2	-
ALLOWABLE HEIGHT	55'-0" AND TWO STORIES	TABLE 504.3, TABLE 504.4	-
MEZZANINE AREA (%)	N/A	§505	-
EQUIPMENT PLATFORM AREA (%)	13%	§505	-
FRONTAGE INCREASE	N/A	§506.3	-
UNLIMITED AREA BUILDINGS	N/A	§507	-
MIXED-USE & OCCUPANCY	N/A	§508	-
INCIDENTAL USES	N/A	§509	-
SPECIAL PROVISIONS	N/A	§510	-

2.6 TYPES OF CONSTRUCTION:		NCSBC	NCSFC
CONSTRUCTION TYPE	II-B	§602	-
GENERAL BUILDING FIRE-RESISTANCE RATINGS (PRIMARY STRUCTURAL FRAME, BEARING AND NONBEARING WALLS AND PARTITIONS, FLOOR, ROOF)	0-HR	TABLE 601	-
FIRE SEPARATION DISTANCE (FSD)	GROUP F: 10' ≤ X < 30'	TABLE 602	-
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED UPON FSD	0-HR	TABLE 602	-

2.7 FIRE & SMOKE PROTECTION:		NCSBC	NCSFC
SHAFT ENCLOSURES FIRE-RESISTANCE RATINGS	N/A	§707.3.1 & §713.4	-
VERTICAL EXIT ENCLOSURE FIRE-RESISTANCE RATINGS	N/A	§707.3.2 & §1023.2	-
OPENING PROTECTIVES	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§716	-
DUCT AND AIR TRANSFER OPENINGS	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§717	-
EXTERIOR WALLS	NO LIMIT	TABLE 705.8	-
CORRIDORS	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§1020	-

2.8 INTERIOR FINISHES:		NCSBC	NCSFC
CEILING & WALL (EXIT ENCLOSURES)	NON-SPRINKLERED F-1: CLASS A OR B	TABLE 803.13	-
CEILING & WALL (CORRIDORS)	NON-SPRINKLERED F-1: CLASS A, B OR C		
CEILING & WALL (ROOMS AND ENCL. SPACES)	NON-SPRINKLERED F-1: CLASS A, B OR C		
FLOOR	CLASS I OR II MATERIALS COMPLYING WITH DOC FF-1 "PILL TEST" (CPSC 16 CFR PART 1630) OR WITH ASTM D2859	§804.4	

2.9 FIRE PROTECTION SYSTEMS:		NCSBC	NCSFC
AUTOMATIC SPRINKLER SYSTEM	NOT REQUIRED	§903	§903
PORTABLE FIRE EXTINGUISHERS	REQUIRED; PROVIDED THROUGHOUT	-	§906
FIRE ALARM AND DETECTION	NOT REQUIRED	§907.2.4	§907.2.4
FIRE-FLOW REQUIREMENT	1,500 GPM (@20 PSI) FOR 2 HOURS	-	§B105, TABLE B105.1(2)
MINIMUM NUMBER OF HYDRANTS	1 HYDRANT (SEE SITE CIVIL PLANS FOR LOCATIONS)	-	TABLE C102.1

2.10 MEANS OF EGRESS:		NCSBC	NCSFC
ACCESSORY STORAGE AREAS, MECHANICAL EQUIPMENT ROOMS, BUSINESS AREAS	17 OCCUPANTS	§1004	-
EQUIPMENT SPACES (WTP)	4,895 SF @ 1:300 SF (GROSS) = 17		
EGRESS CAPACITY PER OCCUPANT LOAD	0.3 (STAIRS) & 0.2 (OTHER)	§1005.3	-
EXIT ACCESS - COMMON PATH	NON-SPRINKLERED GROUP F: 75 FT	TABLE 1006.2.1	-
EXIT ACCESS - TRAVEL DISTANCE	NON-SPRINKLERED GROUP F-1: 200 FT	TABLE 1017.2	-
MIN. EXIT DOORS	2; SEE LIFE SAFETY PLANS FOR EXITING	§1006	-
ACCESSIBLE MEANS OF EGRESS	NOT REQUIRED FOR GROUP F-1	§1009	-
EXIT DISCHARGE; ACCESS TO PUBLIC WAY	PUBLIC WAY	§1028.5	-

2.11 ACCESSIBILITY:		NCSBC	NCSFC
SCOPING REQUIREMENTS	EQUIPMENT SPACES ARE EXEMPT	§1103.2.9 [2010 ADA §203.5]	-

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	M. SHUMPERT
CHECKED BY	B. COOPER
DRAWN BY	T. FREEMAN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING CODE ANALYSIS

0 1" 2"

FILENAME 10343268-72-A.rvt

SCALE NONE

SHEET 72G001

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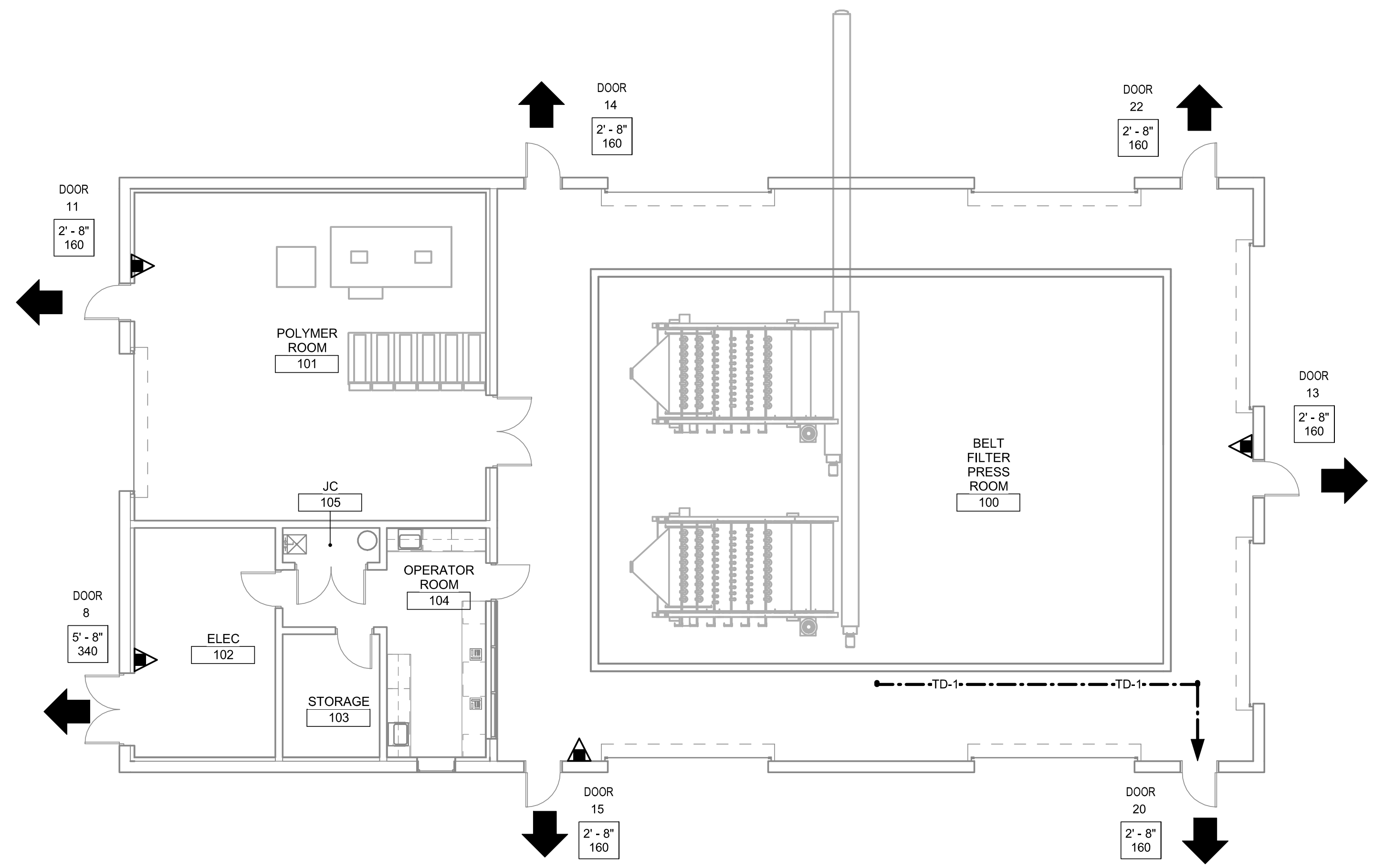

LIFE SAFETY PLAN

1/8" = 1'-0"

LIFE SAFETY NOTES:

1. FOR EXIT LIGHTS AND EMERGENCY LIGHTING, SEE ELECTRICAL LIGHTING DRAWINGS (E SERIES).

LIFE SAFETY SYMBOLS:

EXIT DOOR TAG

A — CLEAR DOOR WIDTH [FEET - INCHES]

B — OCCUPANT LOAD CAPACITY [NO.OF PEOPLE]

OTHERS

FIRE EXTINGUISHER

LINE TYPES FOR MEANS OF EGRESS:

COMPONENT	SYMBOL
TRAVEL DISTANCE	TD
COMMON PATH	CP

EXIT DISCHARGE

EXIT DISCHARGE ARROW

MEANS OF EGRESS ARRANGEMENT DISTANCE SCHEDULE - BUILDING SUMMARY		
EGRESS PATH ID	EGRESS DISTANCE	
	PROVIDED	MAXIMUM PERMITTED
TD-1	34' - 6"	250' - 0"

MEANS OF EGRESS WIDTH CAPACITY - LEVEL 1			
	PROVIDED EGRESS CAPACITY - LEVEL COMPONENTS & RAMPS		
EXIT ID	EGRESS CAPACITY FACTOR	CLEAR WIDTH	OCCUPANT LOAD CAPACITY
8	0.2	5' - 8"	340
11	0.2	2' - 8"	160
13	0.2	2' - 8"	160
14	0.2	2' - 8"	160
15	0.2	2' - 8"	160
20	0.2	2' - 8"	160
22	0.2	2' - 8"	160

D C B A

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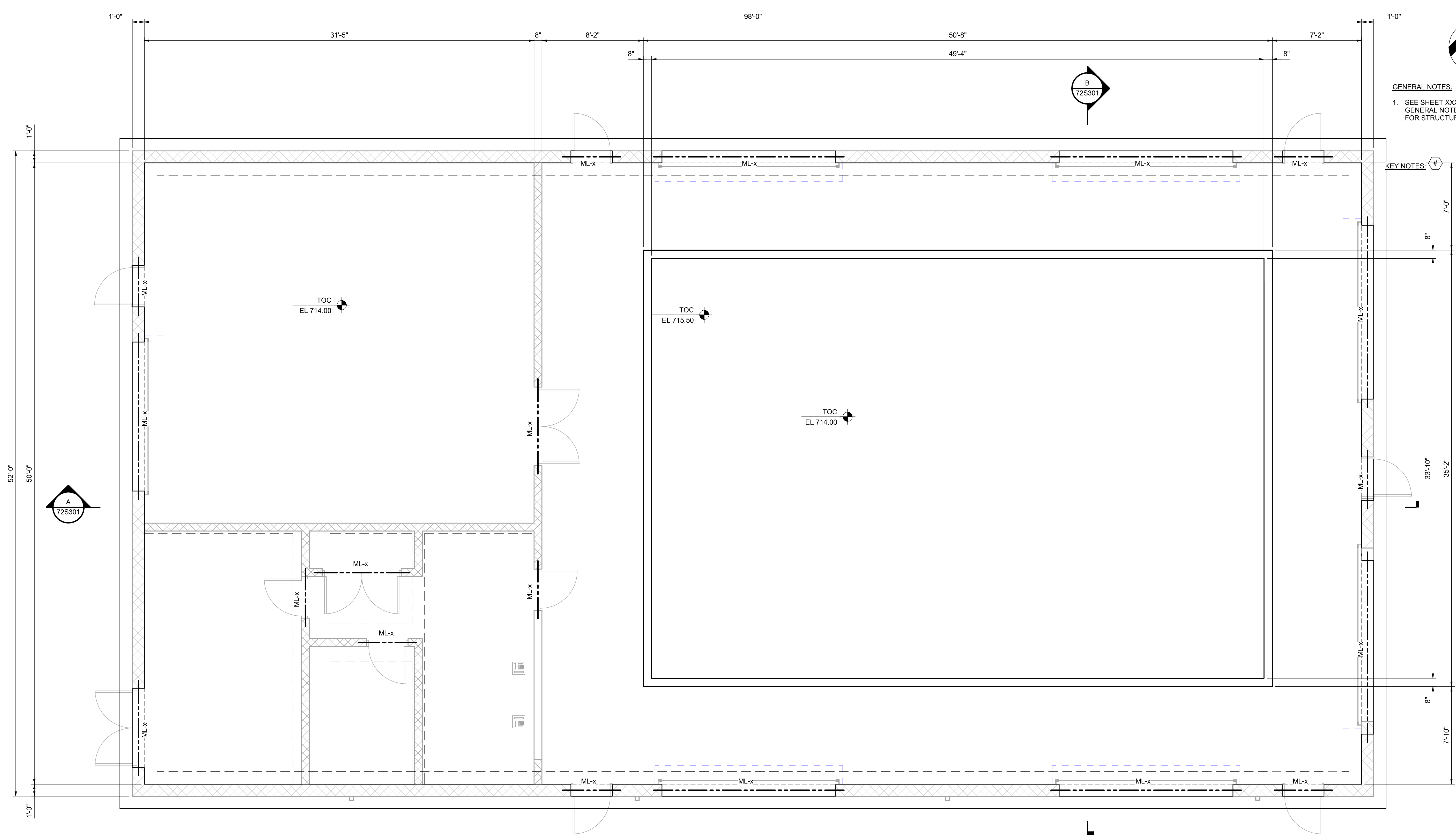
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING LIFE SAFETY PLAN

0 1" 2"

FILENAME	10343268-72-A.rvt
SCALE	1/8" = 1'-0"
SHEET	72G101



GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES. SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.

FOUNDATION PLAN

1/4" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

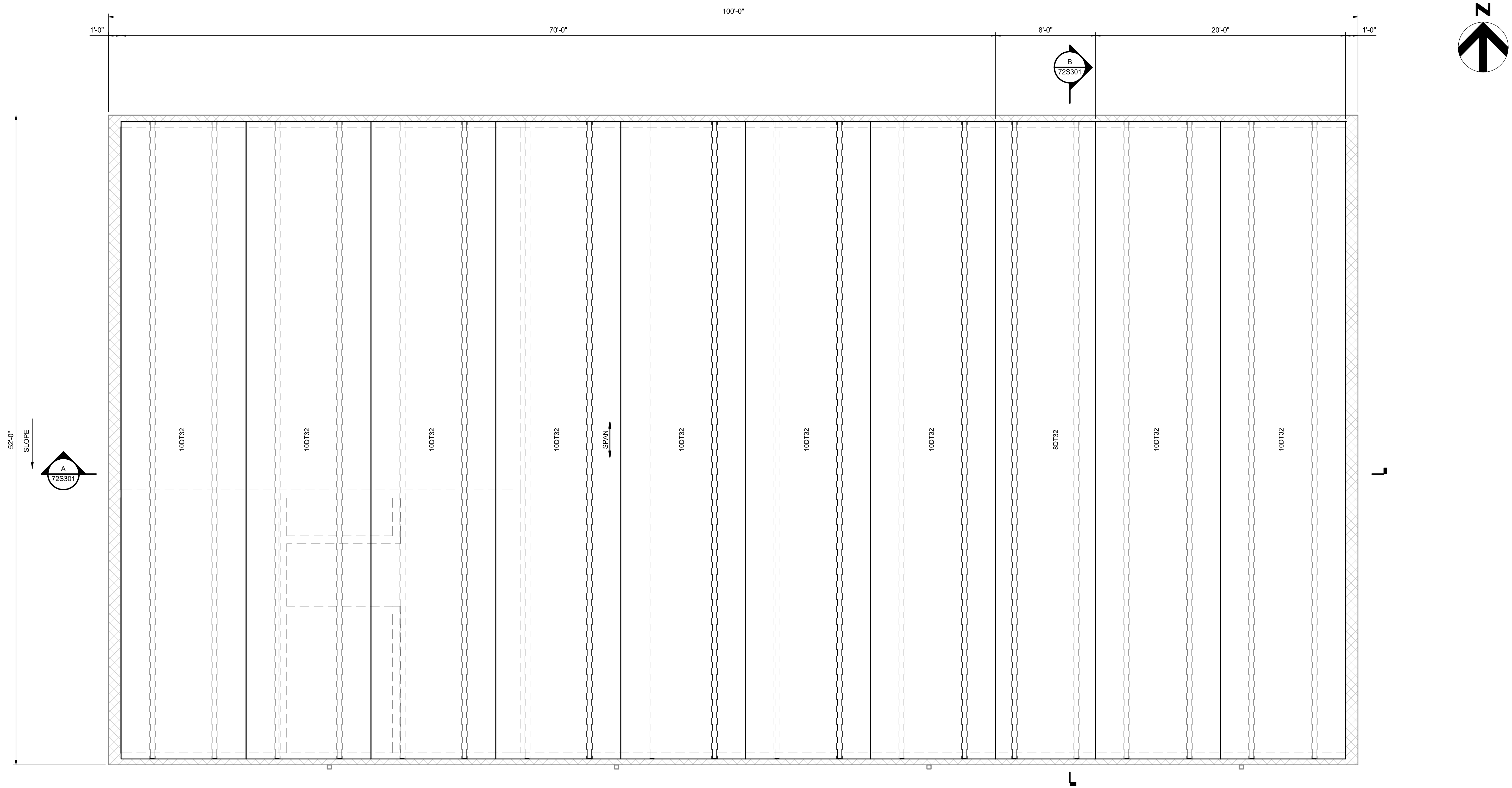
DEWATERING BUILDING FOUNDATION PLAN

0 1" 2"

FILENAME 10343268-72-S.rvt

SCALE 1/4" = 1'-0"

SHEET **72S101**



ROOF PLAN

1/4" = 1'-0"

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CHECKED BY	Checker
DRAWN BY	Author
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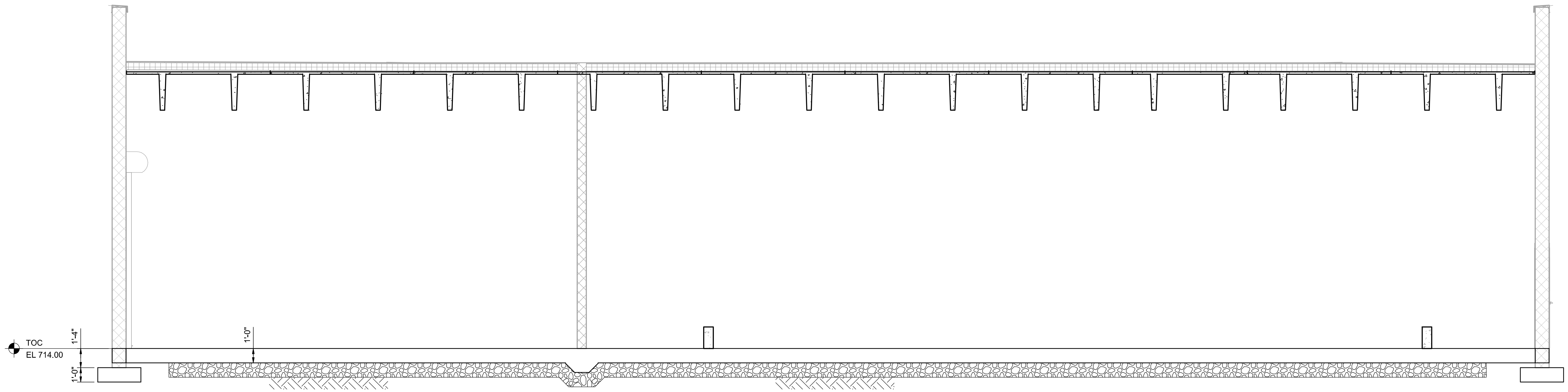
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING ROOF PLAN

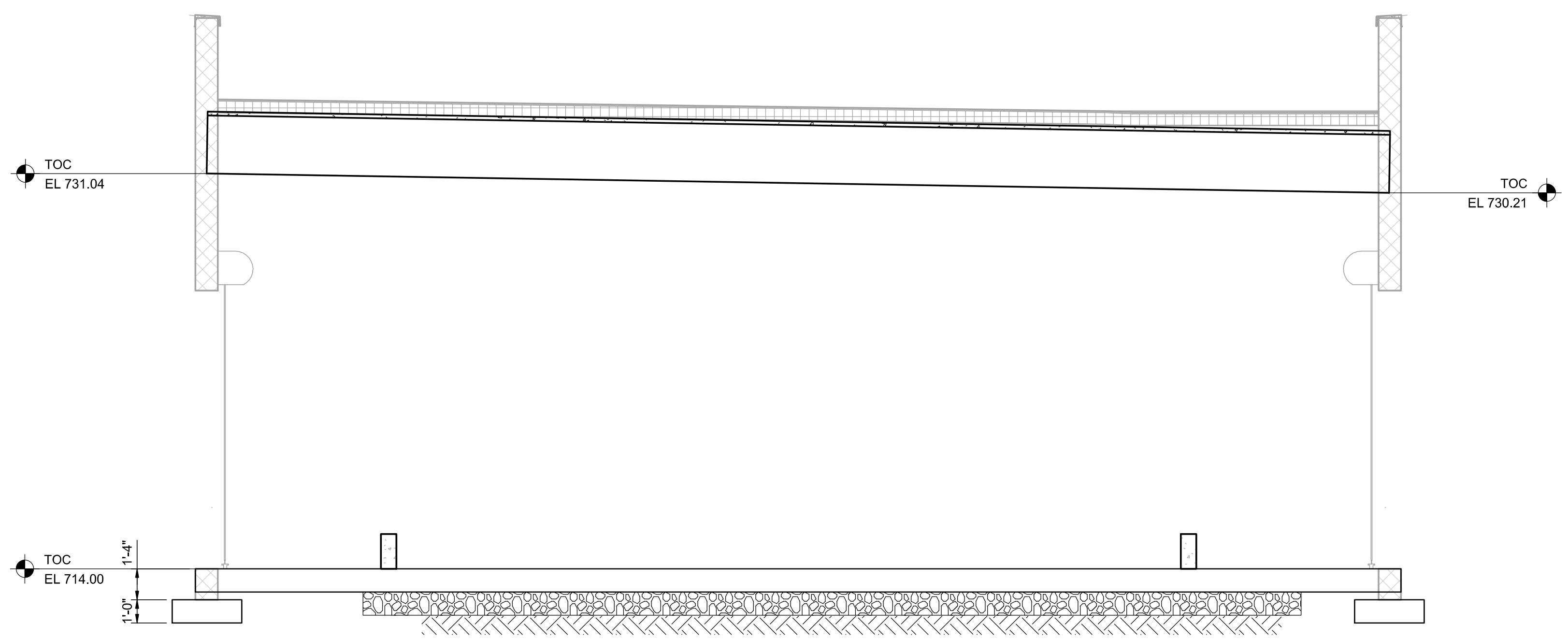
0 1" 2"

FILENAME	10343268-72-S.rvt
SCALE	1/4" = 1'-0"

SHEET
72S102



A
72S101
SECTION
1/4" = 1'-0"



B
72S101
SECTION
1/4" = 1'-0"

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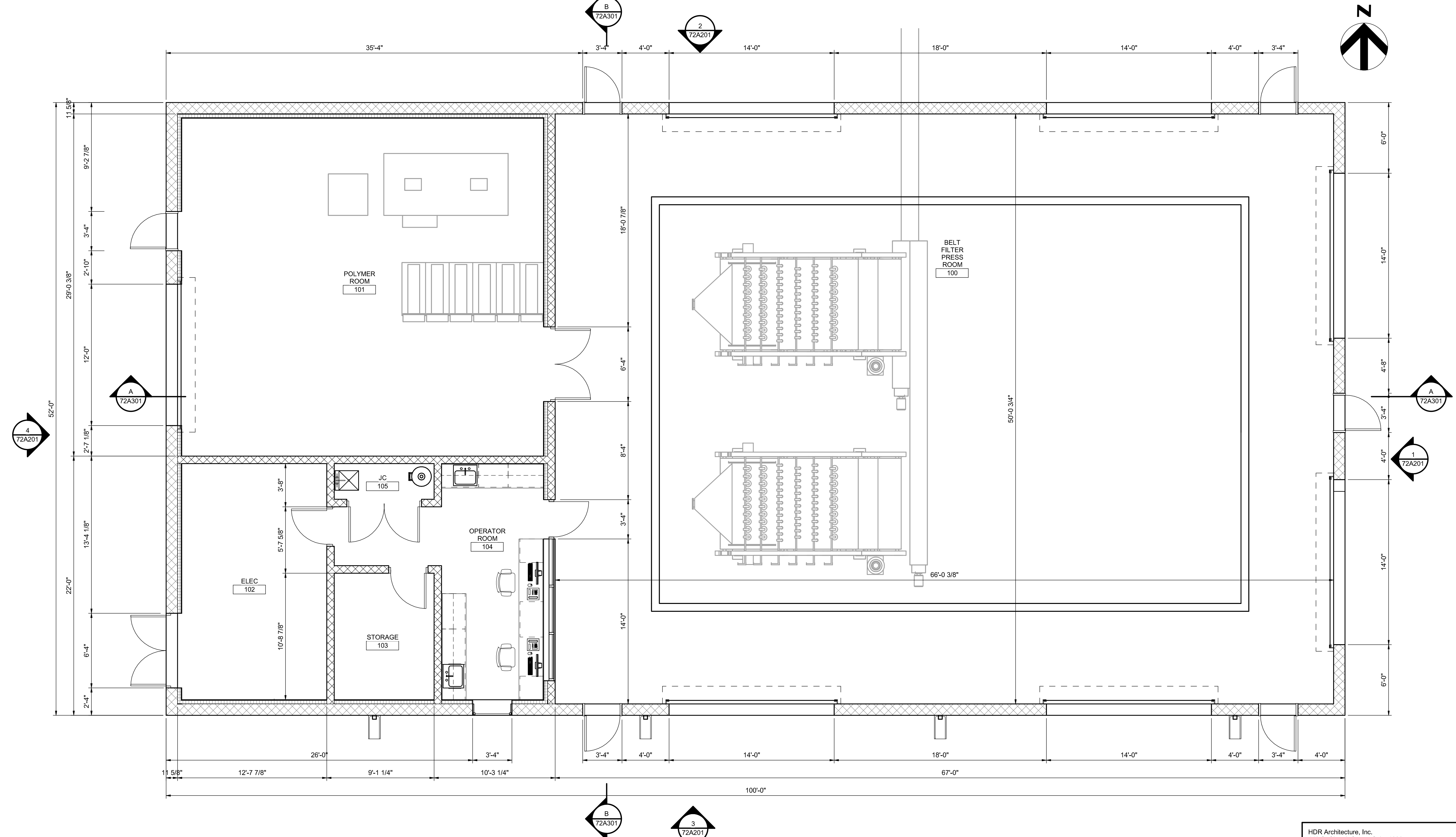
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING SECTIONS

0 1" 2"

FILENAME	10343268-72-S.rvt
SCALE	1/4" = 1'-0"
SHEET	72S301



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DESIGNED BY	J.REDDRICK
CHECKED BY	H.ELLIOTT
DRAWN BY	J.WILLIAMS
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING FLOOR PLAN

0 1" 2"

FILENAME	10343268-72-A.rvt
SCALE	1/4" = 1'-0"
SHEET	72A101

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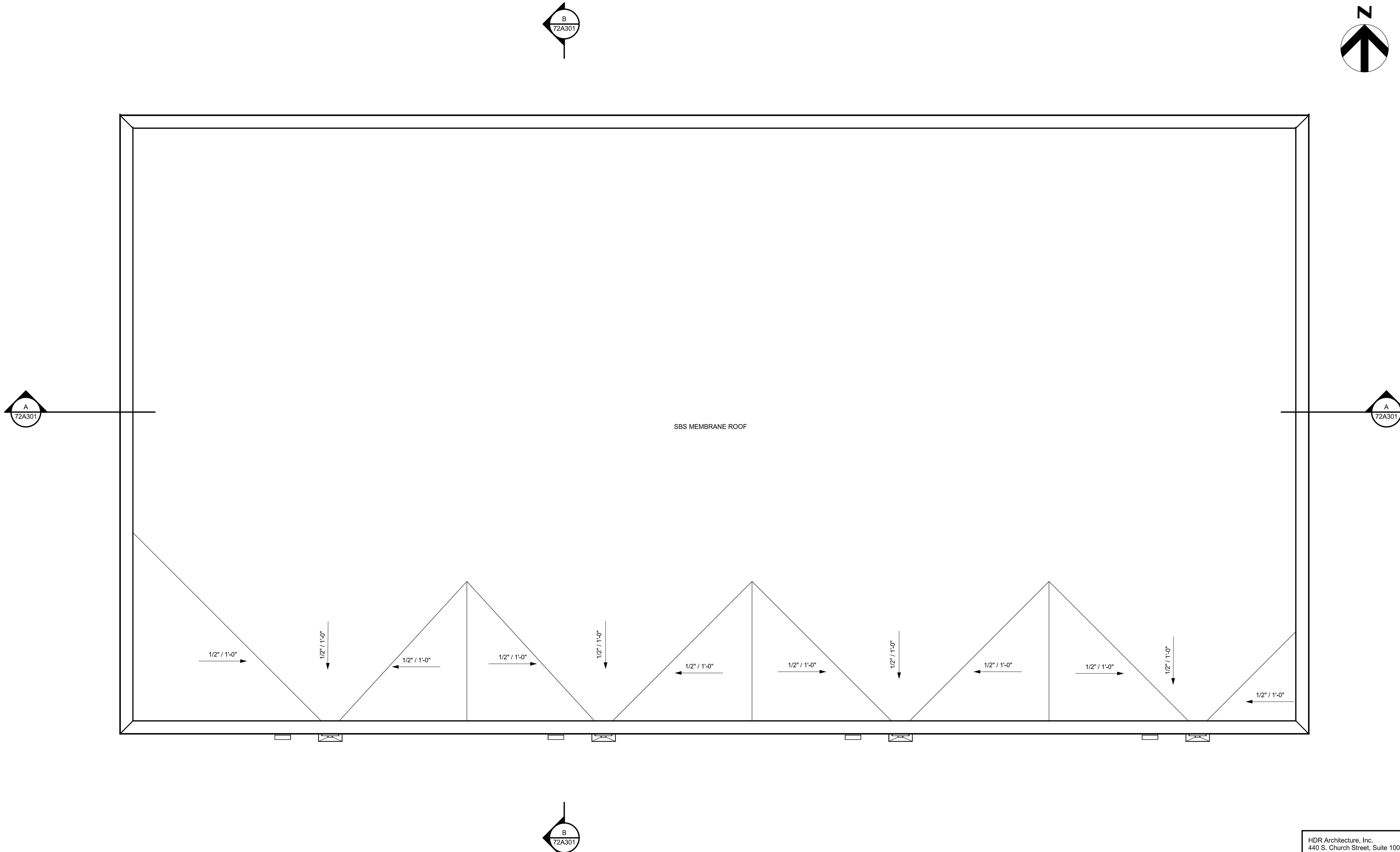

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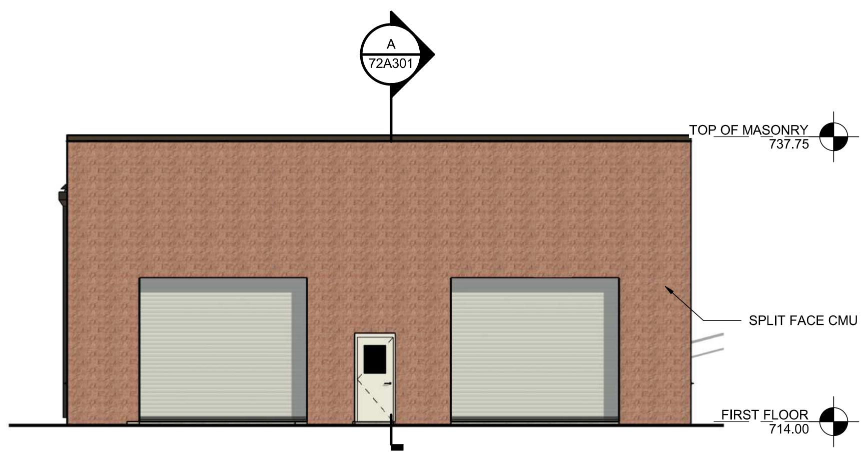
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

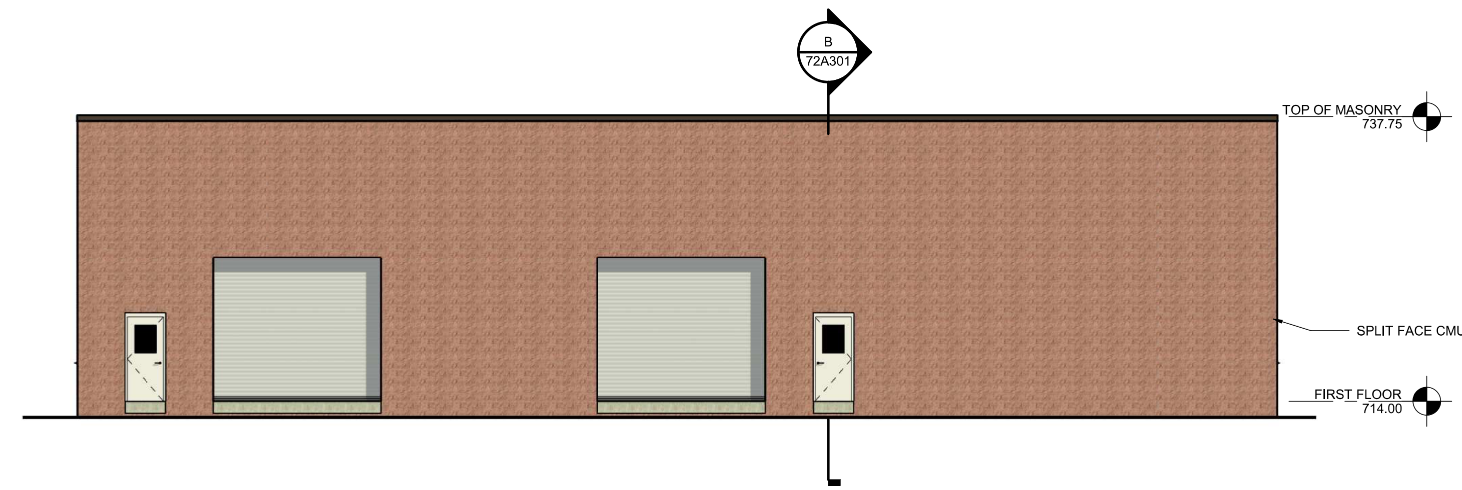
DEWATERING BUILDING ROOF PLAN

0 1" 2"

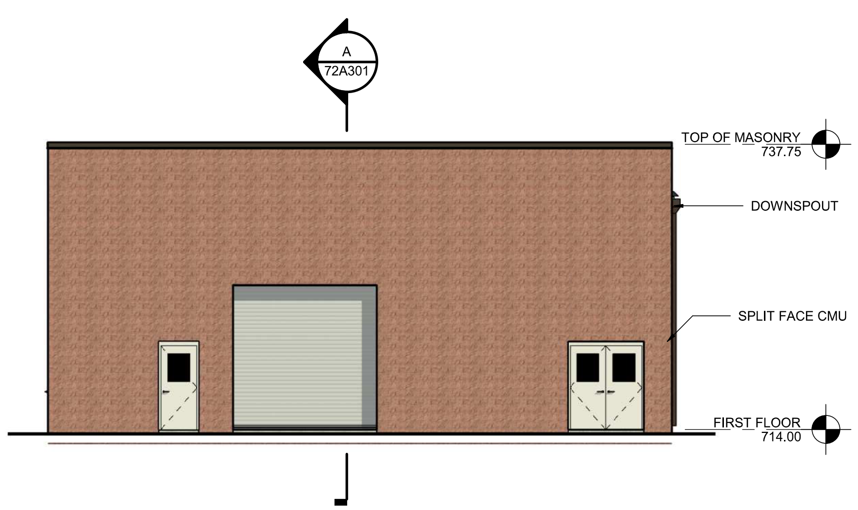
FILENAME	10343268-72-A.rvt
SCALE	1/4" = 1'-0"
SHEET	72A102



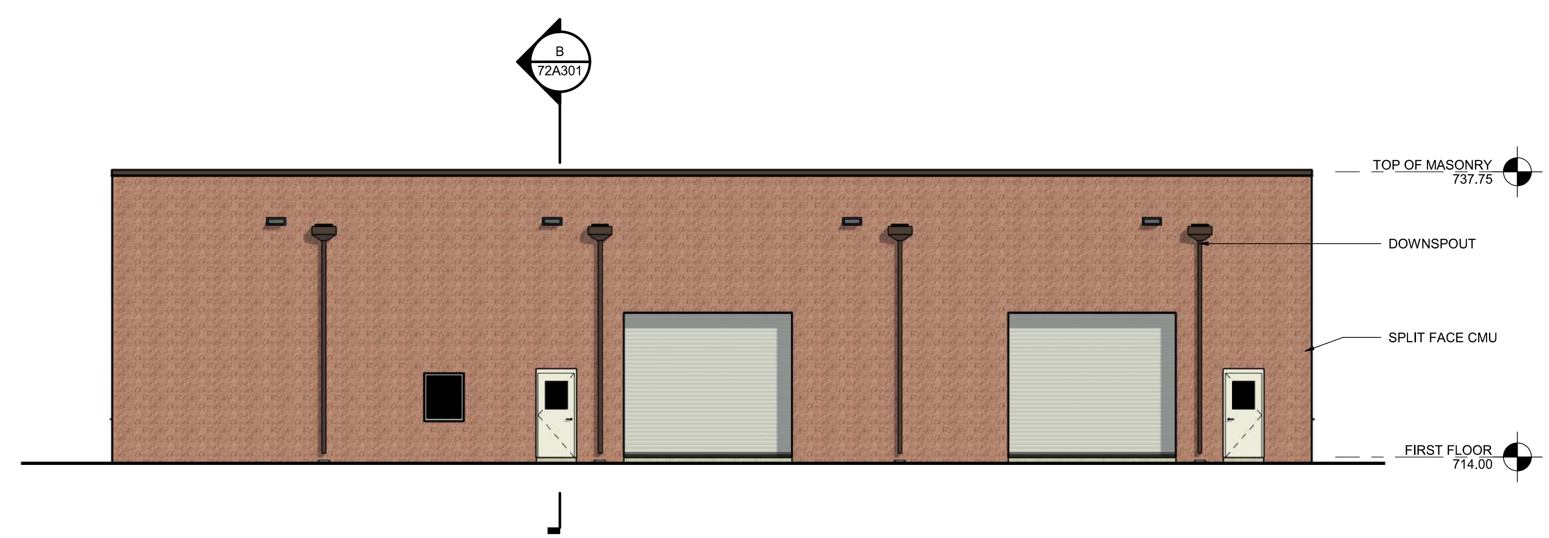
1 72A101 EAST EXTERIOR ELEVATION
1/8" = 1'-0"



2 72A101 NORTH EXTERIOR ELEVATION
1/8" = 1'-0"



4 72A101 WEST EXTERIOR ELEVATION
1/8" = 1'-0"



3 72A101 SOUTH EXTERIOR ELEVATION
1/8" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING BUILDING ELEVATIONS

0 1" 2"

FILENAME	10343268-72-A.rvt
SCALE	1/8" = 1'-0"
SHEET	72A201

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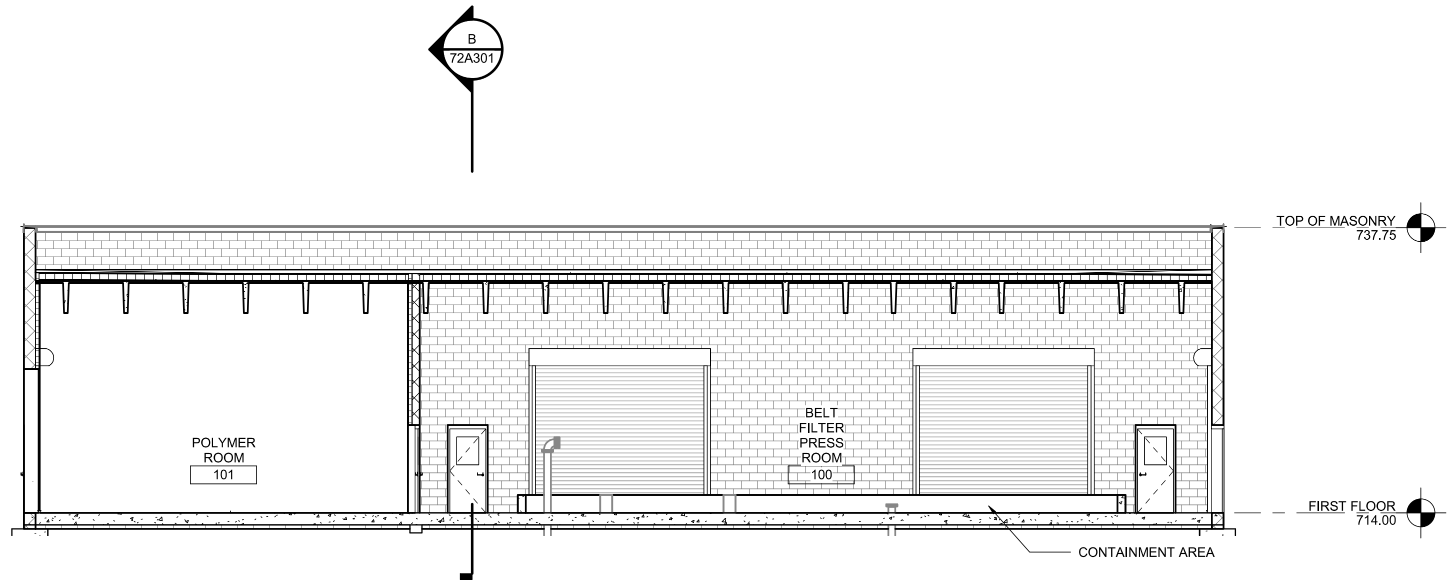
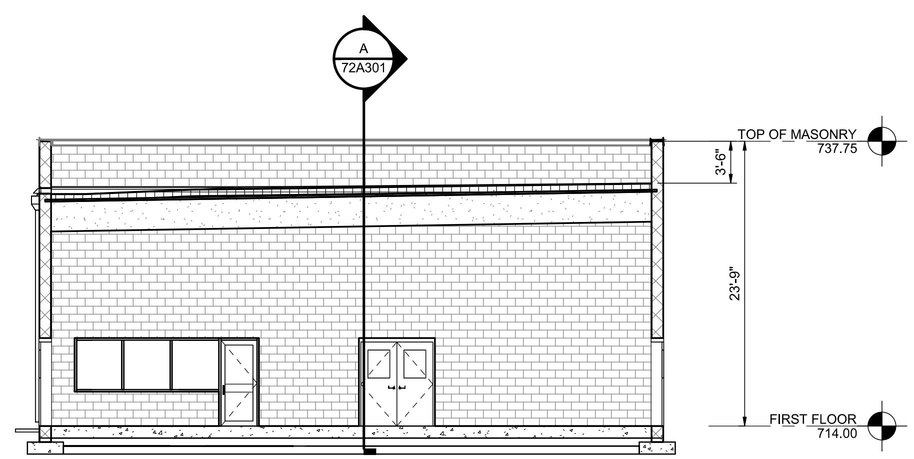


A
72A101
BUILDING SECTION
1/8" = 1'-0"



B
72A101
BUILDING SECTION
1/8" = 1'-0"

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Charlotte, NC 28202
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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	03/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J.REDDRICK
CHECKED BY	H.ELLIOTT
DRAWN BY	J.WILLIAMS
PROJECT NUMBER	10343268

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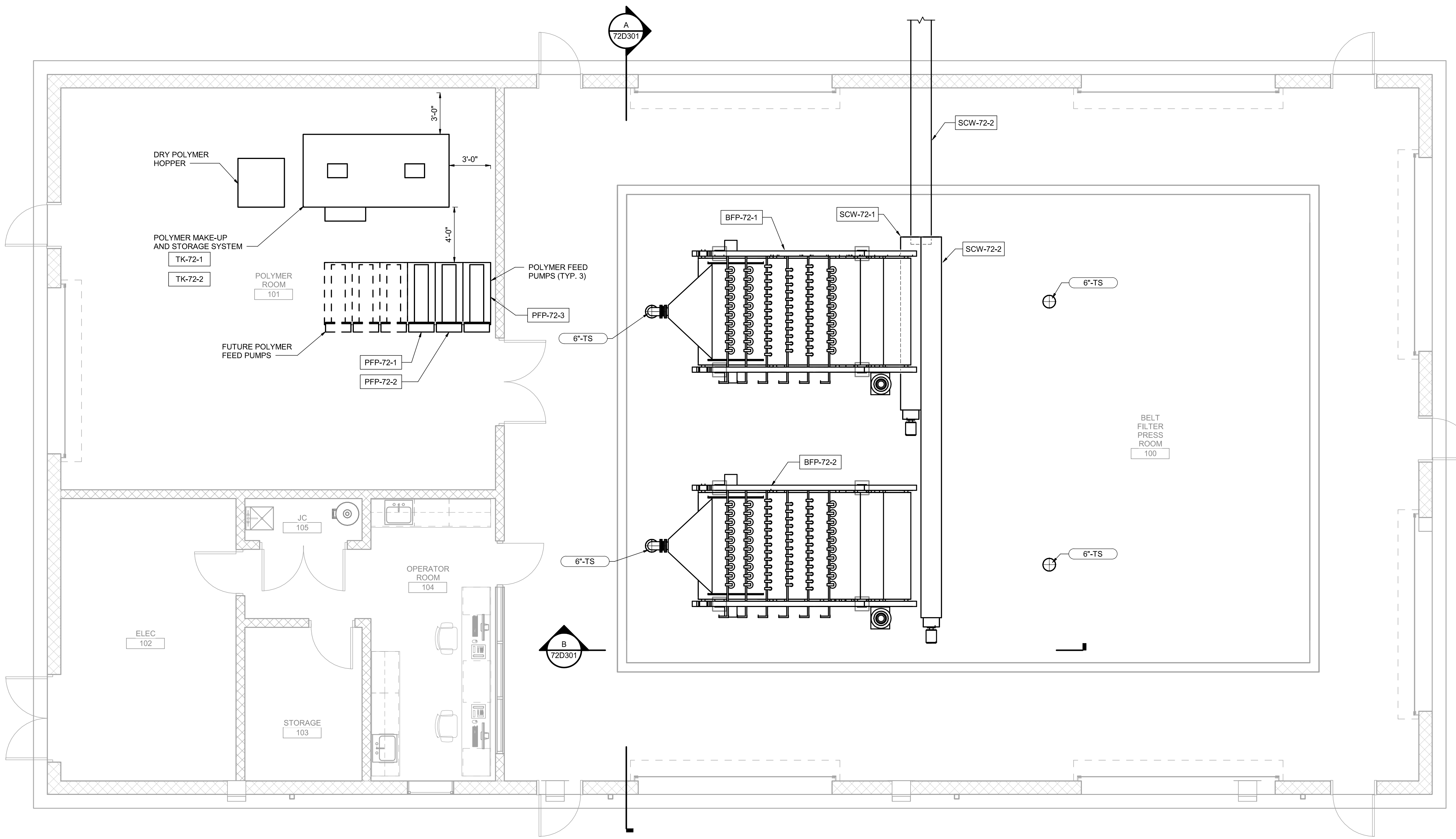
PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

DEWATERING BUILDING
BUILDING SECTIONS

0 1" 2"

FILENAME 10343268-72-A.rvt
SCALE 1/8" = 1'-0"
SHEET 72A301



PLAN
1/4" = 1'-0"

N

GENERAL NOTES:

1. ALL EXISTING ELEVATIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO START OF WORK AND DISCREPANCIES IMMEDIATELY BROUGHT TO ENGINEER'S ATTENTION.
2. PROTECT PIPES FROM CLOGGING THROUGHOUT CONSTRUCTION AND CLEAN GRATES, INLETS, AND PIPES BEFORE TESTING OR PUTTING THEM IN SERVICE TO ENSURE ALL ARE FREE FROM DEBRIS AND BLOCKAGES.
3. REFER TO P&ID DRAWINGS FOR ADDITIONAL INSTALLATION DETAIL ON EQUIPMENT.
4. ANY DAMAGES TO ADJACENT CONCRETE SURFACES SHALL BE REPAIRED TO LIKE NEW CONDITION.
5. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING PLAN

0 1" 2"

FILENAME	10343268-72-D.rvt
SCALE	1/4" = 1'-0"

SHEET
72D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-72-D.rvt
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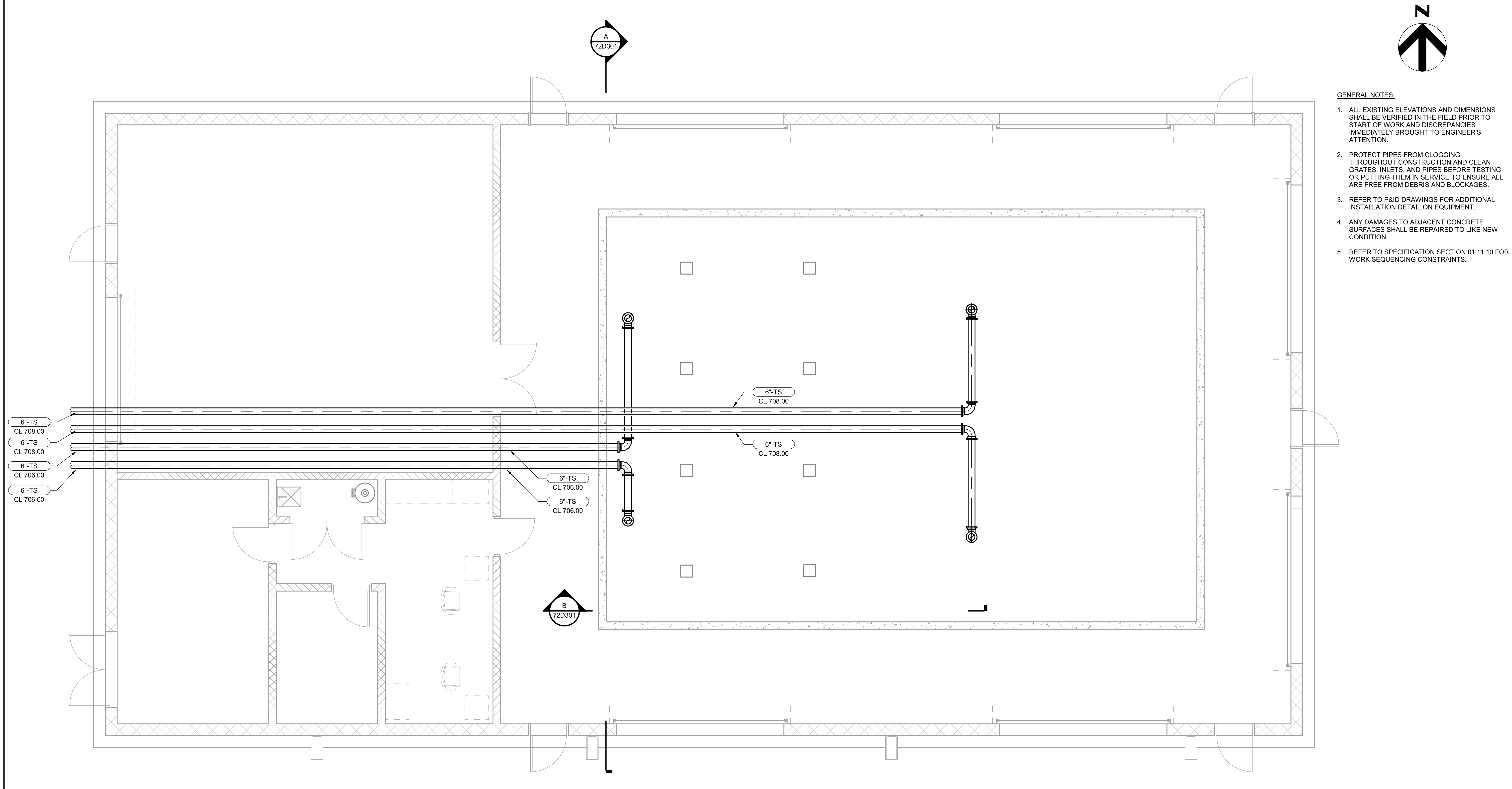

BELOW GRADE PLAN
1/4" = 1'-0"

GENERAL NOTES:

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING BELOW GRADE PLAN

0 1" 2"

FILENAME 10343268-72-D.rvt

SCALE 1/4" = 1'-0"

SHEET **72D102**

GENERAL NOTES:

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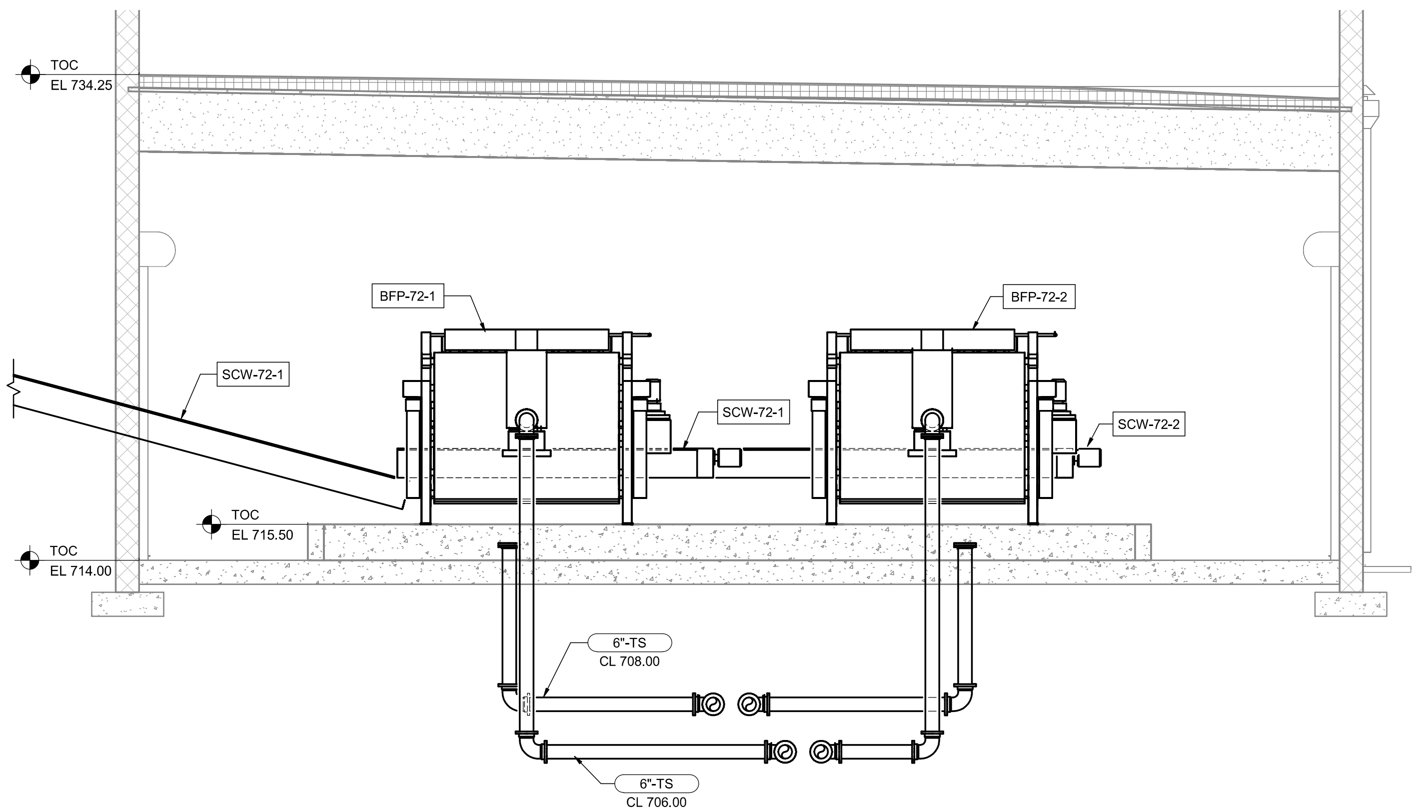
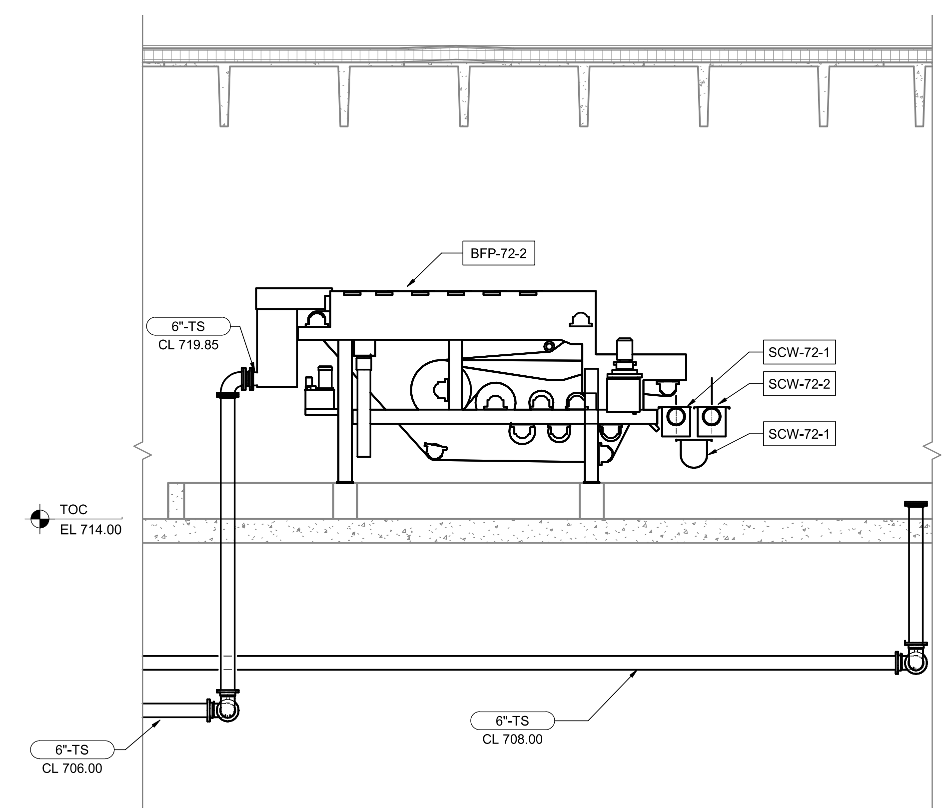


A
72D101
SECTION
1/4" = 1'-0"



B
72D101
SECTION
1/4" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

DEWATERING BUILDING SECTIONS

0 1" 2"

FILENAME 10343268-72-D.rvt

SCALE 1/4" = 1'-0"

SHEET **72D301**

CODE REVIEW ANALYSIS

1.0 INTRODUCTION

THE FOLLOWING CODE REVIEW NARRATIVE IS PROVIDED TO SERVE AS A BASIS OF UNDERSTANDING FOR THE DEVELOPMENT OF THE DESIGN, DRAWINGS AND SPECIFICATIONS FOR THE PLANNED EXPANSION OF THE PIEDMONT TRIAD REGIONAL WATER AUTHORITY (PTRWA) WATER TREATMENT PLANT (WTP) IN RURAL RANDOLPH COUNTY NEAR RANDLEMAN, NORTH CAROLINA. THE FOLLOWING ANALYSIS REVIEWS THE APPLICABLE BUILDING AND LIFE SAFETY CODES.

THE AUTHORITIES HAVING JURISDICTION (AHJ'S) FOR THIS PROJECT INCLUDE THE RANDOLPH COUNTY BUILDING INSPECTIONS DEPARTMENT AND THE NORTH CAROLINA DEPARTMENT OF INSURANCE OFFICE OF THE STATE FIRE MARSHAL.

1.1 DESIGN CODES

BUILDING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: BUILDING CODE (BASED ON 2015 IBC)
EXISTING BUILDING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: EXISTING BUILDING CODE (BASED ON 2015 IEBC)
FIRE CODE	2018 NORTH CAROLINA STATE BUILDING CODE: FIRE PREVENTION CODE (BASED ON 2015 IBC)
PLUMBING CODE	2018 NORTH CAROLINA STATE BUILDING CODE: PLUMBING CODE (BASED ON 2015 IPC)
ENERGY CONSERVATION CODE	2018 NORTH CAROLINA STATE BUILDING CODE: ENERGY CONSERVATION CODE (BASED ON 2015 IECC)
MECHANICAL CODE	2018 NORTH CAROLINA STATE BUILDING CODE: MECHANICAL CODE (BASED ON 2015 IMC)
FUEL GAS CODE	2018 NORTH CAROLINA STATE BUILDING CODE: FUEL GAS CODE (BASED ON 2015 IFGC)
ELECTRICAL CODE	2020 NATIONAL ELECTRICAL CODE (NEC), NFPA 70

CODE DATA TABLE

2.0 PIEDMONT TRIAD REGIONAL WATER AUTHORITY - SLUDGE STORAGE CANOPY BUILDING [73]

2.1 DESCRIPTION

THE FOLLOWING CODE REVIEW NARRATIVE IS PROVIDED TO SERVE AS A BASIS OF UNDERSTANDING FOR THE DEVELOPMENT OF THE DESIGN, DRAWINGS AND SPECIFICATIONS FOR THE SLUDGE STORAGE CANOPY BUILDING TO BE BUILT AS PART OF THE PEDIMONT TRIAD REGIONAL WATER AUTHORITY (WTP) EXPANSION.

2.2 GENERAL BUILDING DATA SUMMARY

OCCUPANCY CLASSIFICATION(S)	GROUP F-1 OCCUPANCY
BUILDING AREA	7,000 SF
FIRE AREA	7,000 SF
HEIGHT	23'-0" (1 STORY ABOVE GRADE)
TYPE OF CONSTRUCTION	II-B (NON-COMBUSTIBLE)
FIRE SEPARATION DISTANCE	10' ≤ X < 30'
FIRE PROTECTION SYSTEMS	FIRE EXTINGUISHERS FIRE HYDRANT
OCCUPANT LOAD (TOTAL)	24 (SEE 2.10 FOR CALCULATION)

2.3 USE & OCCUPANCY CLASSIFICATION:		NCSBC	NCSFC
OCCUPANCY GROUP(S):	GROUP F-1 MODERATE-HAZARD FACTORY INDUSTRIAL	§306	-
ACCESS. OCCUPANCY (<10%)	N/A	§508.2	-
HAZARDOUS MATERIALS	N/A	§307	-
CLASSIFICATION OF HAZARDS	N/A	§307	

2.4 SPECIAL REQUIREMENTS:		NCSBC	NCSFC
AREAS WITH HAZARDOUS MATERIALS	N/A	§414	-
EMERGENCY EYE WASH / EMERGENCY SHOWER (EEW/ES) STATIONS	N/A	[29 CODE OF FEDERAL REGULATIONS, OSHA 1910.151]	-

2.5 BUILDING HEIGHTS & AREAS:		NCSBC	NCSFC
ACTUAL HEIGHT & AREA	23'-0" AND ONE STORY TOTAL AREA OF 7,000 SF	-	-
FIRE AREA	7,000 SF	-	-
ALLOWABLE AREA/STORY;	GROUP F-1: 15,500 SF	TABLE 506.2	-
ALLOWABLE HEIGHT	55'-0" AND TWO STORIES	TABLE 504.3, TABLE 504.4	-
MEZZANINE AREA (%)	N/A	§505	-
EQUIPMENT PLATFORM AREA (%)	N/A	§505	-
FRONTAGE INCREASE	N/A	§506.3	-
UNLIMITED AREA BUILDINGS	N/A	§507	-
MIXED-USE & OCCUPANCY	N/A	§508	-
INCIDENTAL USES	N/A	§509	-
SPECIAL PROVISIONS	N/A	§510	-

2.6 TYPES OF CONSTRUCTION:		NCSBC	NCSFC
CONSTRUCTION TYPE	II-B	§602	-
GENERAL BUILDING FIRE-RESISTANCE RATINGS (PRIMARY STRUCTURAL FRAME, BEARING AND NONBEARING WALLS AND PARTITIONS, FLOOR, ROOF)	0-HR	TABLE 601	-
FIRE SEPARATION DISTANCE (FSD)	GROUP F: 10' ≤ X < 30'	TABLE 602	-
FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED UPON FSD	0-HR	TABLE 602	-

2.7 FIRE & SMOKE PROTECTION:		NCSBC	NCSFC
SHAFT ENCLOSURES FIRE-RESISTANCE RATINGS	N/A	§707.3.1 & §713.4	-
VERTICAL EXIT ENCLOSURE FIRE-RESISTANCE RATINGS	N/A	§707.3.2 & §1023.2	-
OPENING PROTECTIVES	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§716	-
DUCT AND AIR TRANSFER OPENINGS	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§717	-
EXTERIOR WALLS	NO LIMIT	TABLE 705.8	-
CORRIDORS	N/A (NO FIRE-RATED BARRIERS, PARTITIONS, ASSEMBLIES, ETC.)	§1020	-

2.8 INTERIOR FINISHES:		NCSBC	NCSFC
CEILING & WALL (EXIT ENCLOSURES)	NON-SPRINKLERED F-1: CLASS A OR B	TABLE 803.13	-
CEILING & WALL (CORRIDORS)	NON-SPRINKLERED F-1: CLASS A, B OR C		
CEILING & WALL (ROOMS AND ENCL. SPACES)	NON-SPRINKLERED F-1: CLASS A, B OR C		
FLOOR	CLASS I OR II MATERIALS COMPLYING WITH DOC FF-1 "PILL TEST" (CPSC 16 CFR PART 1630) OR WITH ASTM D2859	§804.4	

2.9 FIRE PROTECTION SYSTEMS:		NCSBC	NCSFC
AUTOMATIC SPRINKLER SYSTEM	NOT REQUIRED	§903	§903
PORTABLE FIRE EXTINGUISHERS	REQUIRED; PROVIDED THROUGHOUT	-	§906
FIRE ALARM AND DETECTION	NOT REQUIRED	§907.2.4	§907.2.4
FIRE-FLOW REQUIREMENT	1,750 GPM (@20 PSI) FOR 2 HOURS	-	§B105, TABLE B105.1(2)
MINIMUM NUMBER OF HYDRANTS	1 HYDRANT (SEE SITE CIVIL PLANS FOR LOCATIONS)	-	TABLE C102.1

2.10 MEANS OF EGRESS:		NCSBC	NCSFC
ACCESSORY STORAGE AREAS, MECHANICAL EQUIPMENT ROOMS, BUSINESS AREAS	24 OCCUPANTS	§1004	-
EQUIPMENT SPACES (WTP)	7,000 SF @ 1:300 SF (GROSS) = 24		
EGRESS CAPACITY PER OCCUPANT LOAD	0.3 (STAIRS) & 0.2 (OTHER)	§1005.3	-
EXIT ACCESS - COMMON PATH	NON-SPRINKLERED GROUP F: 75 FT	TABLE 1006.2.1	-
EXIT ACCESS - TRAVEL DISTANCE	NON-SPRINKLERED GROUP F-1: 200 FT	TABLE 1017.2	-
MIN. EXIT DOORS	2; SEE LIFE SAFETY PLANS FOR EXITING	§1006	-
ACCESSIBLE MEANS OF EGRESS	NOT REQUIRED FOR GROUP F-1	§1009	-
EXIT DISCHARGE; ACCESS TO PUBLIC WAY	PUBLIC WAY	§1028.5	-

2.11 ACCESSIBILITY:		NCSBC	NCSFC
SCOPING REQUIREMENTS	EQUIPMENT SPACES ARE EXEMPT	§1103.2.9 [2010 ADA §203.5]	-

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	M. SHUMPERT
CHECKED BY	B. COOPER
DRAWN BY	T. FREEMAN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE STORAGE CODE ANALYSIS

0 1" 2"

FILENAME 10343268-73-A.rvt

SCALE NONE

SHEET 73G001

1 2 3 4 5 6 7 8

D C B A

N

LIFE SAFETY NOTES:

1. FOR EXIT LIGHTS AND EMERGENCY LIGHTING, SEE ELECTRICAL LIGHTING DRAWINGS (E SERIES).

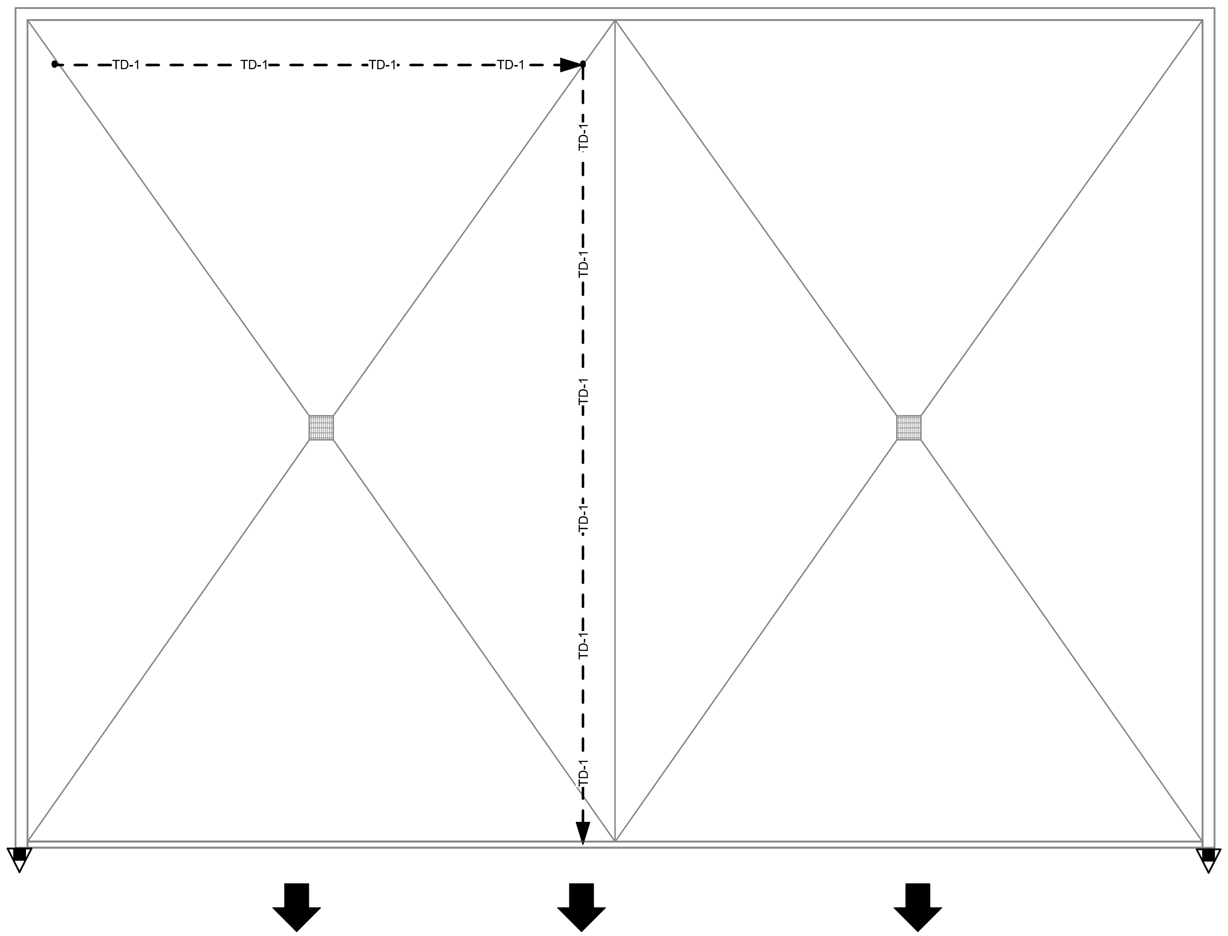
LINE TYPES FOR MEANS OF EGRESS:

COMPONENT	SYMBOL
TRAVEL DISTANCE	TD
COMMON PATH	CP

EXIT DISCHARGE

EXIT DISCHARGE ARROW

MEANS OF EGRESS ARRANGEMENT DISTANCE SCHEDULE - BUILDING SUMMARY		
	EGRESS DISTANCE	
EGRESS PATH ID	PROVIDED	MAXIMUM PERMITTED
TD-1	109' - 0"	300' - 0"



NOTE: ONLY THE SOUTH SIDE IS OPEN AT GRADE

LIFE SAFETY PLAN
1/8" = 1'-0"

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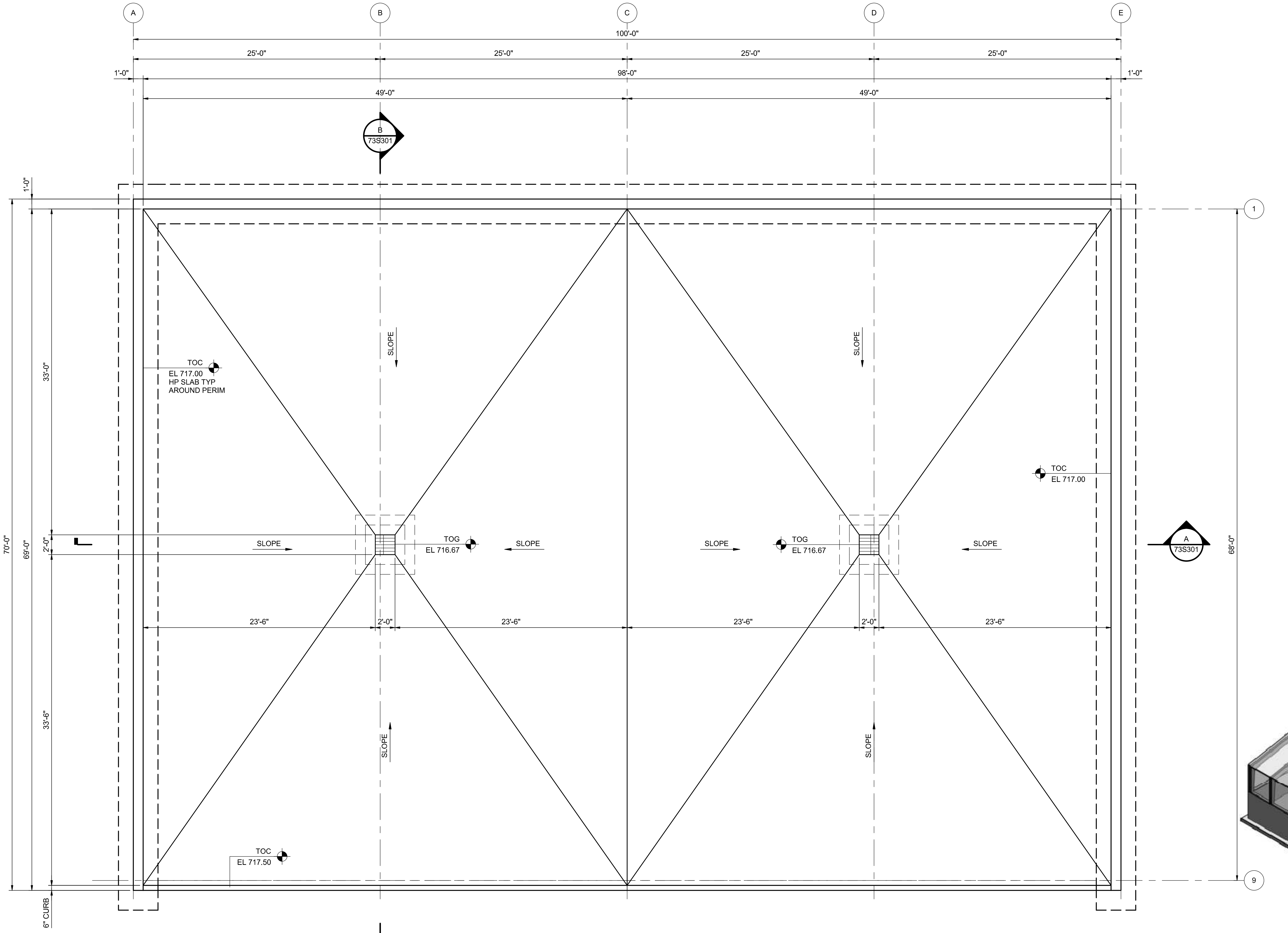
SLUDGE STORAGE LIFE SAFETY PLAN

0 1" 2"

FILENAME 10343268-73-A.rvt

SCALE 1/8" = 1'-0"

SHEET 73G101



FOUNDATION PLAN

3/16" = 1'-0"

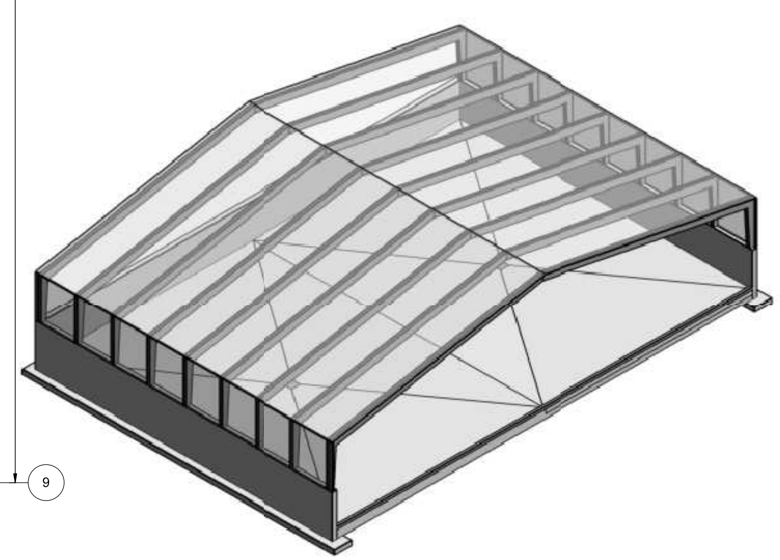


IMAGE OF SLUDGE STORAGE FACILITY

GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES, SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.

KEY NOTES: #

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DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

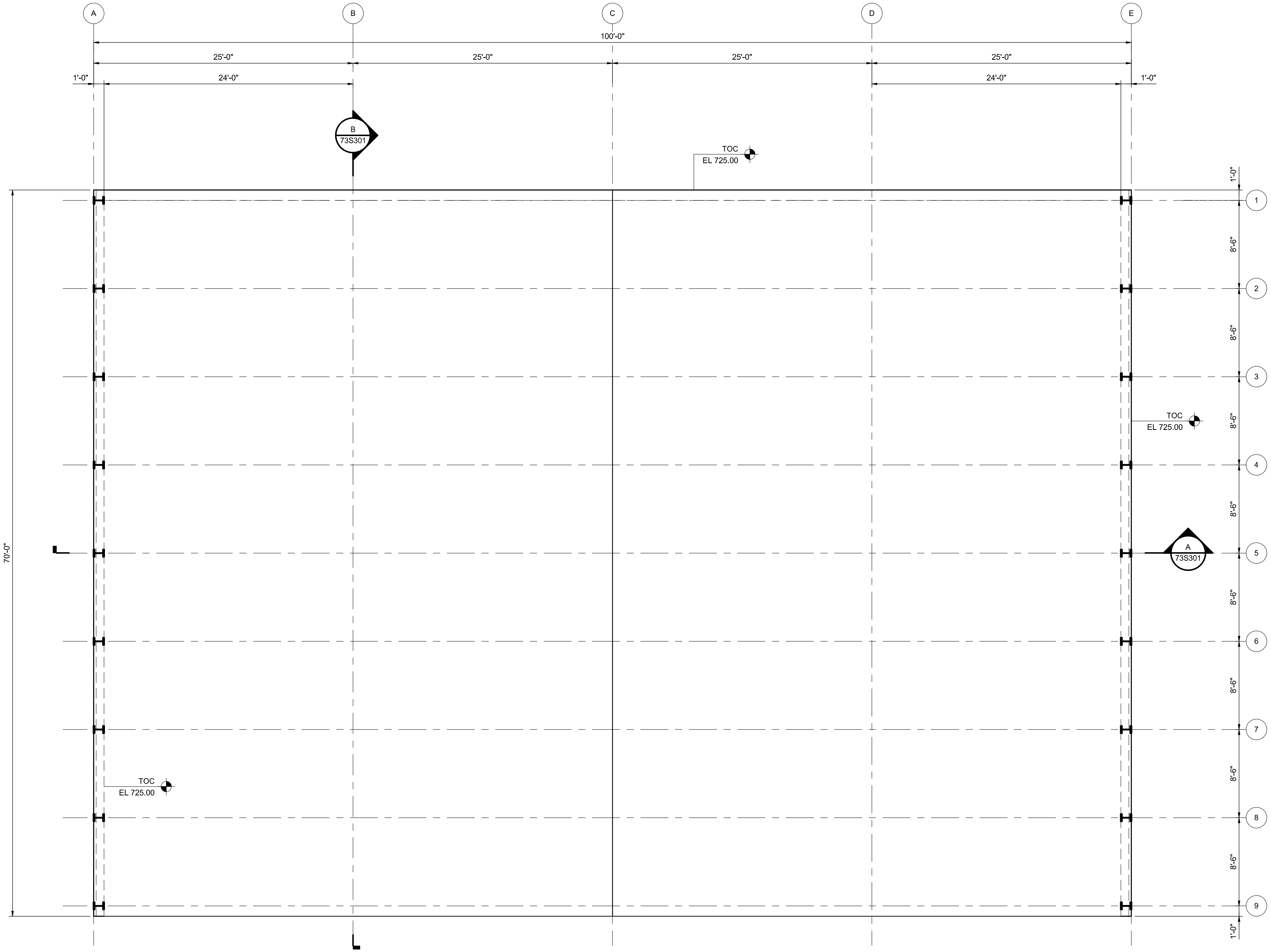
SLUDGE STORAGE FOUNDATION PLAN

0 1" 2"

FILENAME 10343268-73-S.rvt

SCALE 3/16" = 1'-0"

SHEET 73S101



FRAMING PLAN

3/16" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

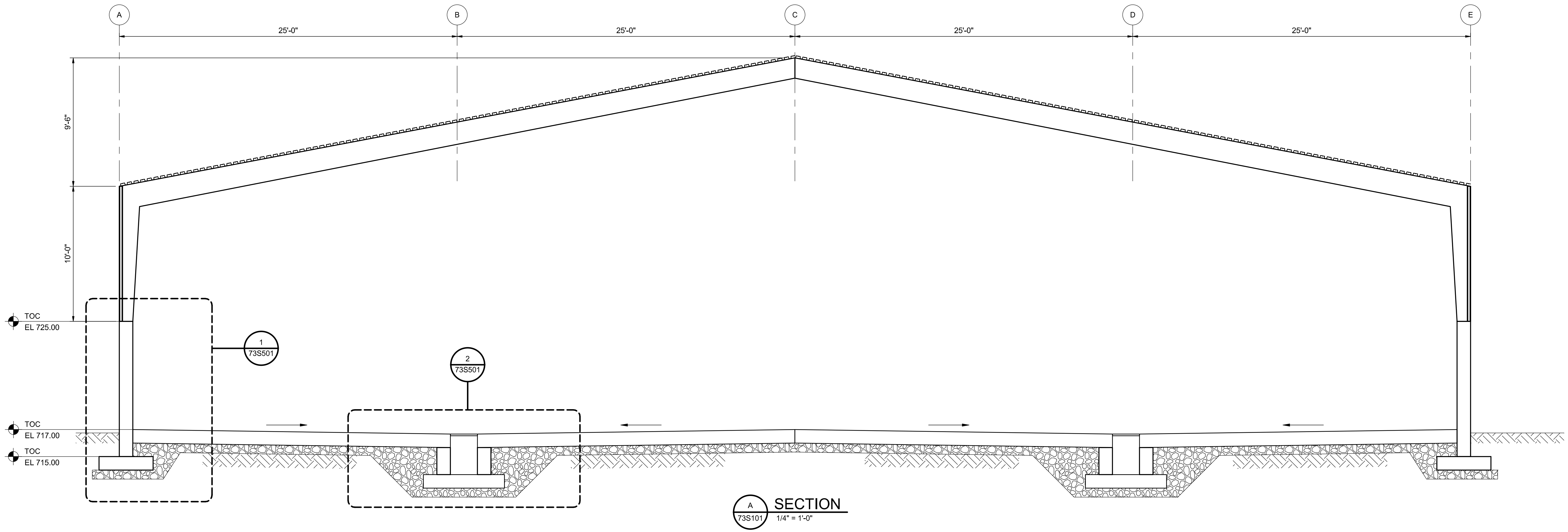
SLUDGE STORAGE FRAMING PLAN

0 1" 2"

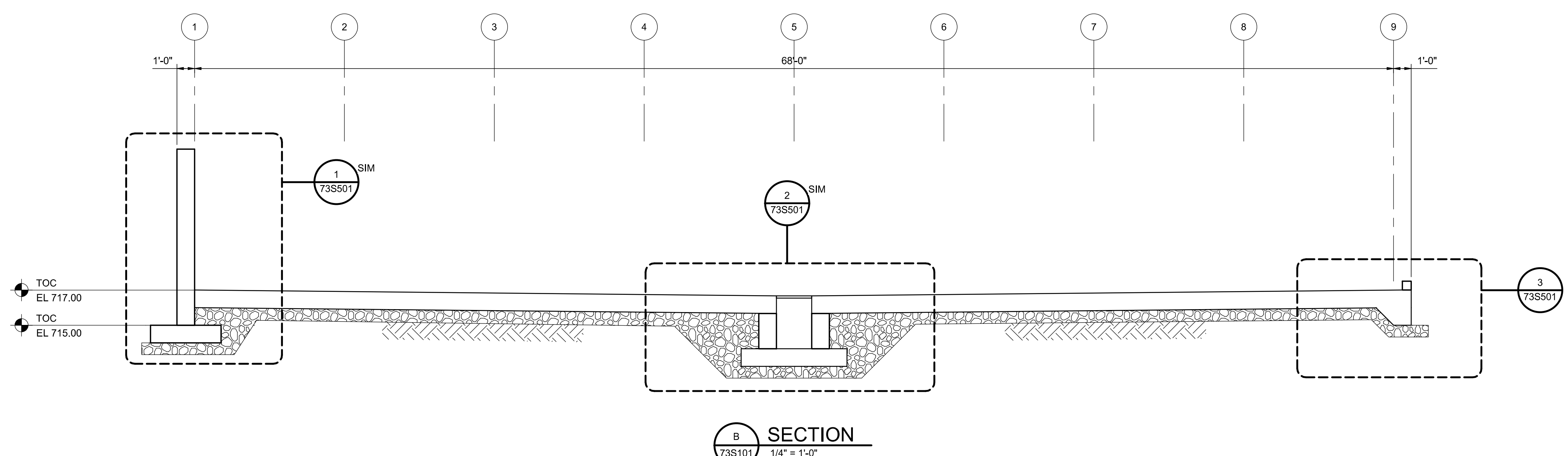
FILENAME 10343268-73-S.rvt

SCALE 3/16" = 1'-0"

SHEET 73S102



A 73S101 SECTION
1/4" = 1'-0"



B 73S101 SECTION
1/4" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE STORAGE SECTIONS

0 1" 2"

FILENAME	10343268-73-S.rvt
SCALE	1/4" = 1'-0"
SHEET	73S301

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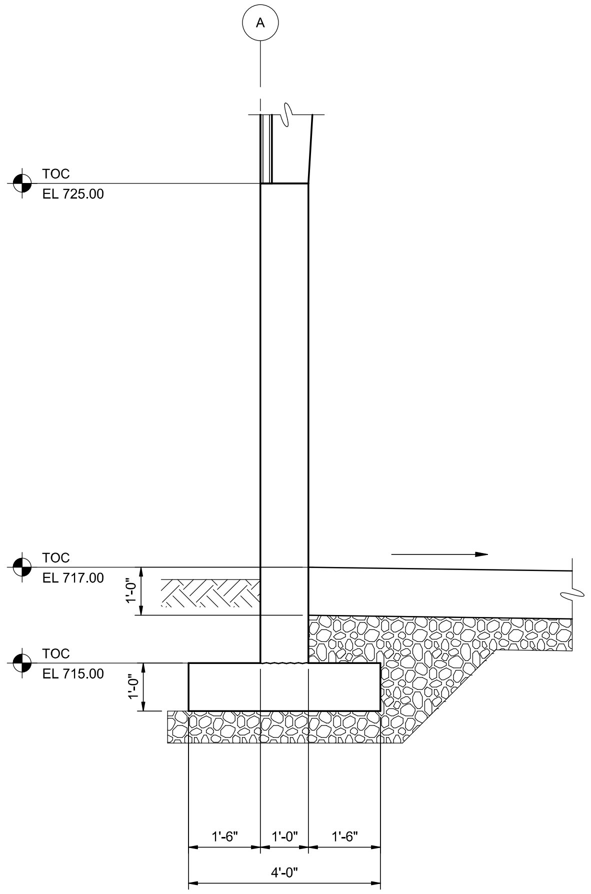
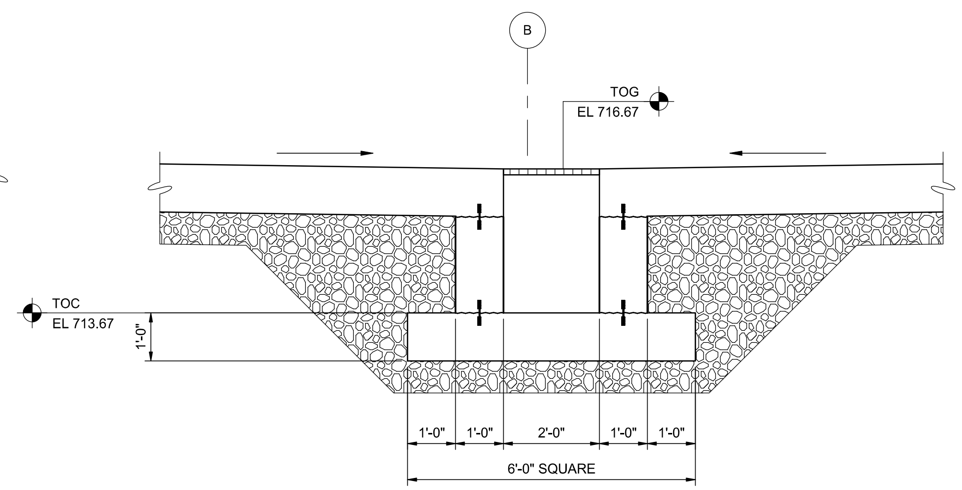
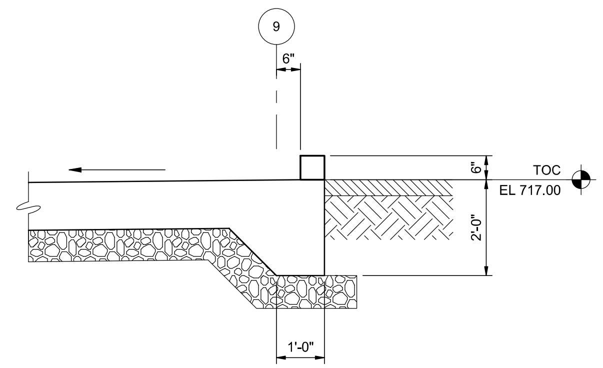


1 DETAIL
73S301 1/2" = 1'-0"



2 DETAIL
73S301 1/2" = 1'-0"



3 DETAIL
73S301 1/2" = 1'-0"

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE STORAGE DETAILS

0 1" 2"

FILENAME	10343268-73-S.rvt
SCALE	1/2" = 1'-0"

SHEET
73S501

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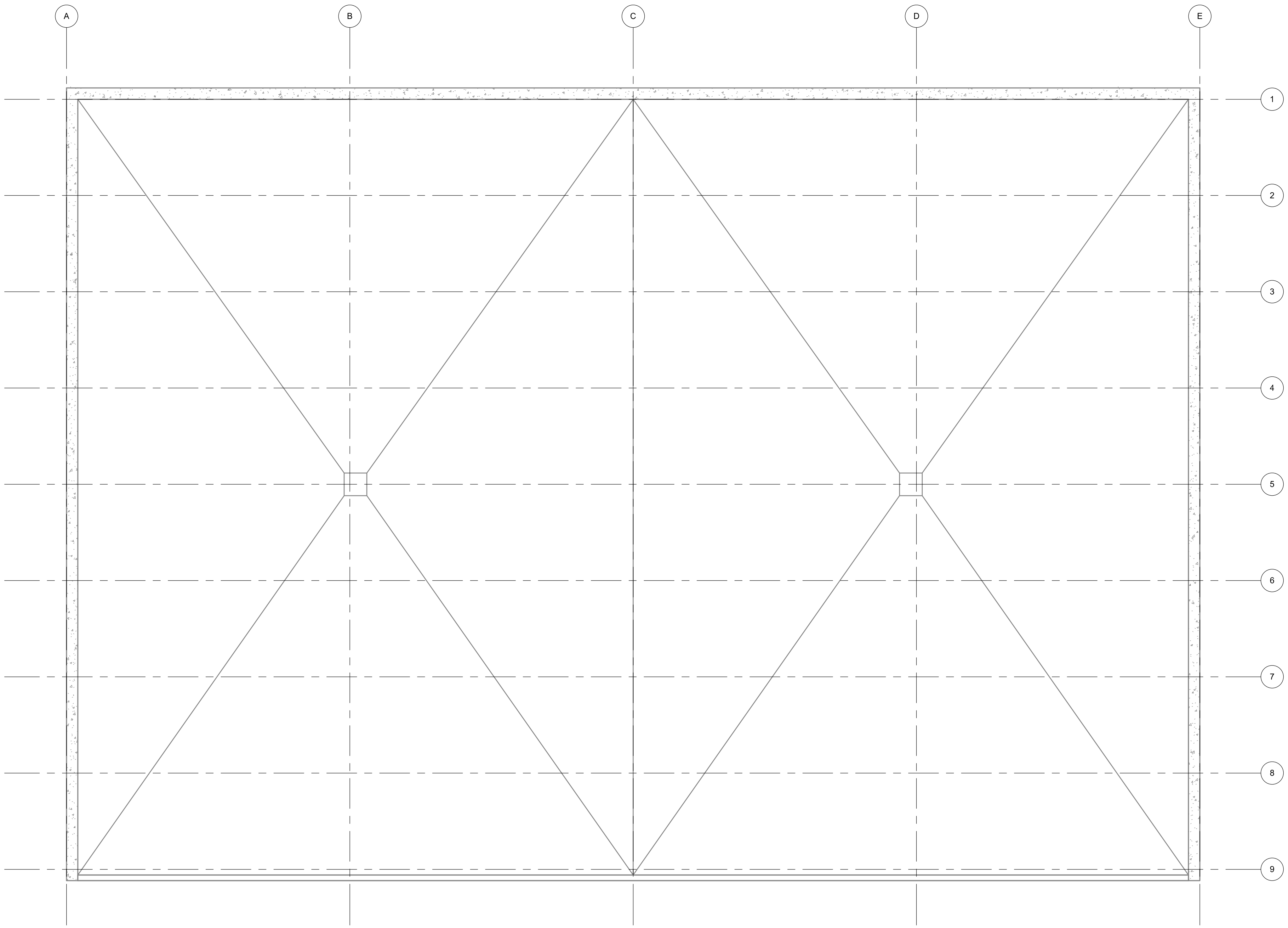

PLAN
3/16" = 1'-0"

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SLUDGE STORAGE PLAN

0 1" 2"

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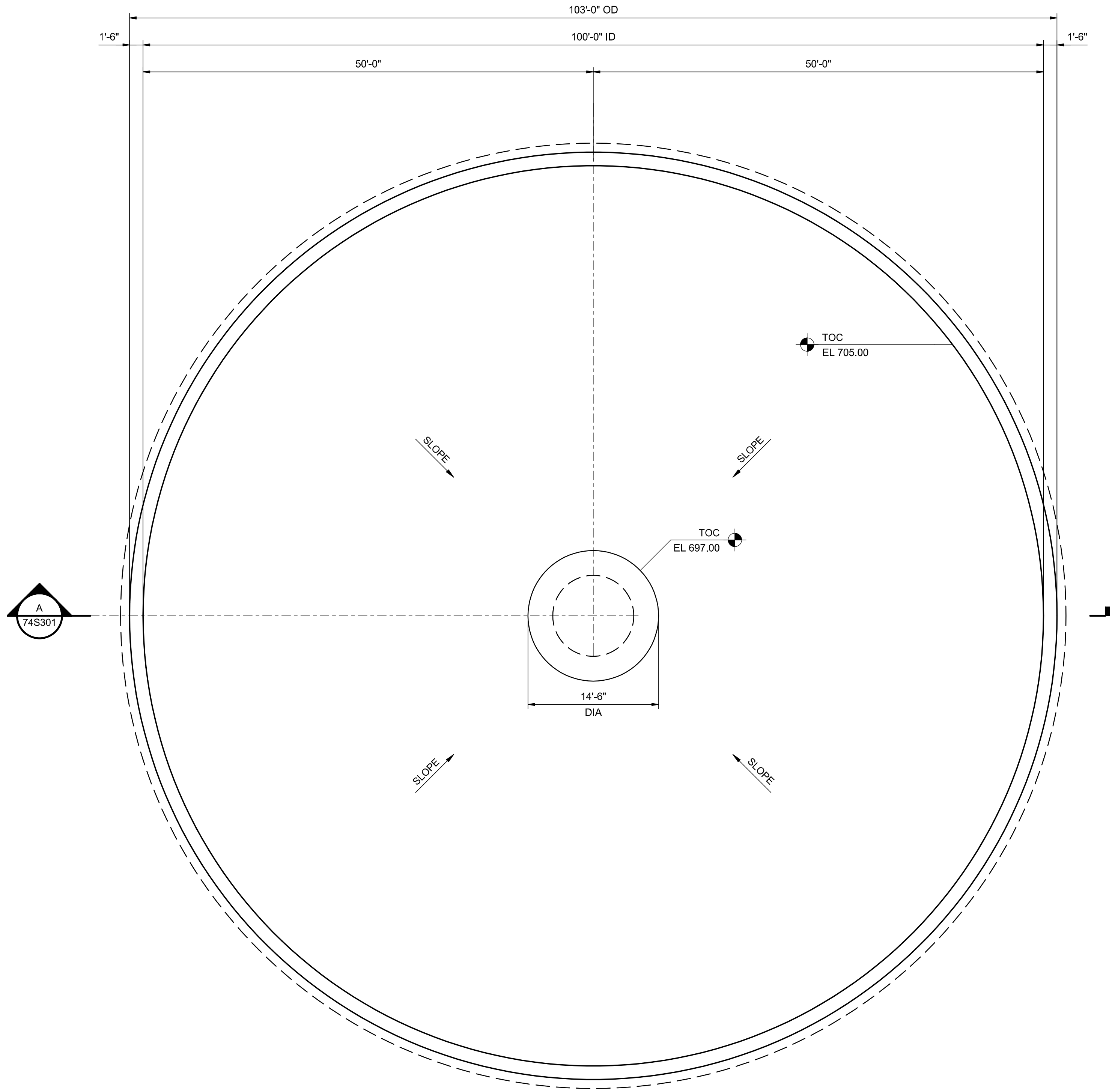
SCALE	3/16" = 1'-0"
SHEET	73D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-73-D.rvt
9/12/2023 6:47:20 PM

GENERAL NOTES:

1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES, SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.

KEY NOTES: #



FOUNDATION PLAN

1/8" = 1'-0"

IMAGE OF SLUDGE THICKENER

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555 Fayetteville Street, Suite 900
Raleigh, NC 27601
919.232.6600
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	J. LAVOIE
CHECKED BY	
DRAWN BY	W. MALACHIN
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

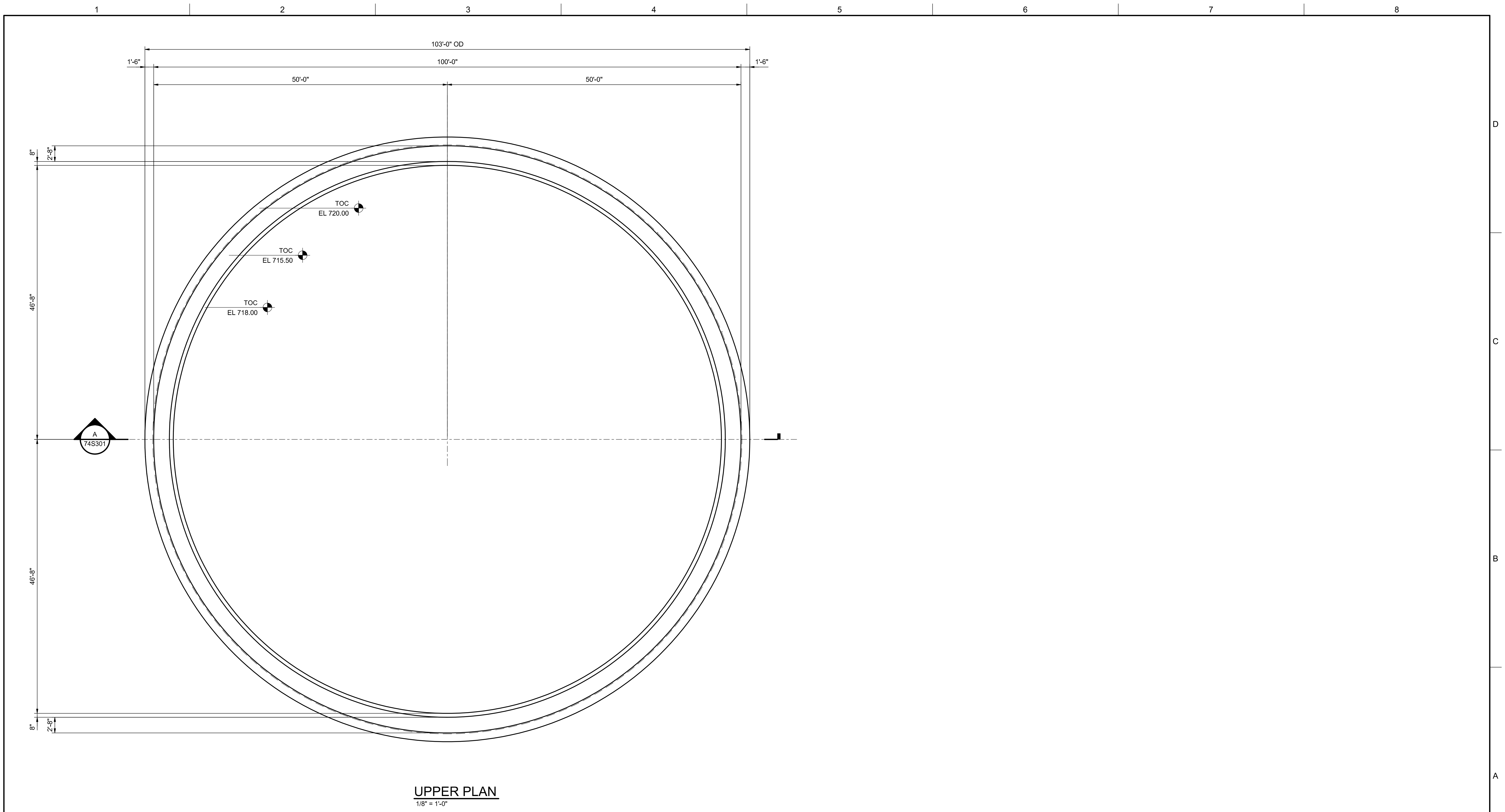
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE THICKENER FOUNDATION PLAN

0 1" 2"

FILENAME	10343268-74-S.rvt
SCALE	1/8" = 1'-0"
SHEET	74S101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-74-S.rvt
9/8/2023 11:22:34 AM



UPPER PLAN
1/8" = 1'-0"

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	Designer
CHECKED BY	Checker
DRAWN BY	Author
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE THICKENER UPPER PLAN

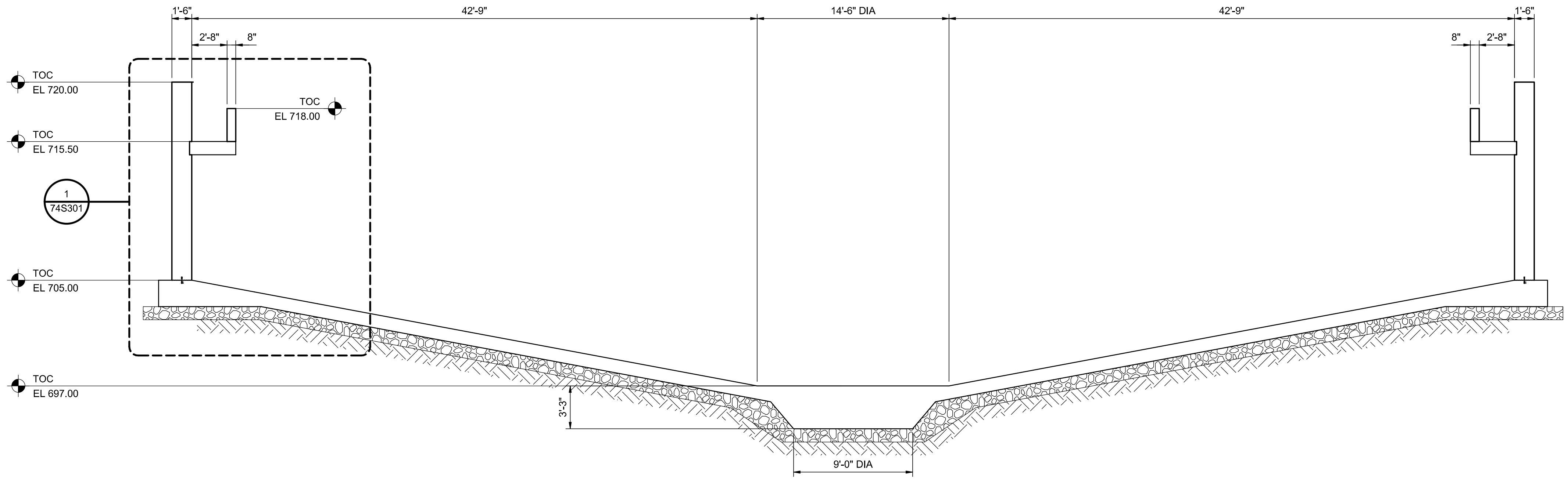
0 1" 2"

FILENAME	10343268-74-S.rvt
SCALE	1/8" = 1'-0"

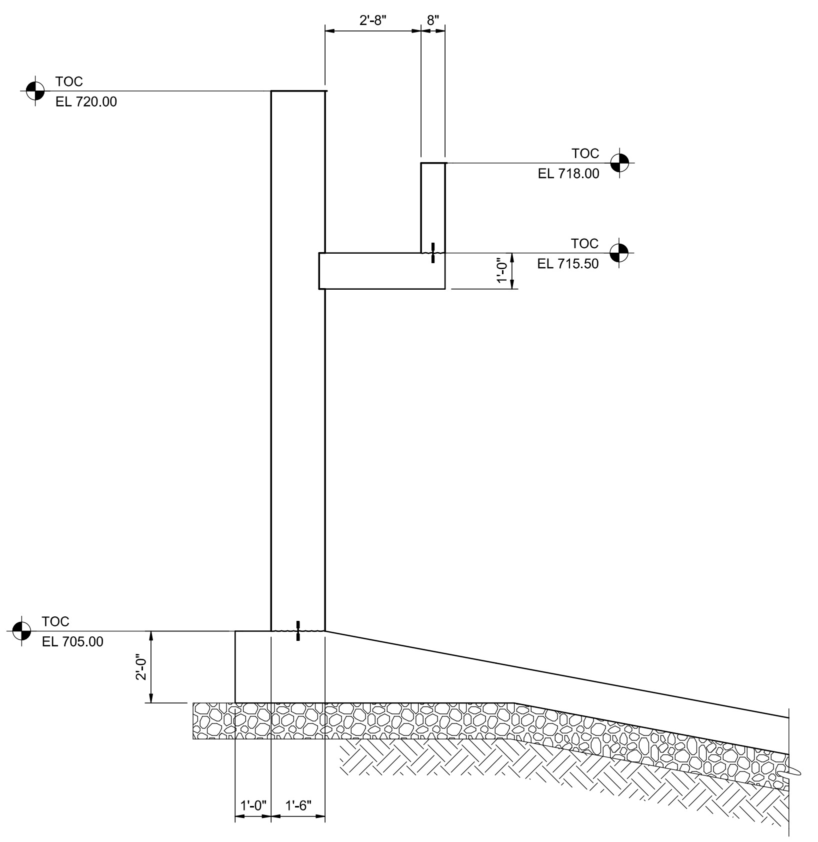
SHEET
74S102

1 2 3 4 5 6 7 8

D C B A



A
74S101
SECTION
3/16" = 1'-0"



1
74S301
DETAIL
3/8" = 1'-0"

HDR

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CHECKED BY	Checker
DRAWN BY	Author
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

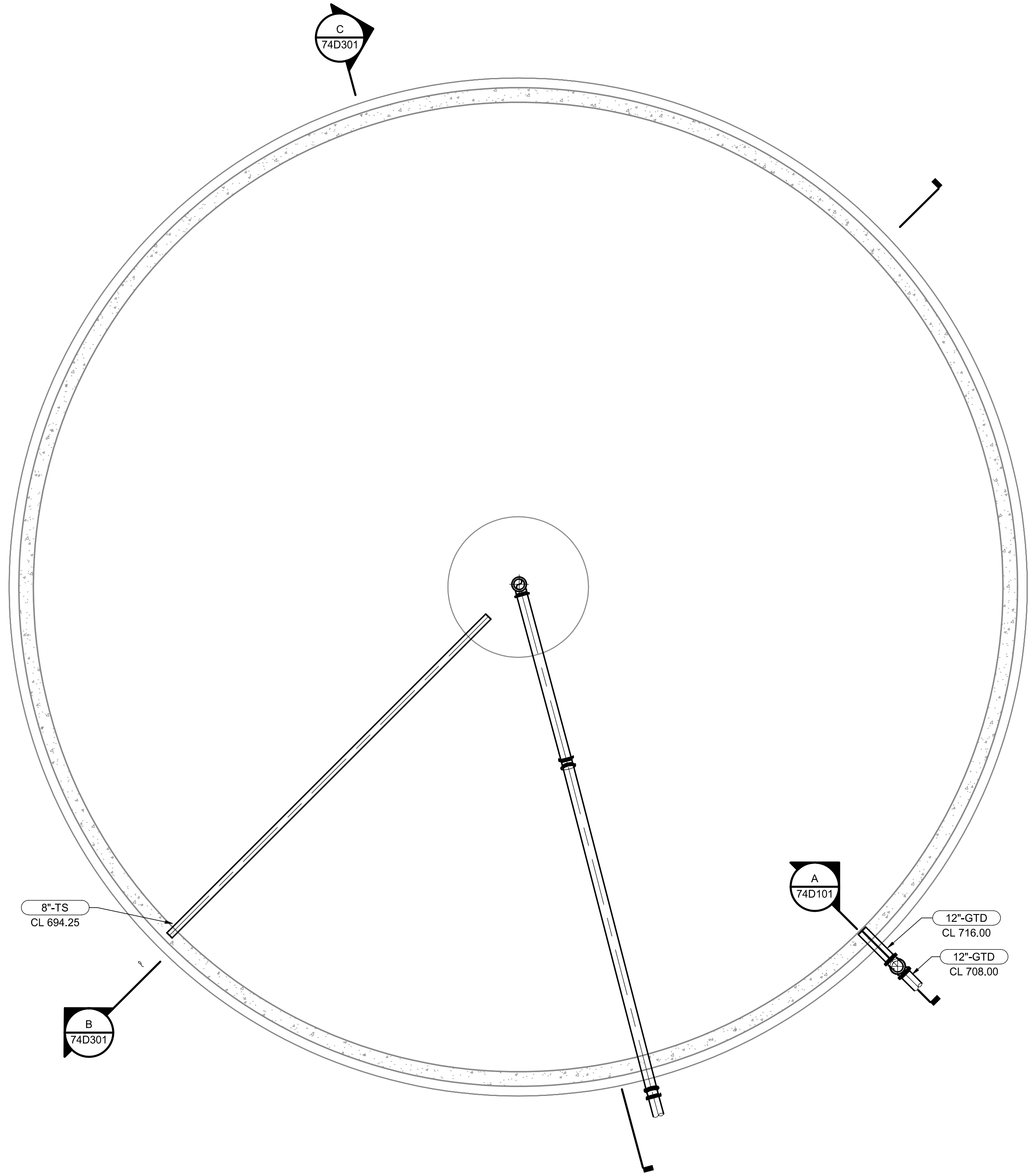
SLUDGE THICKENER SECTIONS

0 1" 2"

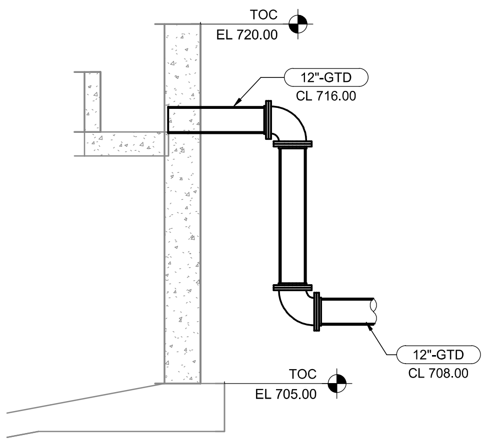
FILENAME	10343268-74-S.rvt
SCALE	As indicated

SHEET
74S301

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-74-S.rvt
9/8/2023 11:22:34 AM



SLUDGE THICKENER UPPER PLAN
1/8" = 1'-0"



A
SECTION
NOT TO SCALE

GENERAL NOTES:

1. ALL EXISTING ELEVATIONS AND DIMENSIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO START OF WORK AND DISCREPANCIES IMMEDIATELY BROUGHT TO ENGINEER'S ATTENTION.
2. PROTECT PIPES FROM CLOGGING THROUGHOUT CONSTRUCTION AND CLEAN GRATES, INLETS, AND PIPES BEFORE TESTING OR PUTTING THEM IN SERVICE TO ENSURE ALL ARE FREE FROM DEBRIS AND BLOCKAGES.
3. REFER TO P&ID DRAWINGS FOR ADDITIONAL INSTALLATION DETAIL ON EQUIPMENT.
4. ANY DAMAGES TO ADJACENT CONCRETE SURFACES SHALL BE REPAIRED TO LIKE NEW CONDITION.
5. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

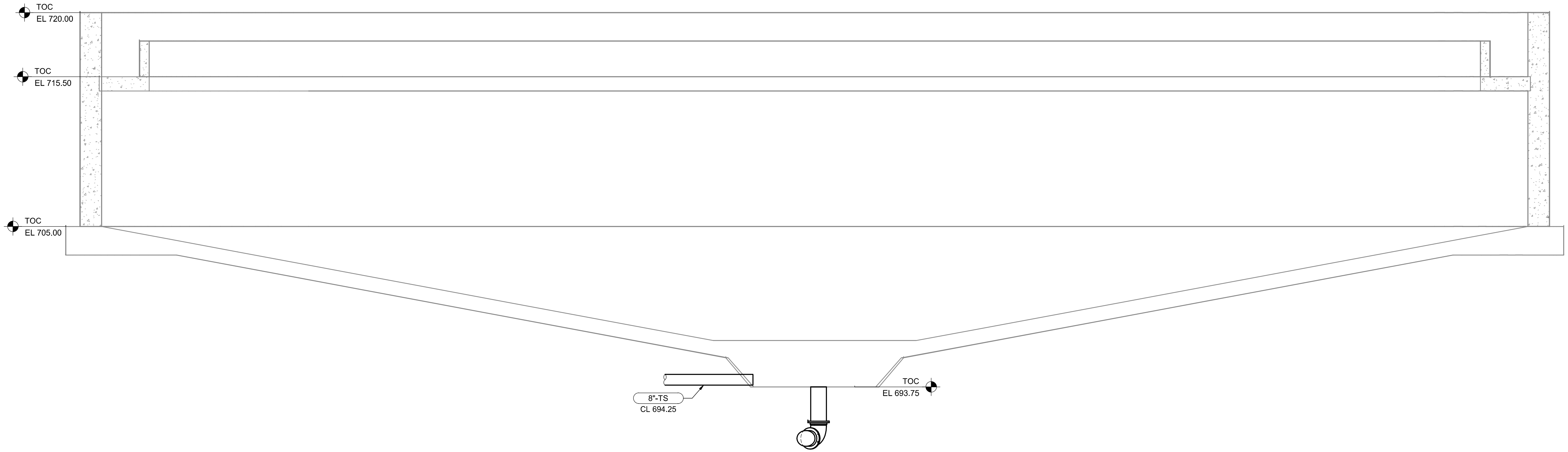
SLUDGE THICKENER
SLUDGE THICKENER UPPER PLAN

0 1" 2"

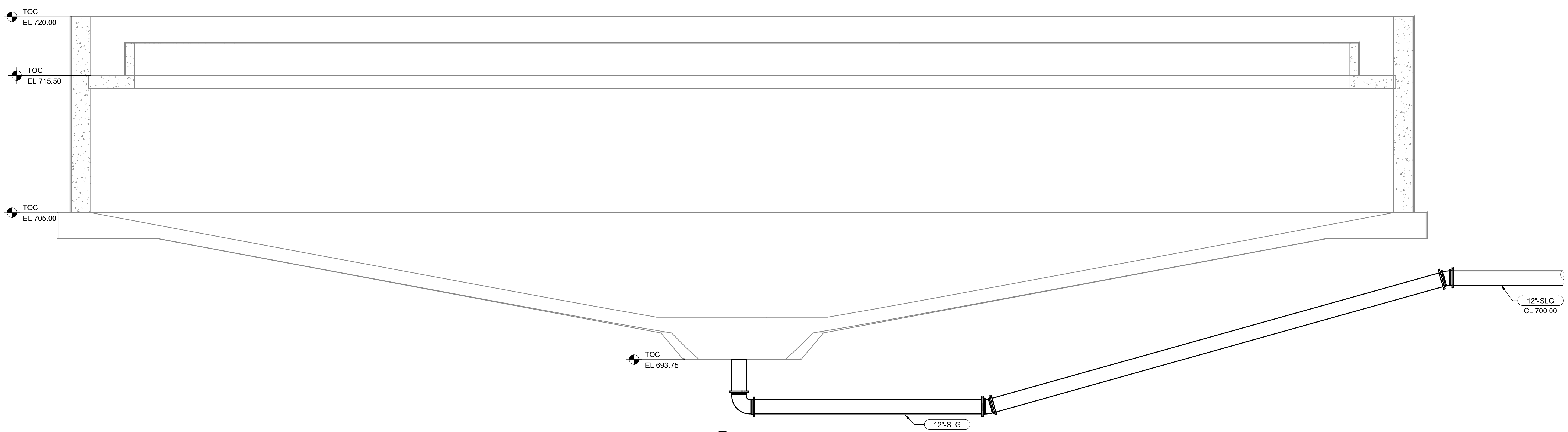
FILENAME	10343268-74-D.rvt
SCALE	AS NOTED
SHEET	74D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-74-D.rvt
9/12/2023 6:49:22 PM

1 2 3 4 5 6 7 8



B
74D101
SECTION
1/4" = 1'-0"



C
74D101
SECTION
1/4" = 1'-0"

GENERAL NOTES:

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D C B A

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DRAWN BY	R. ADAMS
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PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE THICKENER SECTIONS

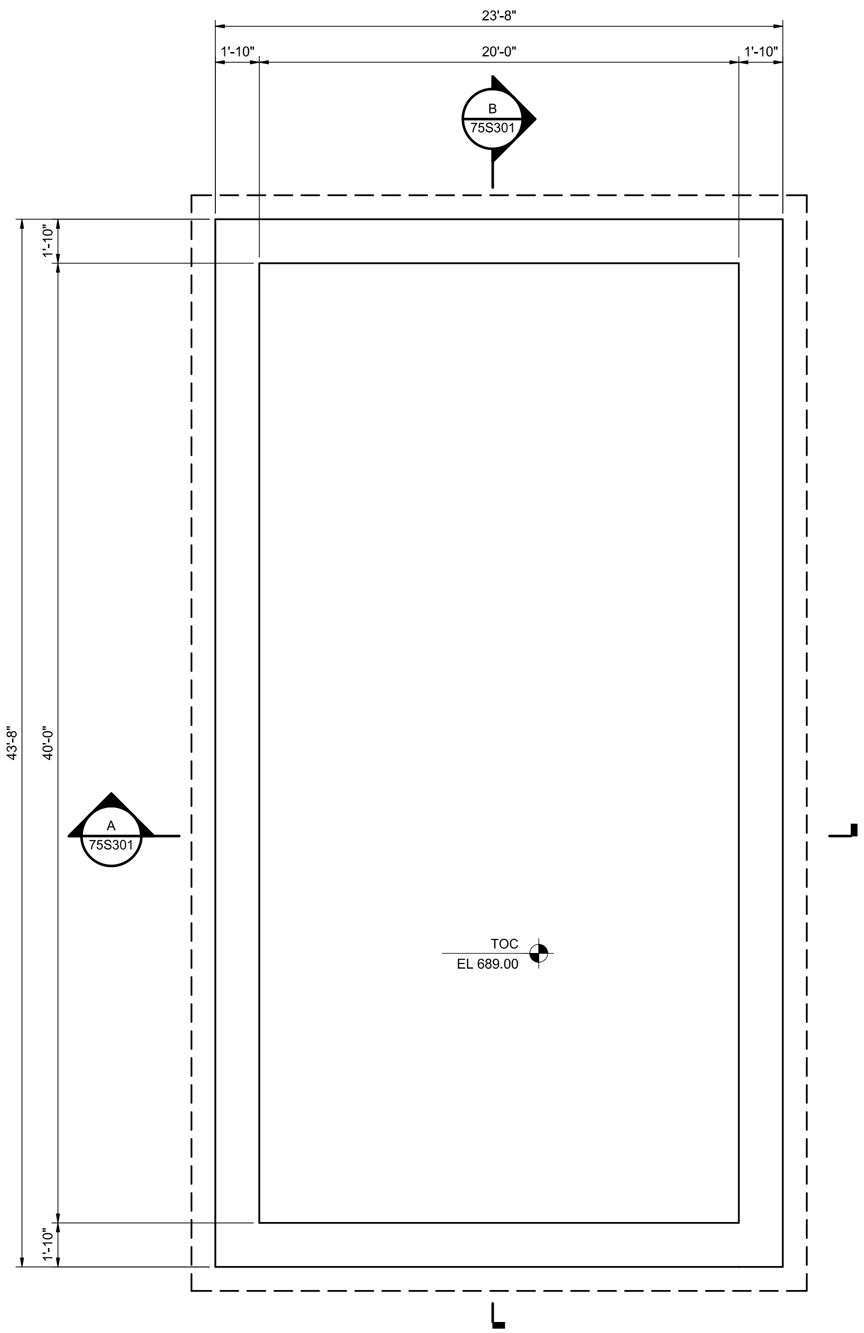
0 1" 2"

FILENAME	10343268-74-D.rvt
SCALE	1/4" = 1'-0"
SHEET	74D301

GENERAL NOTES:

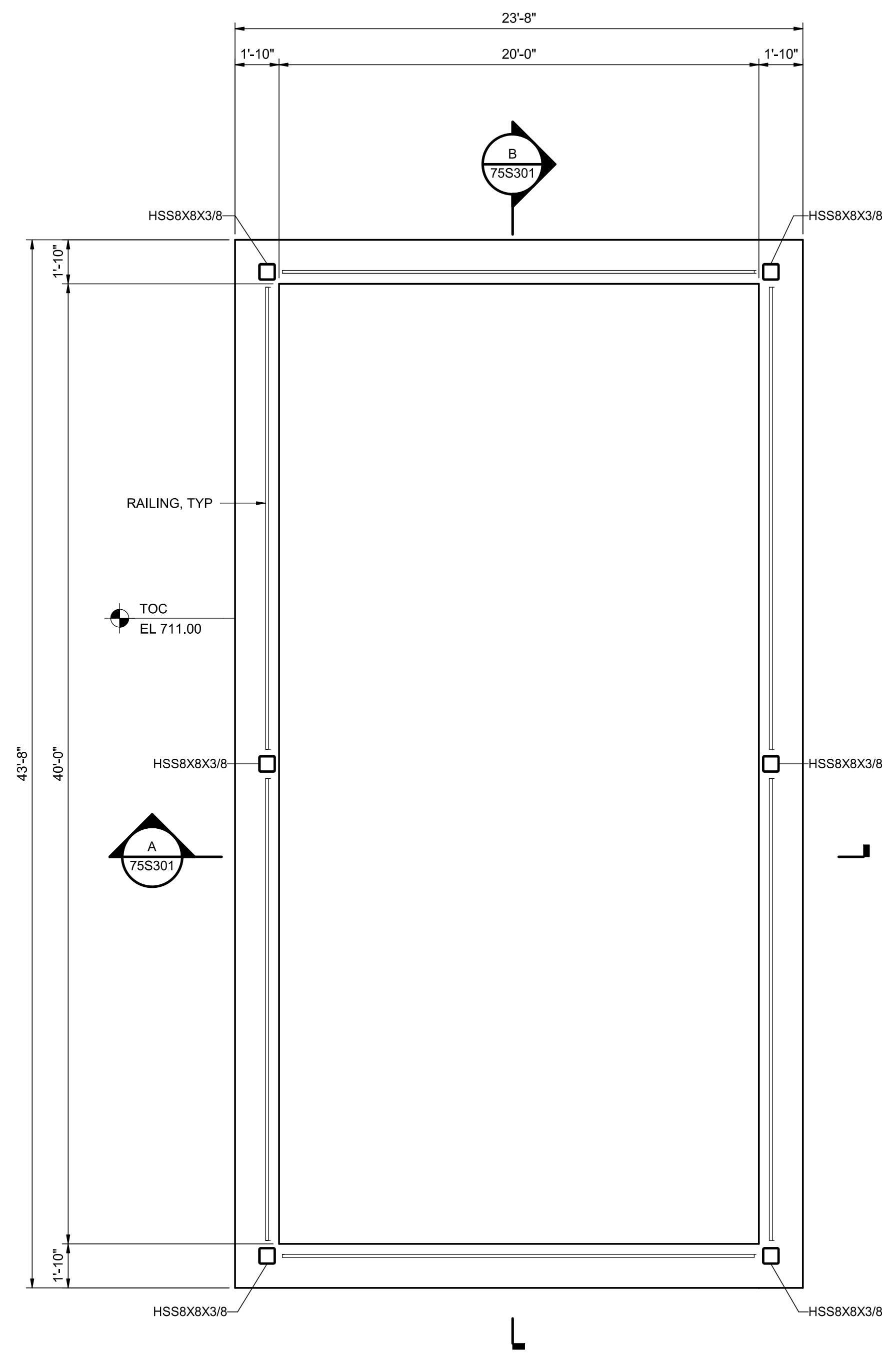
1. SEE SHEET XXX FOR STRUCTURAL GENERAL NOTES. SEE XXX SERIES SHEETS FOR STRUCTURAL STANDARD DETAILS.

KEY NOTES: #



FOUNDATION PLAN

1/4" = 1'-0"



UPPER PLAN

1/4" = 1'-0"

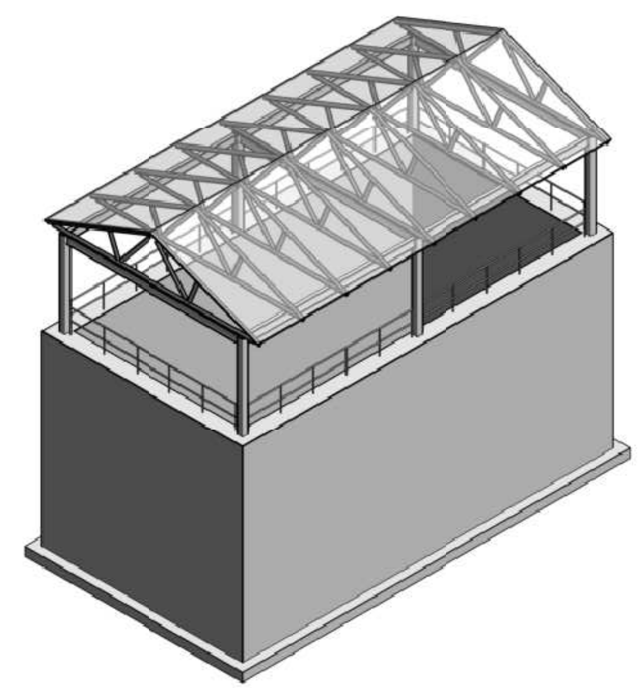


IMAGE OF STRUCTURE

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WATER AUTHORITY
WTP EXPANSION

THICKENED SLUDGE PUMP STATION
FOUNDATION AND UPPER PLANS

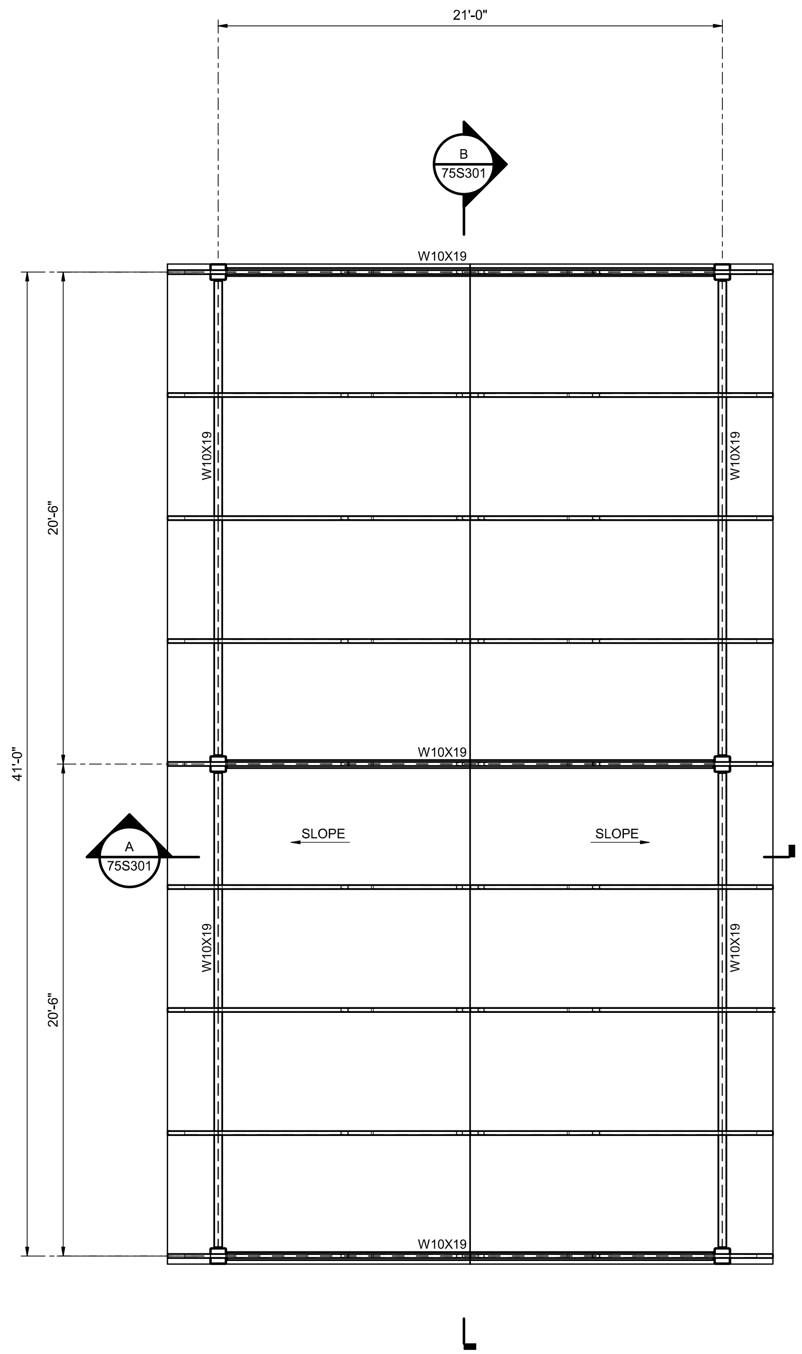
0 1" 2"

FILENAME 10343268-75-S.rvt

SCALE 1/4" = 1'-0"

SHEET 75S101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-75-S.rvt
9/8/2023 11:20:33 AM



CANOPY FRAMING PLAN

1/4" = 1'-0"

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CHECKED BY	Checker
DRAWN BY	Author
PROJECT NUMBER	10343268

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RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

THICKENED SLUDGE PUMP STATION
CANOPY FRAMING PLAN

0 1" 2"

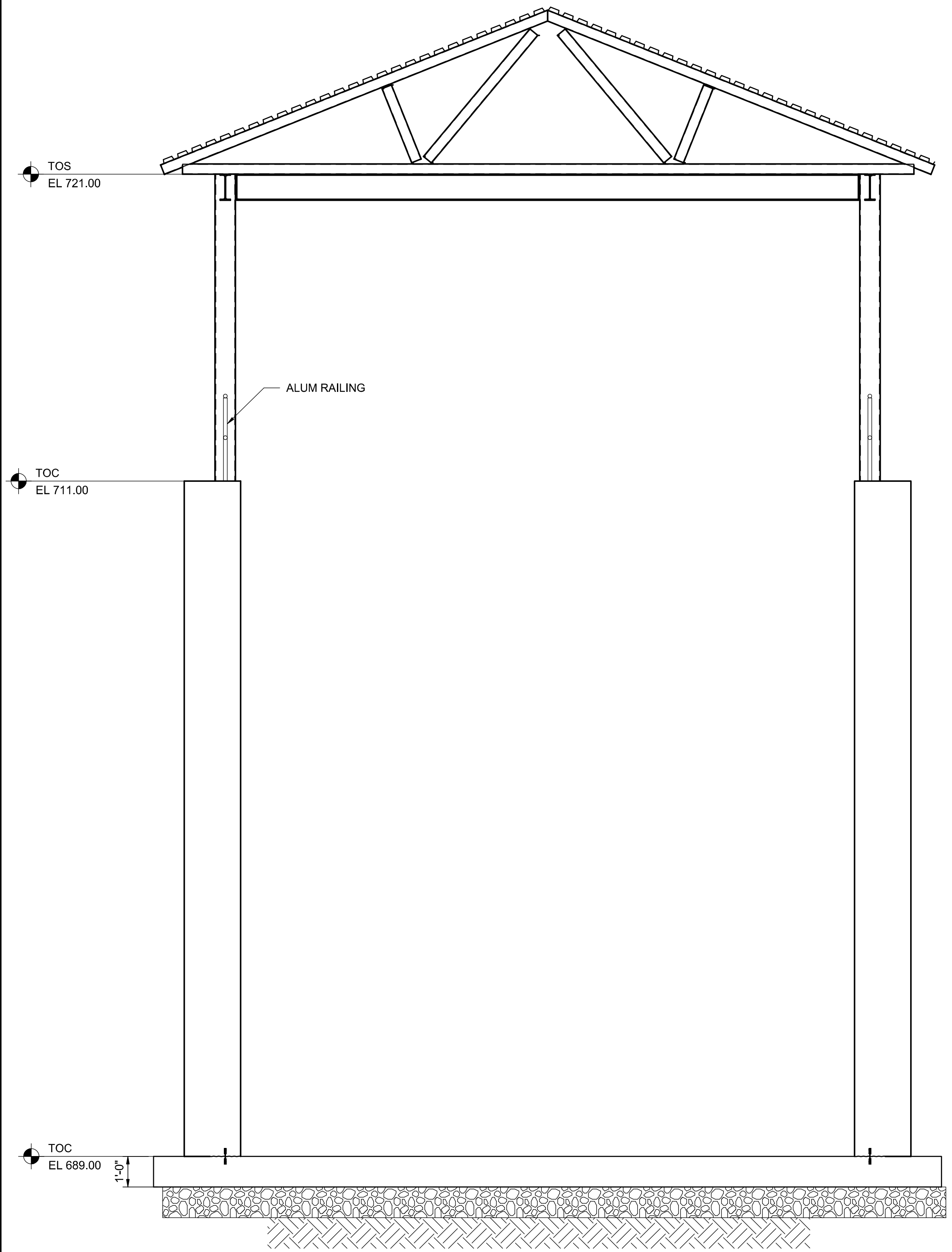
FILENAME 10343268-75-S.rvt

SCALE 1/4" = 1'-0"

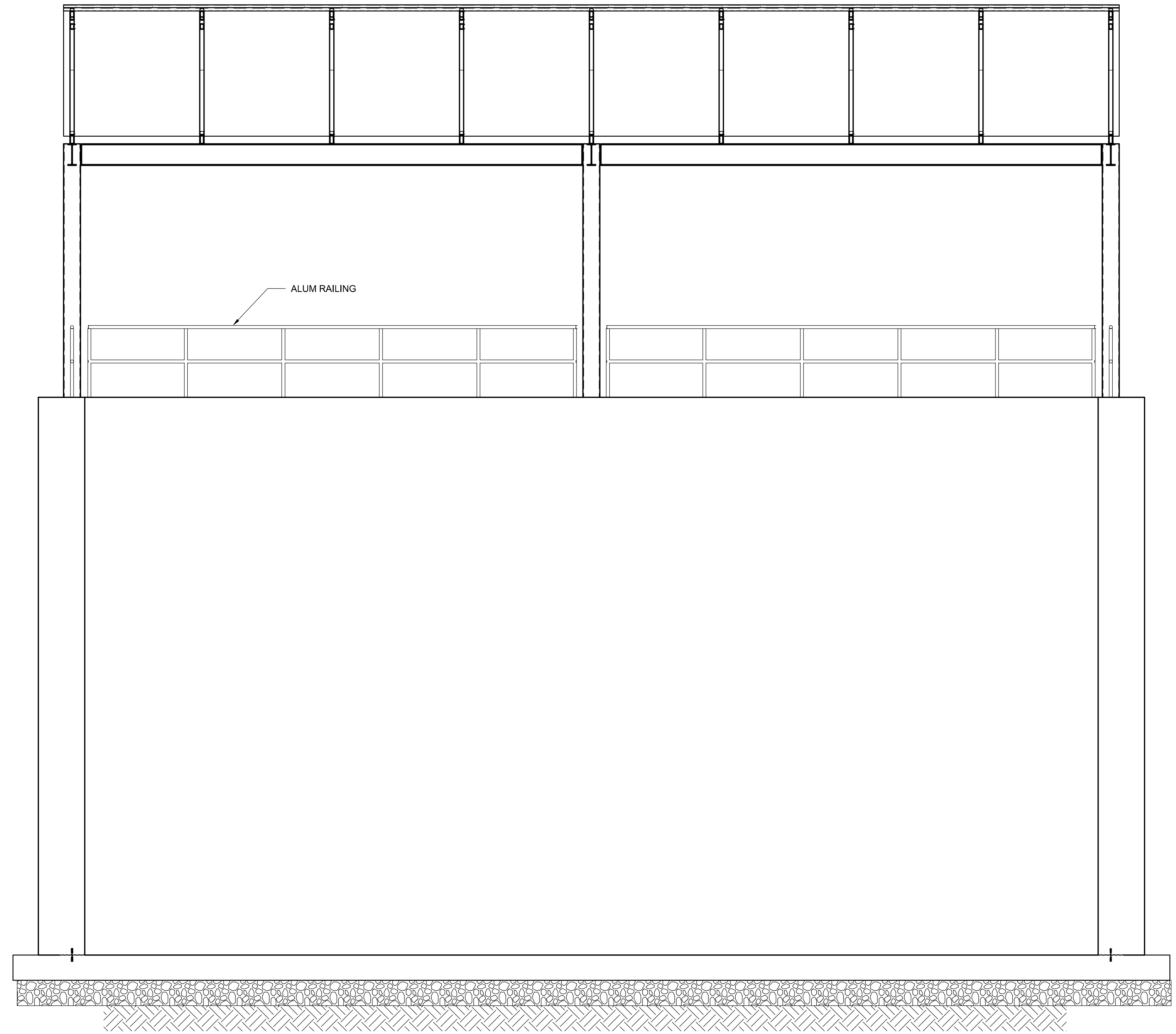
SHEET
75S102

GENERAL NOTES:

1. GRATING AND PUMP STATION ACCESS TO BE INCLUDED IN FINAL DESIGN



A
75S101
SECTION
3/8" = 1'-0"



B
75S101
SECTION
3/8" = 1'-0"

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OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

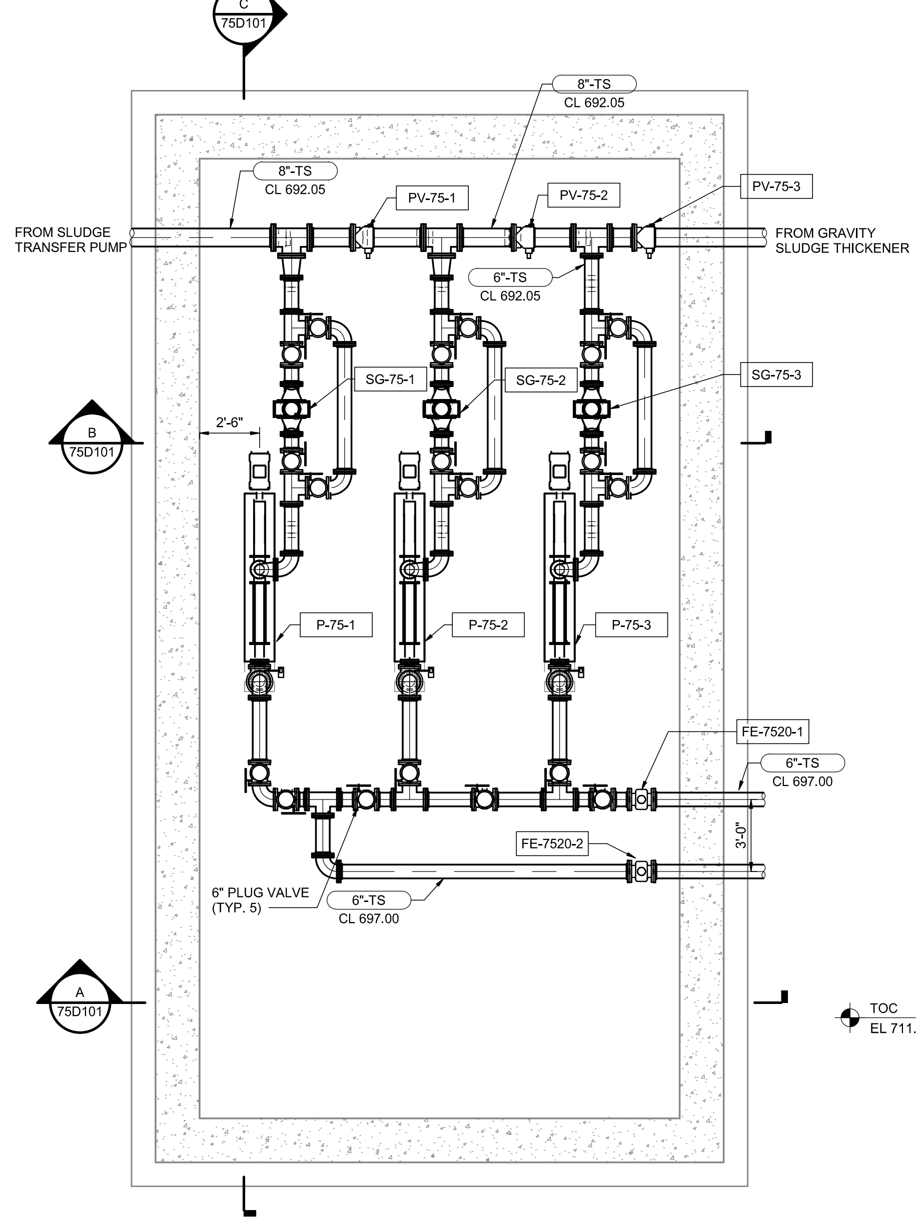
THICKENED SLUDGE PUMP STATION
SECTIONS

0 1" 2"

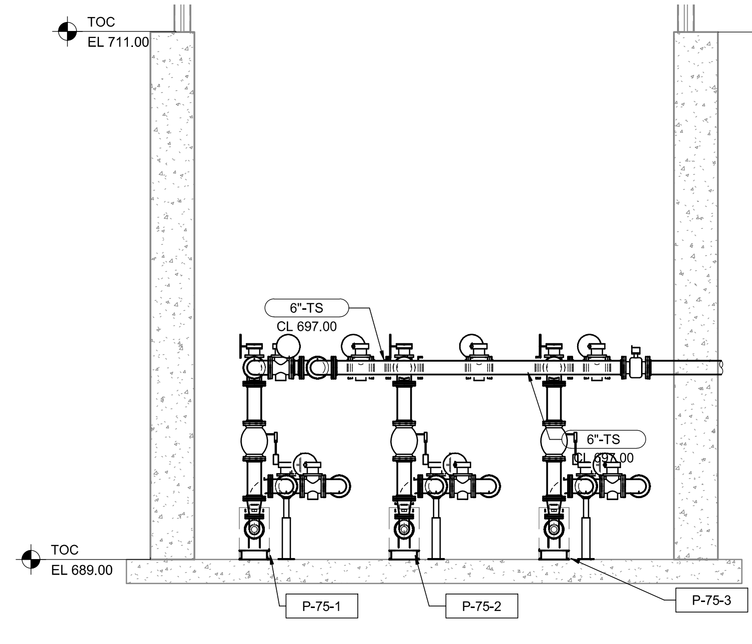
FILENAME	10343268-75-S.rvt
SCALE	3/8" = 1'-0"

SHEET
75S301

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-75-S.rvt
9/8/2023 11:20:33 AM



PLAN AT EL 689.00
1/4" = 1'-0"



A SECTION
1/4" = 1'-0"

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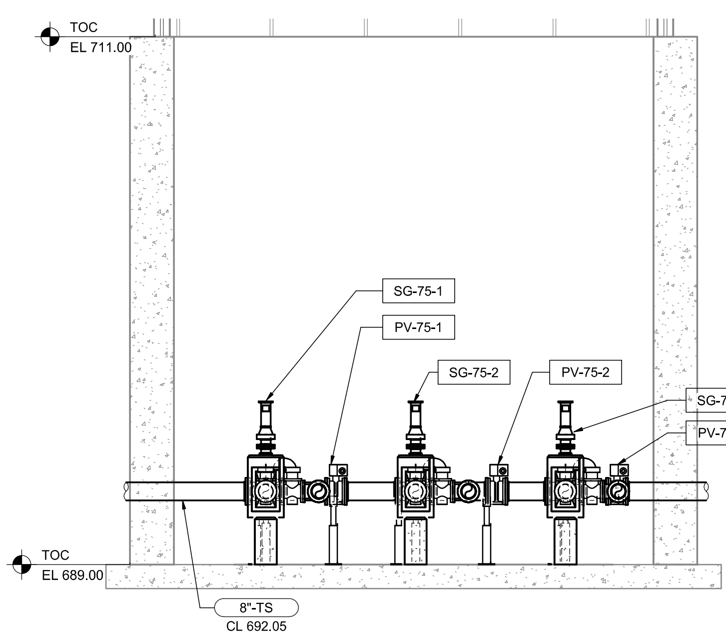
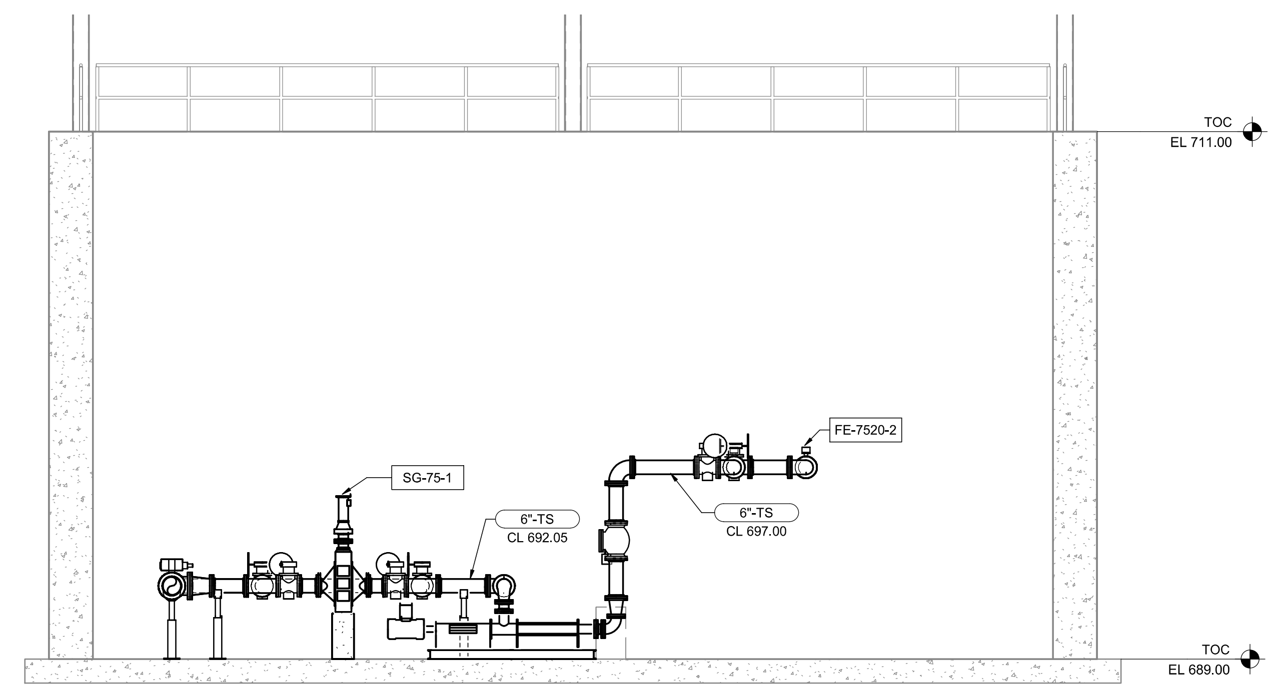
5. REFER TO SPECIFICATION SECTION 01 11 10 FOR WORK SEQUENCING CONSTRAINTS.
6. INSTALL PLUG VALVES HORIZONTALLY IN A HORIZONTAL PIPE SO THAT THE PLUG IS IN THE UPPER PART OF THE VALVE BODY WHILE IN THE OPEN POSITION.
7. INSTALL PLUG VALVES IN THE REVERSE DIRECTION, "SEAT AWAY FROM PUMP", FLOW TENDING TO THE OPEN VALVE



B SECTION
1/4" = 1'-0"



C SECTION
1/4" = 1'-0"

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N.C.B.E.L.S. License Number F-0116

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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	N. HERINGER
CHECKED BY	C. CROTWELL
DRAWN BY	R. ADAMS
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

THICKENED SLUDGE PUMP STATION PLAN AND SECTIONS

0 1" 2"

FILENAME 10343268-75-D.rvt
SCALE 1/4" = 1'-0"
SHEET 75D101

Autodesk Docs://10343268_PTRWA WTP Expansion_2022/10343268-75-D.rvt
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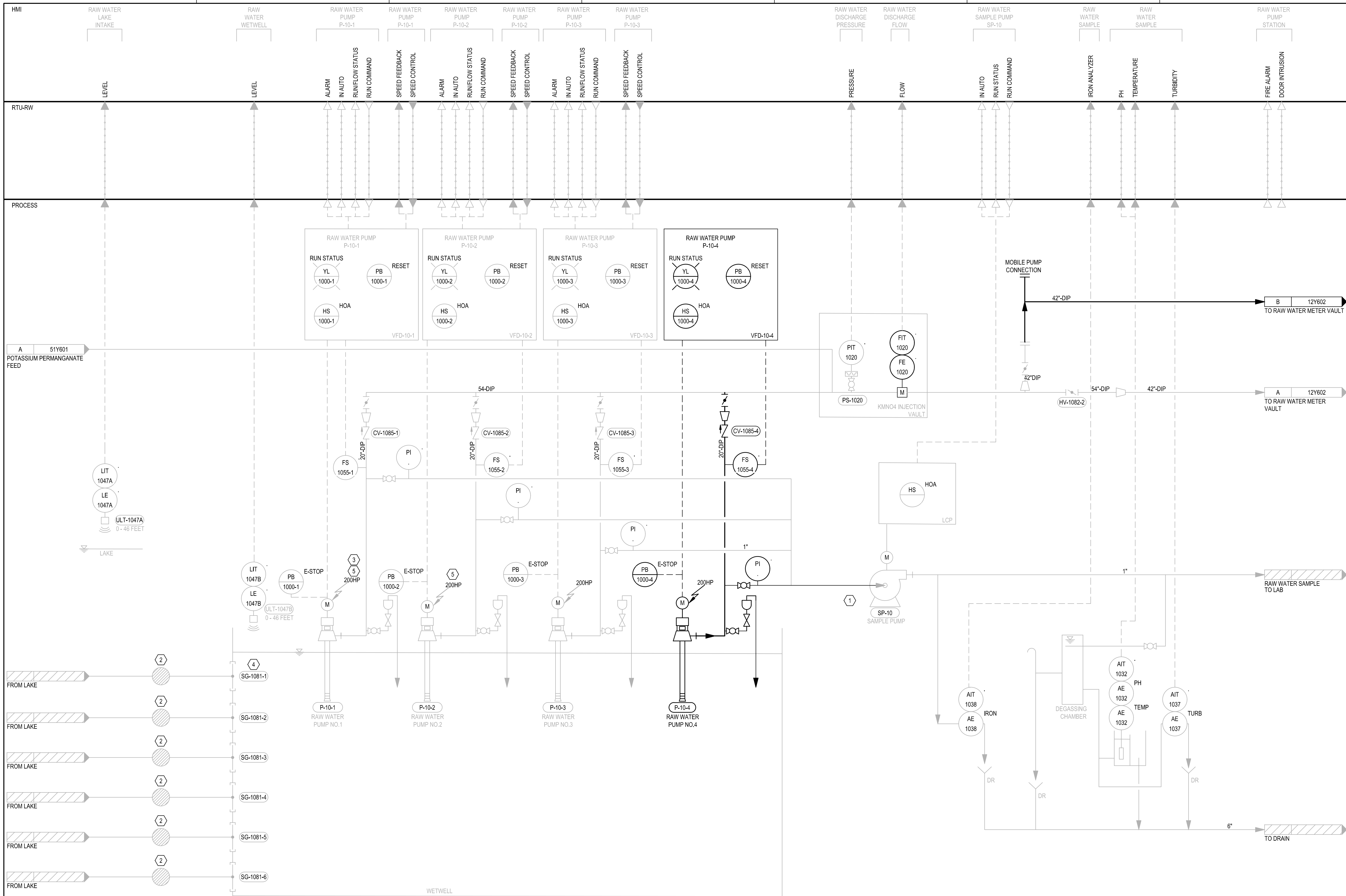

GENERAL NOTES

1. P&ID HAS BEEN DEVELOPED BASED UPON AVAILABLE DOCUMENTATION AND VISUAL VERIFICATION WHERE ACCESSIBLE.
2. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
3. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
4. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

KEY NOTES #

1. SIZE OF SAMPLE LINE BASED ON SAMPLE PUMP CONNECTION.
2. TWO 36MGD INTAKE SCREENS AT ELEVATION XX AND XX .
3. P-10-1 IS 6250 GPM AT 94' TDH 580 RPM 200 HP.
4. LOCATION OF GATES DO NOT DEPICT ACTUAL ELEVATION ON WETWELL WALL.
5. ALL PUMPS ARE 200 HP, PUMPS 1 AND 2 HAVE 250HP VFD.

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER

DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

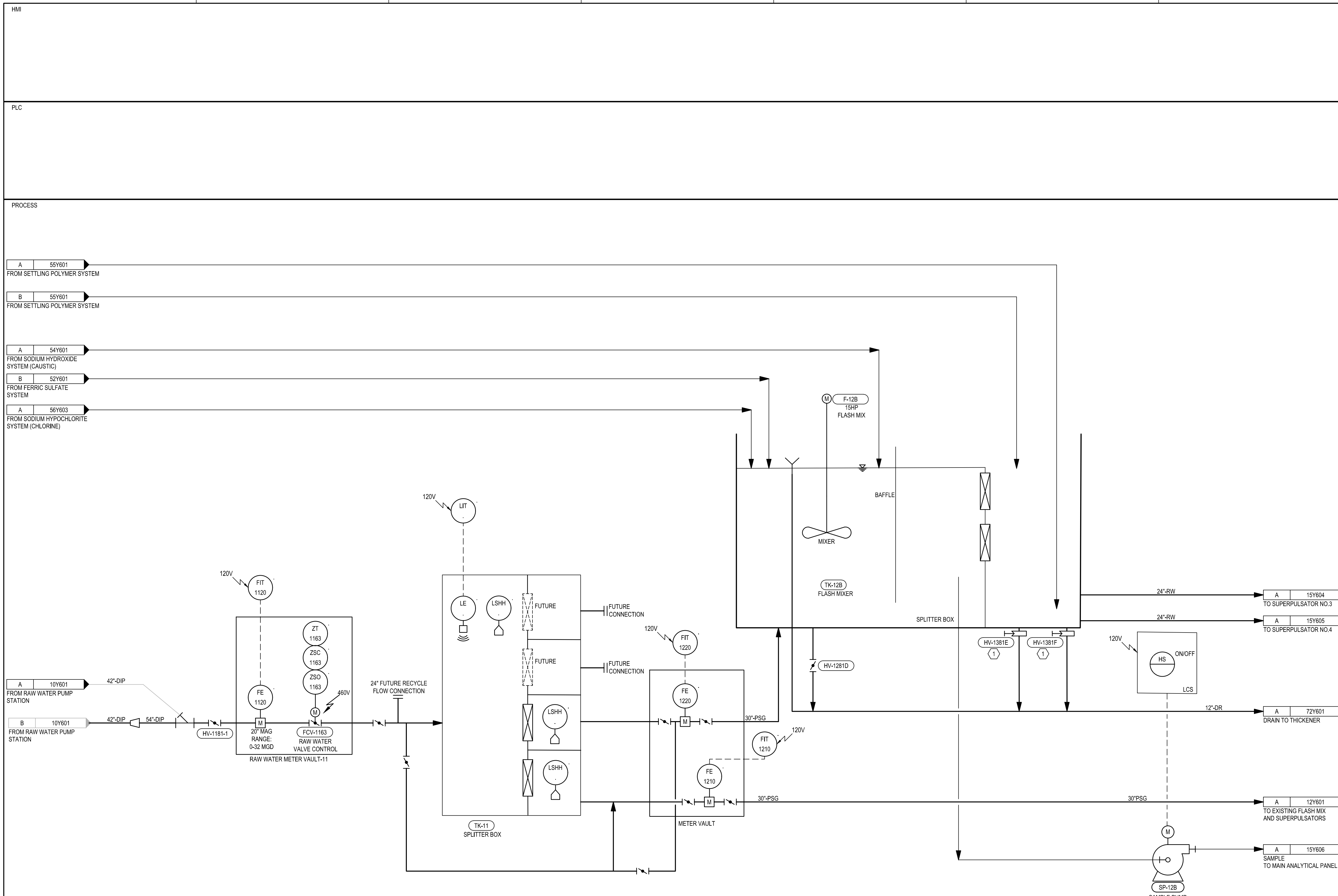
RAW WATER PUMP STATION P&ID

0 1" 2"

FILENAME	10Y601.DWG
SCALE	NONE

SHEET 10Y601

1 2 3 4 5 6 7 8



GENERAL NOTES

1. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

KEY NOTES #

1. EXTENDED VALVE STEM FOR ABOVE GROUND ACCESS

D C B A

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ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	
DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

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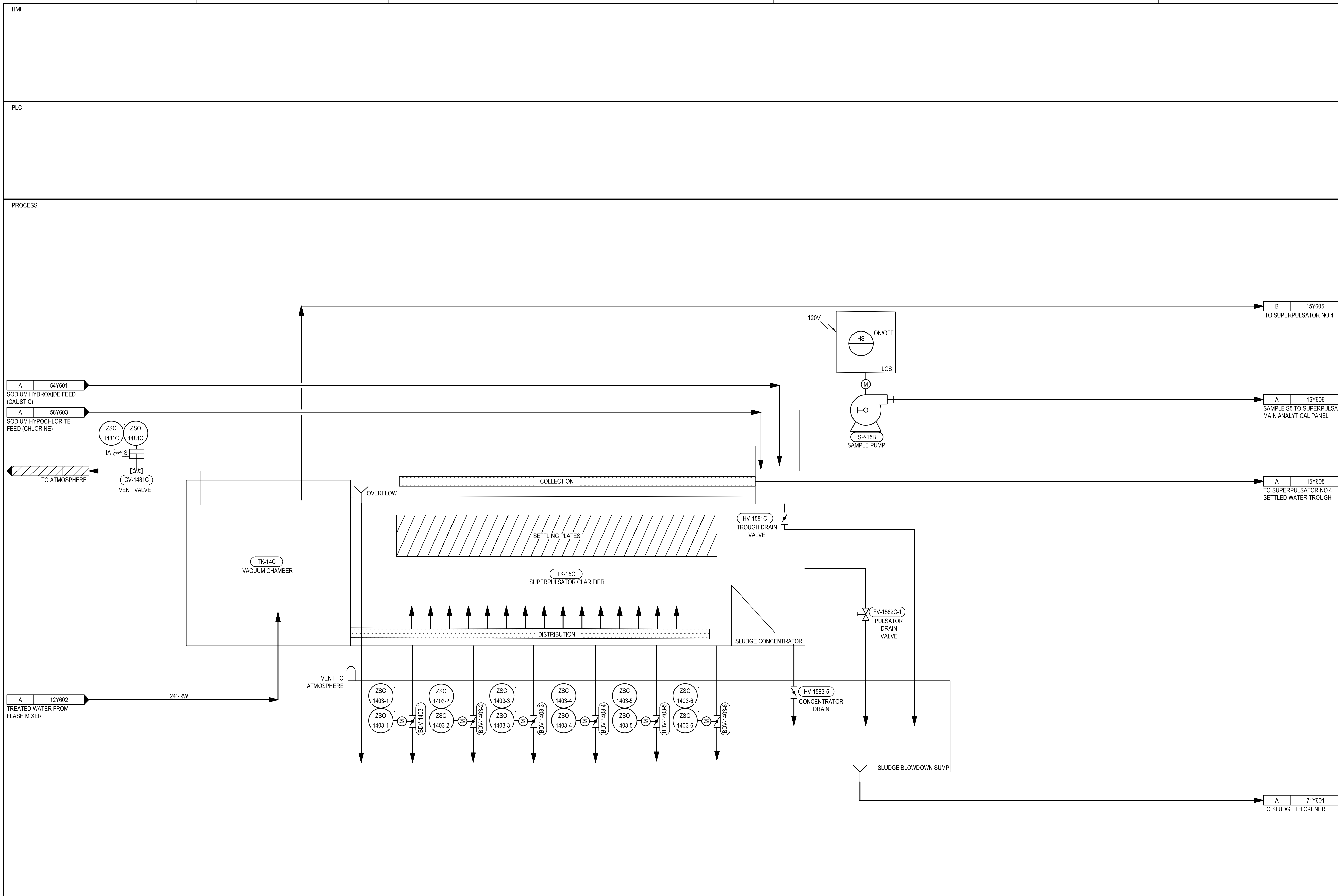
PIEDMONT TRIAD REGIONAL WATER AUTHORITY
WTP EXPANSION

FLASH MIXER P&ID

0 1" 2"

FILENAME	12Y602.DWG
SCALE	NONE

SHEET 12Y602



GENERAL NOTES

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DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

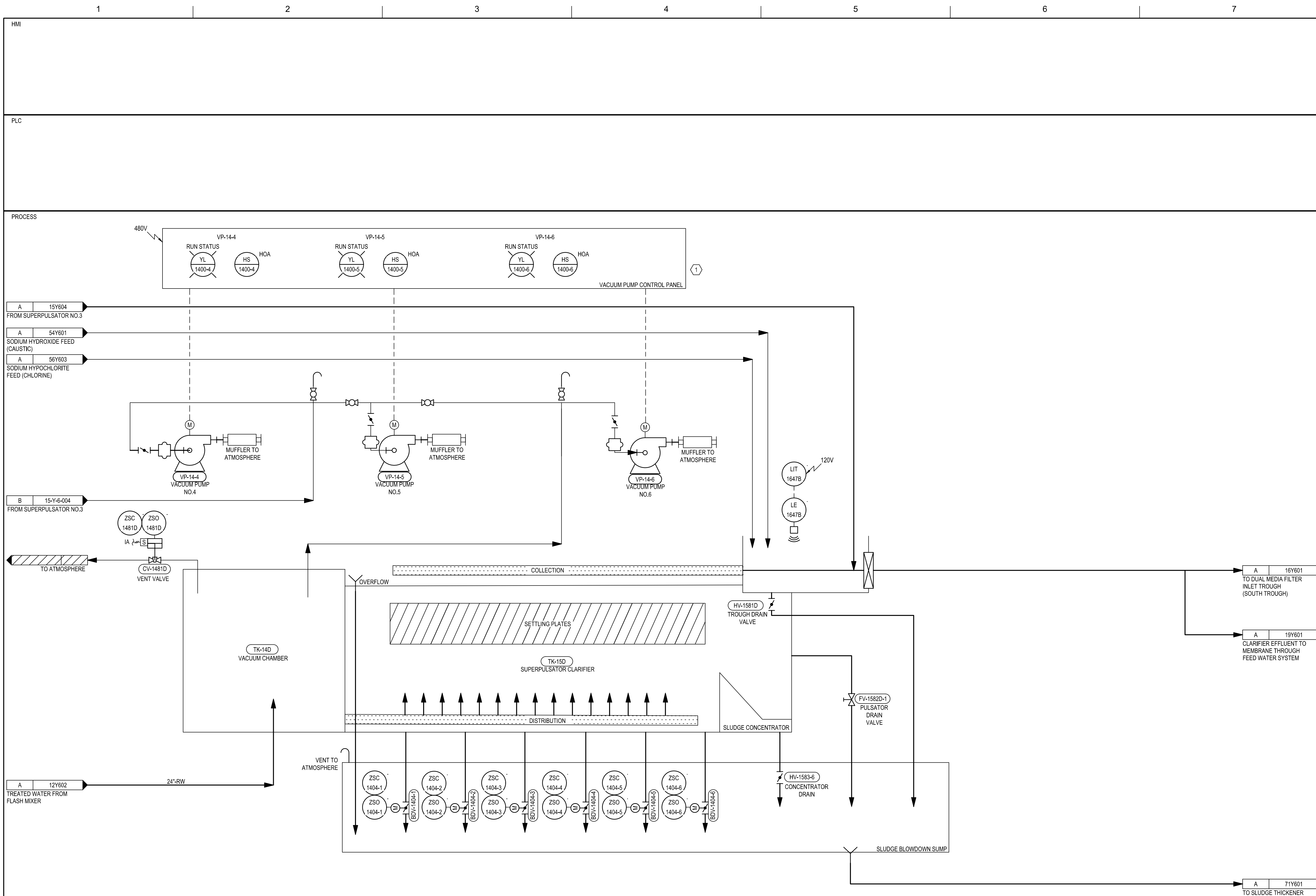
PIEDMONT TRIAD REGIONAL WATER AUTHORITY
WTP EXPANSION

SUPERPULSATOR NO.3
P&ID

0 1" 2"

FILENAME 15Y604.DWG
SCALE NONE

SHEET 15Y604



GENERAL NOTES

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2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

KEY NOTES #

1. MOTOR STARTER LOCATED WITHIN CONTROL PANEL.

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CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

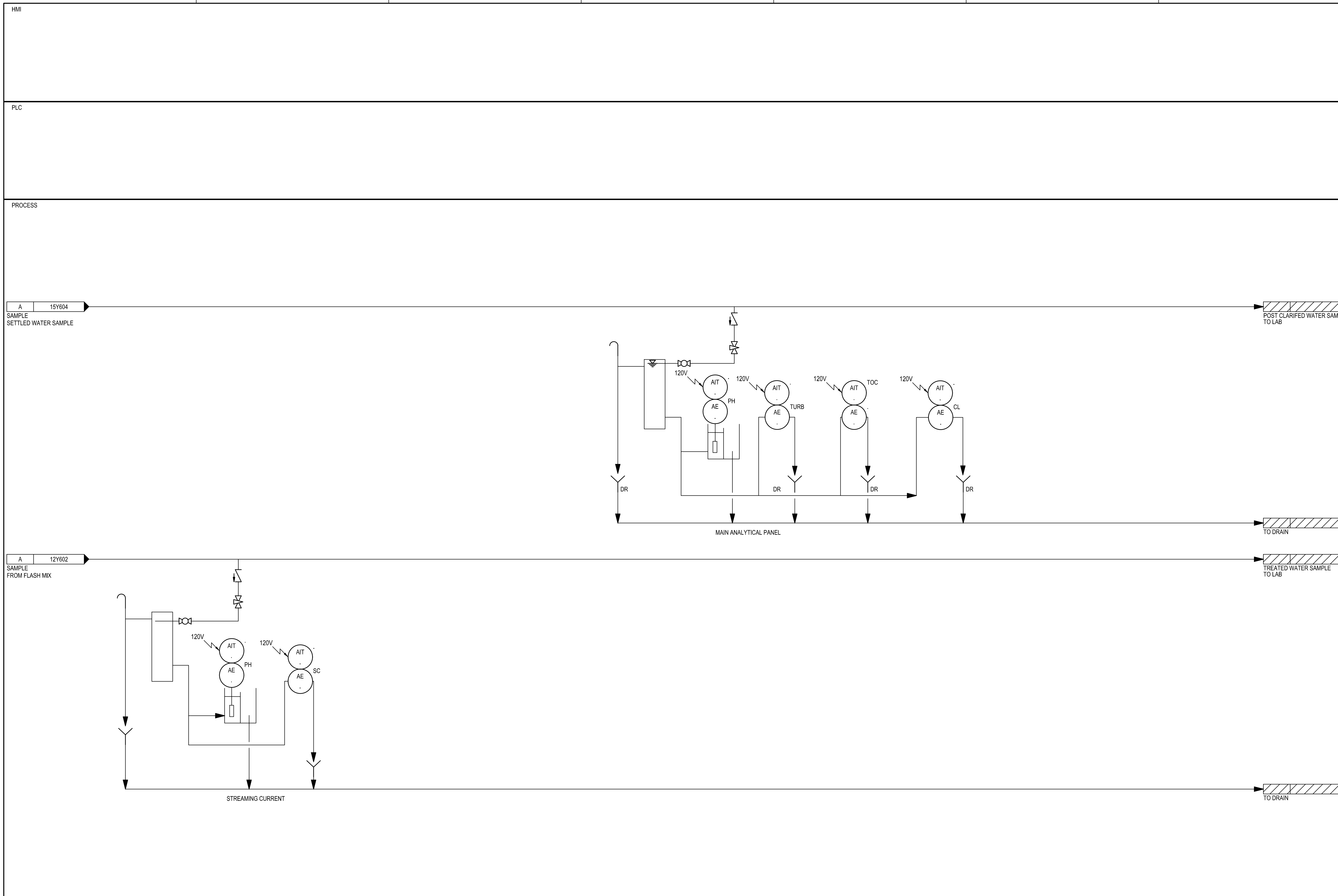
SUPERPULSATOR NO.4 P&ID

0 1" 2"

FILENAME 15Y605.DWG

SCALE NONE

SHEET 15Y605



GENERAL NOTES

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2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

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CHECKED BY L. HURTADO
DRAWN BY M. MURRAY
PROJECT NUMBER 10343268

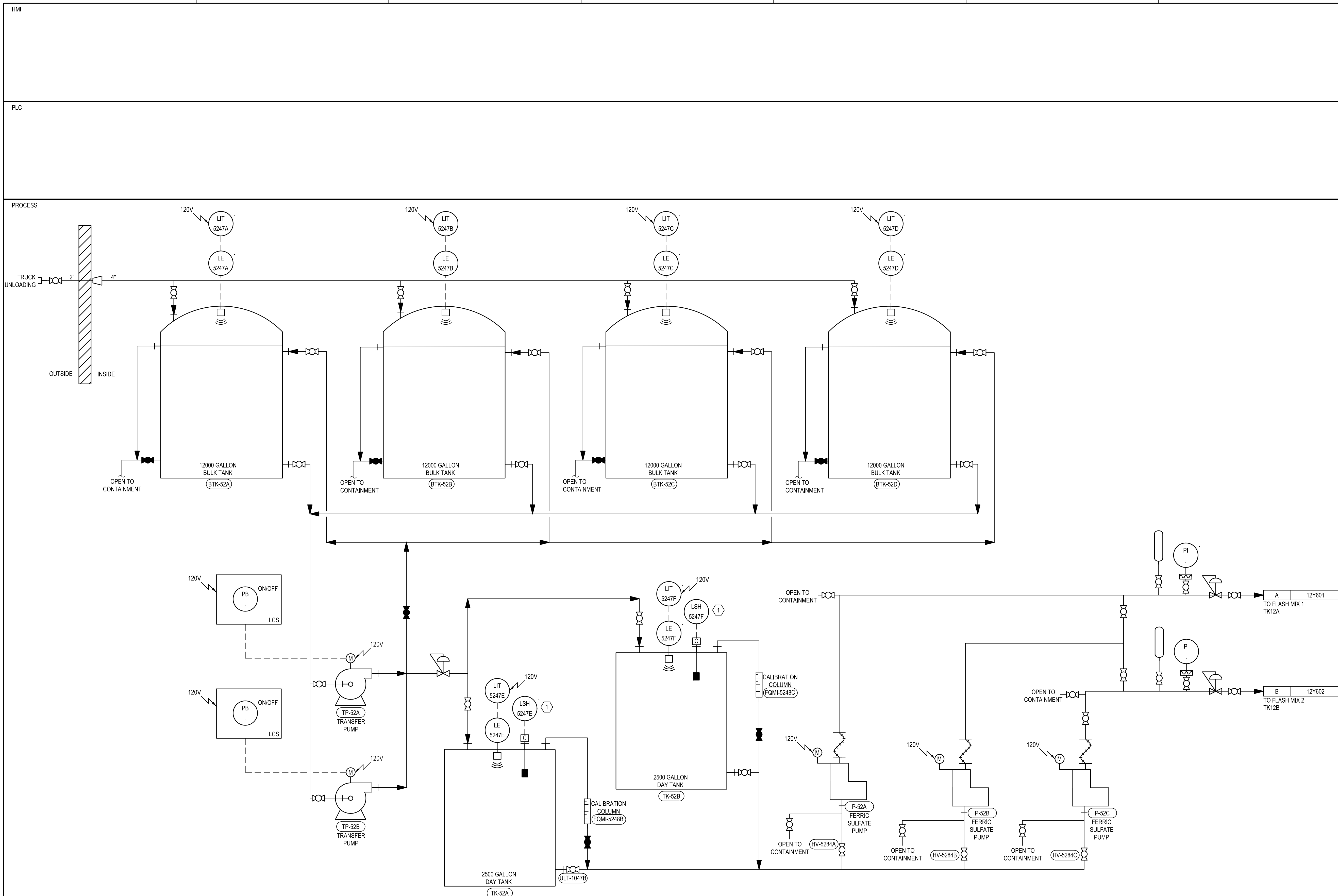
PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SUPERPULSATOR AND MEDIA FILTER WATER SAMPLE P&ID

0 1" 2"

FILENAME 15Y606.DWG
SCALE NONE
SHEET 15Y606



GENERAL NOTES

1. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

KEY NOTES #

1. DAY TANK FILL SEQUENCE SHALL BE PLC CONTROLLED WITH HARDWIRED HIGH LEVEL INTERLOCK TO STOP TRANSFER PUMPS.

HDR Engineering, Inc. of the Carolinas
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Raleigh, NC 27601
919.232.6600
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER

DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

FERRIC SULFATE P&ID

0 1" 2"

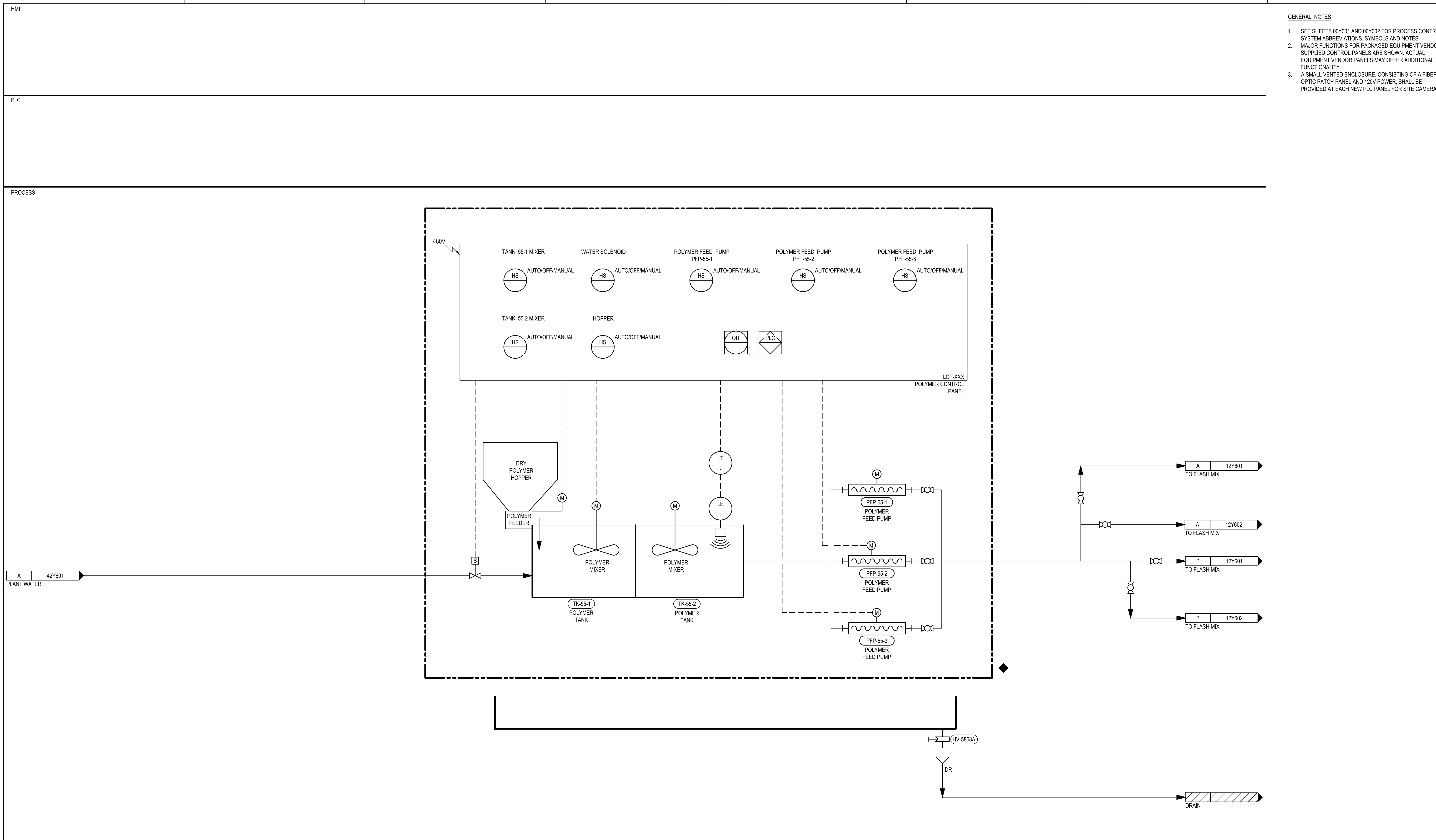
FILENAME 52Y601.DWG

SCALE NONE

SHEET 52Y601

GENERAL NOTES

1. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.



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DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SETTLING POLYMER SYSTEM P&ID

0 1" 2"

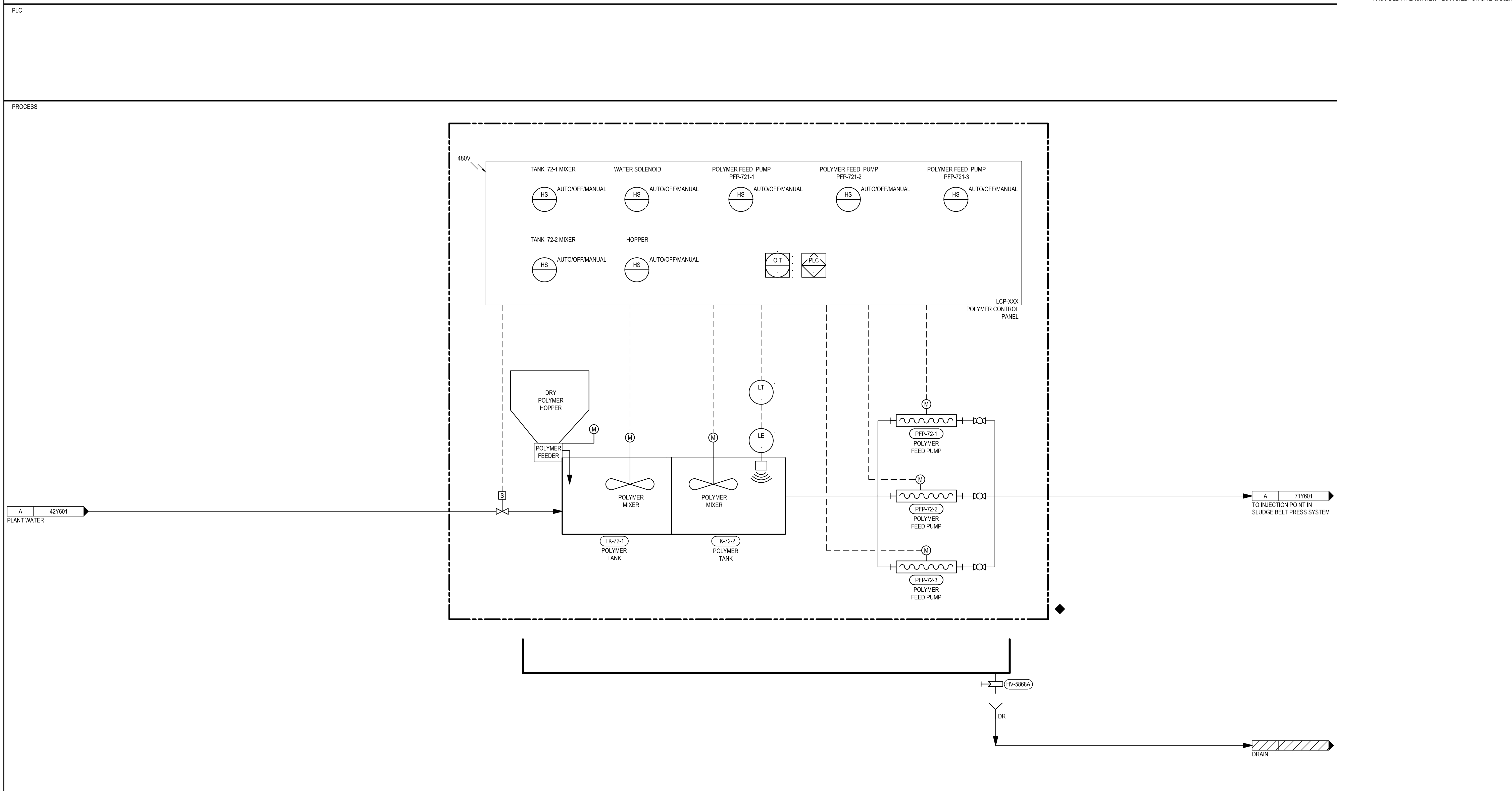
FILENAME 55Y601.DWG

SCALE NONE

SHEET 55Y601

GENERAL NOTES

1. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.



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PROJECT MANAGER

DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

SLUDGE POLYMER SYSTEM P&ID

0 1" 2"

FILENAME 70Y601.DWG

SCALE NONE

SHEET 70Y601

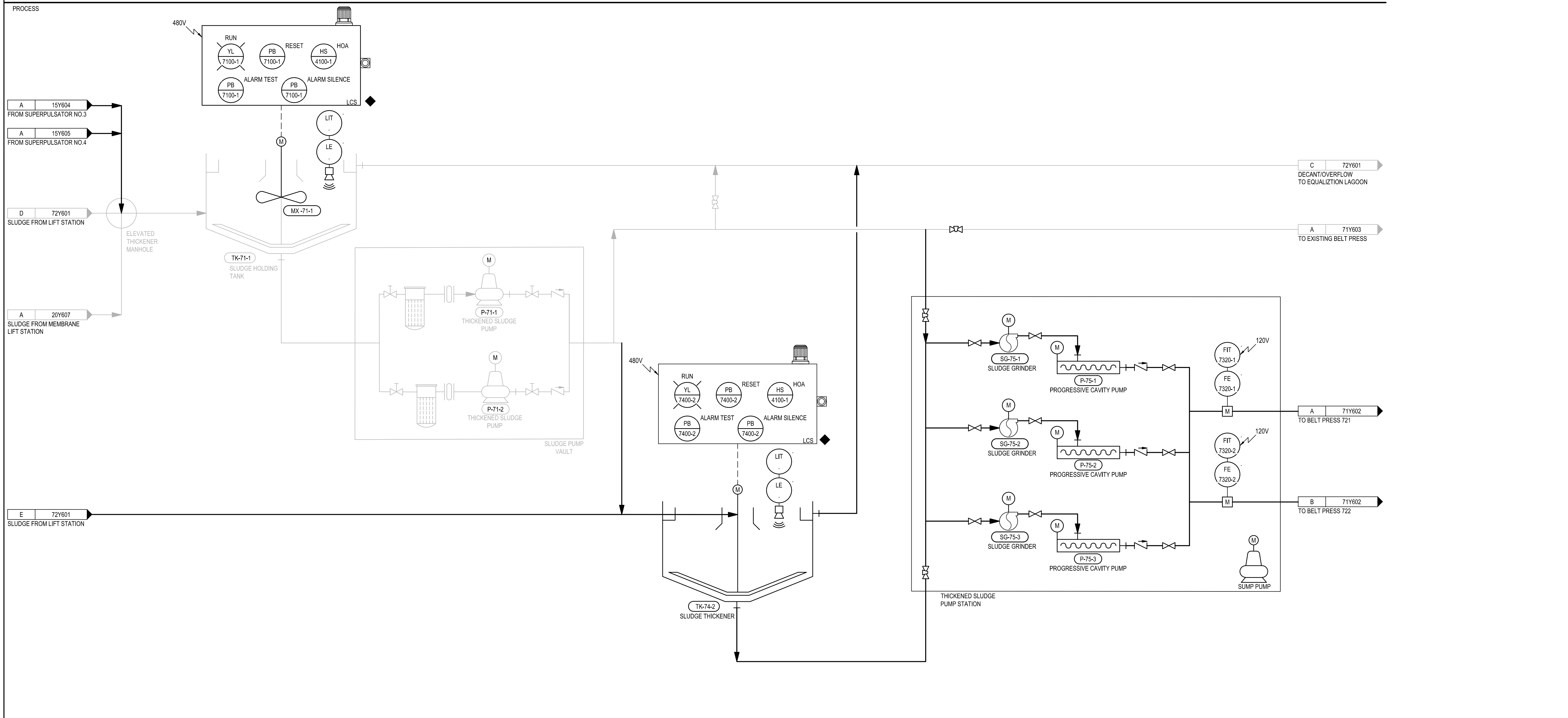
HMI

PLC

GENERAL NOTES

1. P&ID HAS BEEN DEVELOPED BASED UPON AVAILABLE DOCUMENTATION AND VISUAL VERIFICATION WHERE ACCESSIBLE.
2. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
3. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
4. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

PROCESS



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N.C.B.E.L.S. License Number F-0116

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PROJECT MANAGER
DESIGNED BY A. CROSSMAN
CHECKED BY L. HURTADO
DRAWN BY M. MURRAY
PROJECT NUMBER 10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

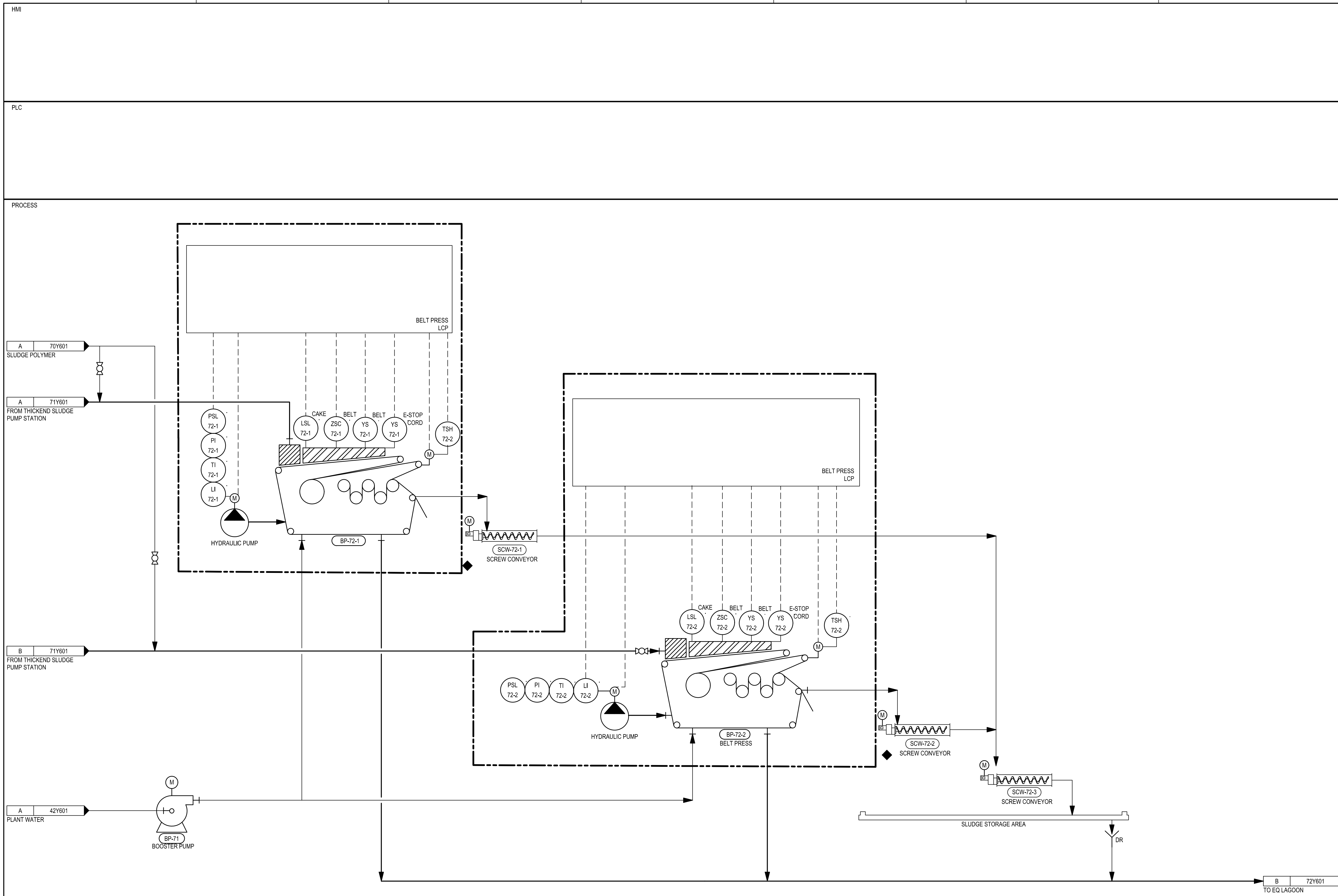
SLUDGE THICKENER P&ID

0 1" 2"

FILENAME 71Y601.DWG
SCALE NONE
SHEET 71Y601

GENERAL NOTES

1. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
2. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
3. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.



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DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

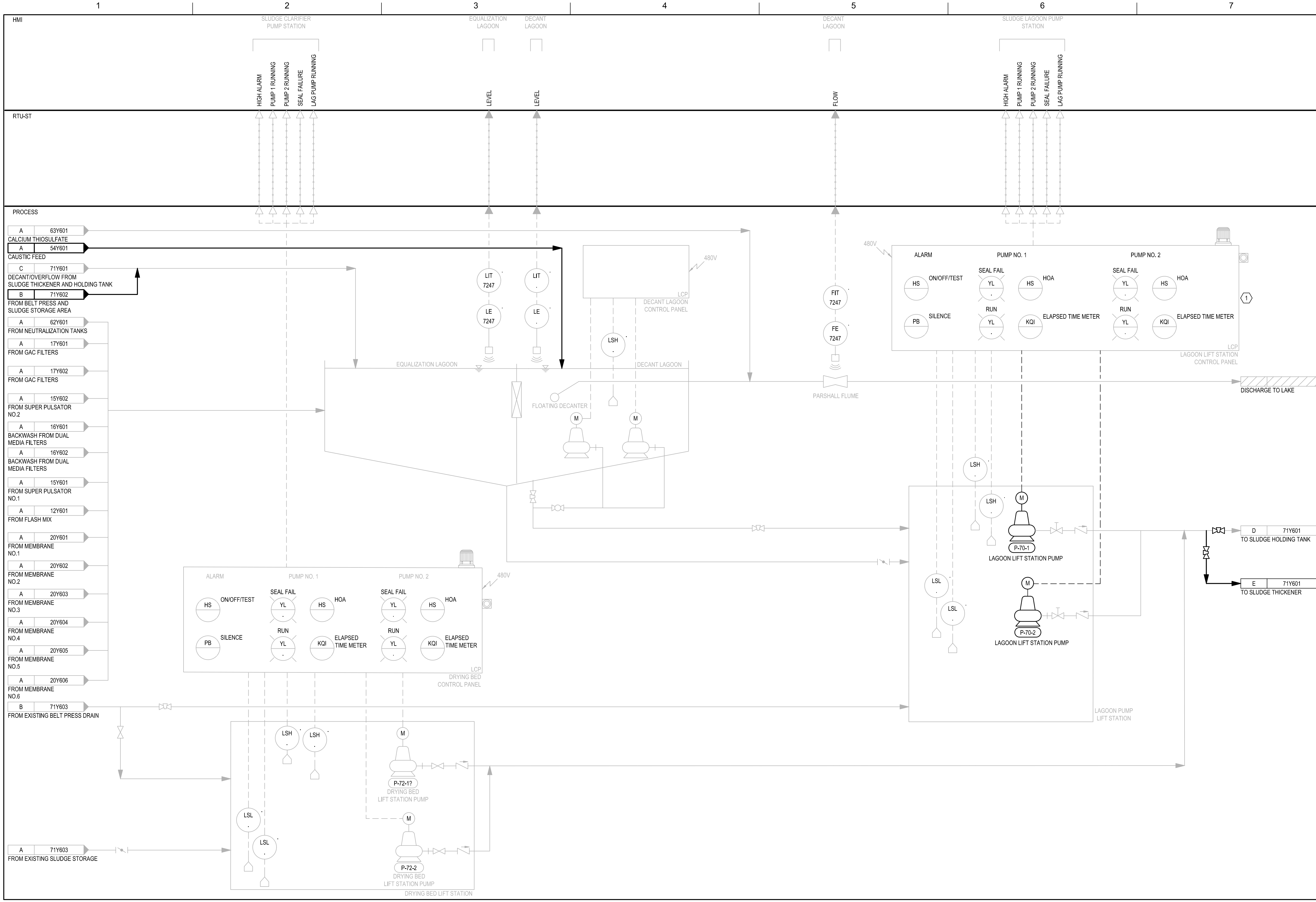
PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

BELT PRESS P&ID

0 1" 2"

FILENAME 71Y602.DWG
SCALE NONE

SHEET 71Y602



GENERAL NOTES

1. P&ID HAS BEEN DEVELOPED BASED UPON AVAILABLE DOCUMENTATION AND VISUAL VERIFICATION WHERE ACCESSIBLE.
2. SEE SHEETS 00Y001 AND 00Y002 FOR PROCESS CONTROL SYSTEM ABBREVIATIONS, SYMBOLS AND NOTES.
3. MAJOR FUNCTIONS FOR PACKAGED EQUIPMENT VENDOR SUPPLIED CONTROL PANELS ARE SHOWN. ACTUAL EQUIPMENT VENDOR PANELS MAY OFFER ADDITIONAL FUNCTIONALITY.
4. A SMALL VENTED ENCLOSURE, CONSISTING OF A FIBER OPTIC PATCH PANEL AND 120V POWER, SHALL BE PROVIDED AT EACH NEW PLC PANEL FOR SITE CAMERAS.

KEY NOTES #

1. MODIFY CONTROL PANEL TO ACCOMMODATE NEW PUMP SIZES.

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DESIGNED BY	A. CROSSMAN
CHECKED BY	L. HURTADO
DRAWN BY	M. MURRAY
PROJECT NUMBER	10343268

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CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY
WTP EXPANSION

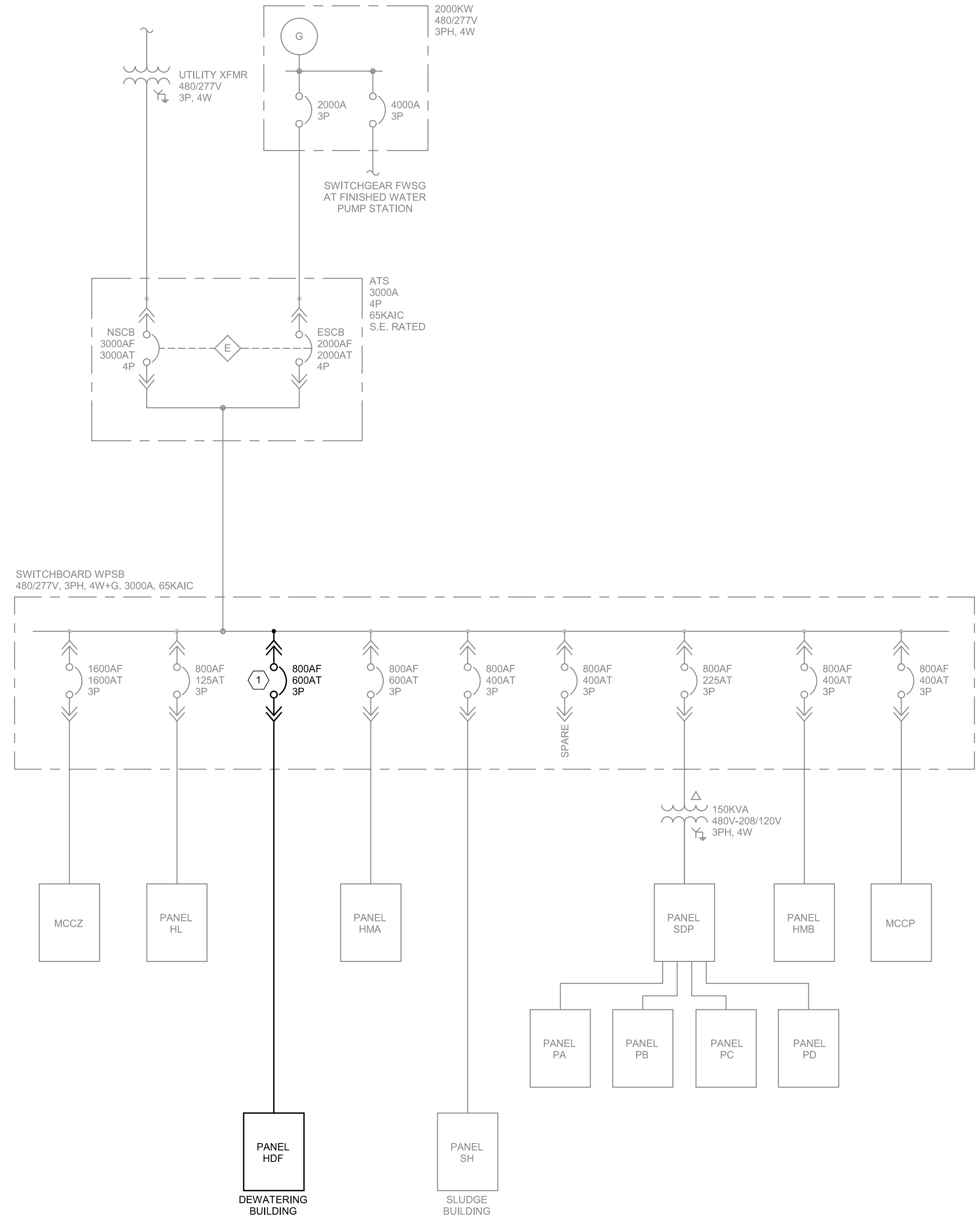
EQUALIZATION AND DECANT LAGOON P&ID

0 1" 2"

FILENAME 72Y601.DWG
SCALE NONE
SHEET 72Y601

KEY NOTES: #

1 REPLACE EXISTING 400A BREAKER WITH A 600A BREAKER.



OPERATIONS BUILDING - POWER ONE-LINE DIAGRAM

HDR

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Raleigh, NC 27601
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N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
	09/2023	30% ISSUED FOR REVIEW

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	S. QUIN
CHECKED BY	
DRAWN BY	C. SHAW
PROJECT NUMBER	10343268

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CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

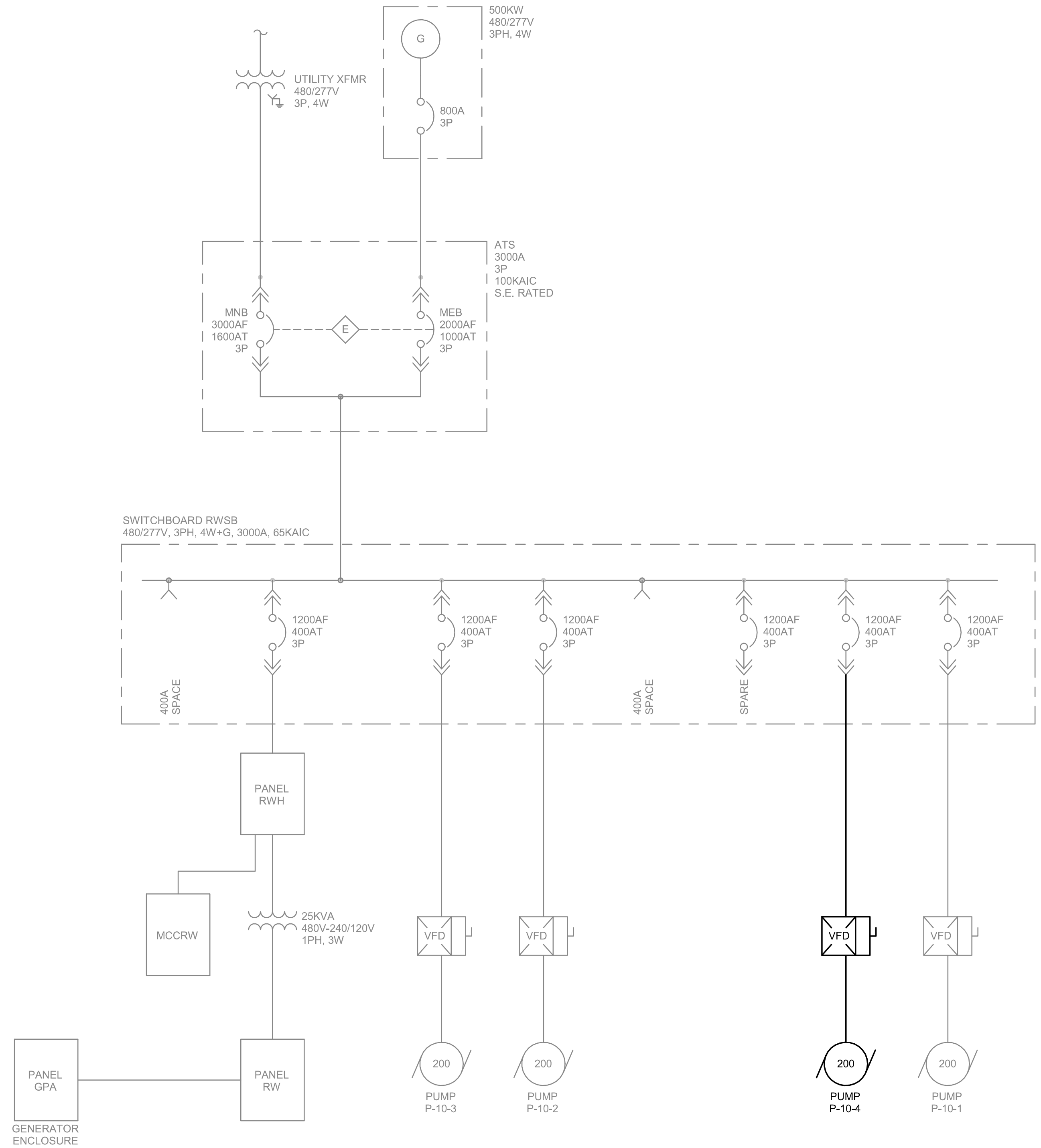
OPERATIONS BUILDING - POWER ONE-LINE DIAGRAM

0 1" 2"

FILENAME 10343268-10-E.rvt

SCALE NONE

SHEET 98E601



RAW WATER PUMP STATION - POWER ONE-LINE DIAGRAM

HDR Engineering, Inc. of the Carolinas
555 Fayetteville Street, Suite 900
Raleigh, NC 27601
919.232.6600
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
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PROJECT MANAGER	KATIE WALKER
DESIGNED BY	S. QUIN
CHECKED BY	
DRAWN BY	C. SHAW
PROJECT NUMBER	10343268

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NOT FOR
CONSTRUCTION
OR
RECORDING

PIEDMONT TRIAD REGIONAL
WATER AUTHORITY
WTP EXPANSION

RAW WATER PUMP STATION - POWER ONE-LINE DIAGRAM

0 1" 2"

FILENAME 10343268-10-E.rvt
SCALE NONE

SHEET 98E602

D

Appendix D. Geotechnical Report

Report of Subsurface Exploration and Geotechnical Engineering Evaluation

PTRWA BES Site
Randleman, Randolph County, North Carolina
F&R Project No. 66A-0144

Prepared For:

HDR Engineering, Inc. of the Carolinas
555 Fayetteville Street, Suite 900
Raleigh, North Carolina 27601

Prepared By:
Froehling & Robertson, Inc.
310 Hubert Street
Raleigh, North Carolina 27603

May 3, 2023

FROEHLING & ROBERTSON

Engineering Stability Since 1881

May 3, 2023

HDR Engineering, Inc. of the Carolinas
555 Fayetteville Street, Suite 900
Raleigh, North Carolina 27601

Katie Walker, PE ENV SP
Drinking Water Lead | Associate
HDR
555 Fayetteville Street, Suite 900
Raleigh, North Carolina 27601

Subject: Report of Subsurface Exploration
Piedmont Triad Regional Water Authority (PTRWA) BES Site
Randleman, Randolph County, North Carolina
F&R Project No. 66A-0144

Dear Ms. Walker:

Froehling & Robertson, Inc. (F&R) has completed the authorized subsurface exploration and geotechnical engineering evaluation for the PTRWA BES Site in Randleman, Randolph County, North Carolina. Our services were performed in general accordance with F&R's Proposal No. 2266-00097 REV2 dated April 25, 2022. The attached report presents our understanding of the project, reviews our exploration procedures, and describes general subsurface conditions.

We have enjoyed working with you on this project. Please contact us if you have any questions regarding this report or if we may be of further service.

Sincerely,

FROEHLING & ROBERTSON, INC.

NORTH CAROLINA
PROFESSIONAL
SEAL
047377
ENGINEER
Brian William McCarthy

Brian W. McCarthy, P.E.
Geotechnical Staff Engineer

Michael S. Sabodish Jr., Ph.D., P.E.
Geotechnical Department Manager

Corporate HQ: 3015 Dumbarton Road Richmond, Virginia 23228 T 804.264.2701 F 804.264.1202 www.fandr.com

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Unified Soil Classification Chart
Boring Logs

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GBA Document "Important Information about Your Geotechnical Engineering Report"

1.0 SCOPE OF SERVICES

F&R's scope of services for this project included the following:

- Completion of 17 soil test borings (B-1 to B-17) to depths ranging from 2.6 to 46.9 feet below the existing ground surface;
- Performing geotechnical laboratory testing on representative soil samples;
- Preparation of typed boring logs and development of subsurface profiles;
- Performing a geotechnical engineering evaluation of the subsurface conditions with regard to their suitability for the proposed construction; and
- Preparation of this data report by professional engineers.

2.0 PROJECT INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

The project site is located at the existing Piedmont Triad Regional Water Authority facility located at 7297 Adams Farm Road in Randleman, North Carolina 27317 (See Figure 1 in Appendix I). More specifically, the area of exploration is located at the existing water treatment plant located approximately 6,800 feet south of the intersection of US Hwy. 220 Business N. and Adams Farm Road. The site is bound to the north by woods and an American Tower facility, to the south and west by the Randleman Reservoir, and to the east by Adams Farm Road.

2.2 Proposed Construction

The proposed construction will consist of a new superpulsator/flash mix structure located immediately north of the existing treatment facility, a new gravity sludge thickener located north of the existing thickener, a new dewatering building located north of the existing thickener, and a new clearwall located south of the existing clearwell 1 as depicted on Figures No. 2B and 2C in Appendix I:

Superpulsator/Flash Mix: The Superpulsator/Flash Mix is proposed to be a rectangular cast-in-place concrete tank structure with outside plan dimensions of approximately 88 by 72 feet.

Reviewing the provided 30% design plans, F&R anticipates that the structure will be supported on a concrete mat foundation with a thickness of 1.5 feet with the bottom of the mat foundation proposed to be set at EL 715.5. Existing site grades within the limits of the structure range from EL 718 to 723. As such, maximum earth cuts of 2.5 to 7.5 feet will be required to establish the mat subgrade elevation. This earth cut will result in a reduction of overburden stress that will be experienced by the proposed foundation bearing grade soils. Based on information provided by HDR, the superpulsator will impound 17.5 feet of water, which combined with the assumed weight of the structure will result in a subgrade contact stress of approximately 1,530 pounds per square foot (psf).

Gravity Sludge Thickener: The Gravity Sludge Thickener is proposed to be a circular cast-in-place concrete tank structure with an inside plan diameter of approximately 100 feet. Reviewing the provided 30% design plans, F&R anticipates that the structure will be supported on a concrete mat foundation with a thickness of approximately 2 to 3 feet with the bottom of the mat foundation proposed to be set at approximately EL 694. Existing site grades within the limits of the structure range from EL 704 to 716. As such, maximum earth cuts of 10 to 22 feet will be required to establish the mat subgrade. This earth cut will result in a significant reduction of overburden stress that will be experienced by the proposed foundation bearing grade soils. Based on information provided by HDR, the sludge thickener will impound 12 to 19 feet of sludge, which combined with the assumed weight of the structure will result in a subgrade contact stress of approximately 1,680 psf.

Clearwell 3: The Clearwell 3 is proposed to be a circular precast circular concrete tank structure with an inside diameter of approximately 161 feet. Based on information provided by HDR, F&R anticipates that the structure will be supported on a concrete mat foundation with a thickness of 2 feet with the bottom of the mat foundation proposed to be set at EL 698. Existing site grades within the limits of the structure range from EL 701 to 704. As such, maximum earth cuts of 3 to 6 feet will be required to establish the mat subgrade. This earth cut will result in a reduction of overburden stress that will be experienced by the proposed foundation bearing grade soils. Based on information provided by HDR, the clearwell will impound approximately 21 feet of water, which combined with the assumed weight of the structure will result in a subgrade contact stress of approximately 1,780 psf.

Dewatering Building: The dewatering building is proposed to be a rectangular masonry structure with outside plan dimensions of approximately 98 by 52 feet with a concrete double tee roof. F&R understands that the masonry walls will be load bearing with a high-bay structure layout. Reviewing the provided 30% design plans, F&R anticipates that the structure will be supported on shallow concrete foundations consisting of wall strip footings with foundation bearing elevation to be set at approximately EL 711.5. Existing site grades within the limits of the structure range from EL 708 to 716. As such, maximum earth cuts and fills of 3.5 to 4.5 feet will be required to establish the foundation subgrade. Based on information provided by HDR, the dewatering building will have wall loads on the order of 6,000 pounds per linear foot (plf) with an interior slab loading of 250 psf.

3.0 EXPLORATION PROCEDURES

3.1 SUBSURFACE EXPLORATION

F&R advanced a total of 17 soil test borings (B-1 to B-17) to depths ranging from 2.6 to 46.9 feet below the existing ground surface. The approximate boring locations are shown on the Boring Location Plan presented as Figure No. 2 in Appendix I. The test boring locations were selected by HDR and established in the field by F&R using a hand-held GPS unit with reported sub-meter accuracy. Ground surface elevations at the boring locations were interpolated from Randolph County GIS topographic data. Given these methods of determination, the boring locations and ground surface elevations should only be considered approximate.

The test borings were advanced by an ATV-mounted drill rig using 2-1/4" inside diameter (I.D.) hollow stem augers for borehole stabilization. Representative soil samples were obtained using a standard, two-inch outside diameter (O.D.) split-barrel sampler in general accordance with ASTM D 1586, Penetration Test and Split-Barrel Sampling of Soils (Standard Penetration Test). The number of blows required to drive the split barrel sampler three, consecutive 6-inch increments with an automatic hammer is recorded and the blows of the last two 6-inch increments are added to obtain the Standard Penetration Test (SPT) N-values representing the penetration resistance of the soil. A representative portion of the soil was obtained from each SPT sample, sealed in an eight-ounce glass jar, labeled, and transported to our laboratory for final classification by a geotechnical engineer.

The soil samples were classified in general accordance with the Unified Soil Classification System (USCS), using visual-manual identification procedures (ASTM D2488). A boring log for each test boring is presented in Appendix II.

Groundwater level measurements were attempted at the termination of drilling and after a stabilization period of approximately 24-hours in all of the borings. Temporary piezometers were installed in seven (7) borings in order to facilitate obtaining stabilized groundwater measurements. The temporary piezometers consisted of 1-inch diameter, hand-slotted PVC pipes installed into the selected borings. After obtaining 24-hour stabilized groundwater levels, the temporary observation wells were removed and all of the test borings were backfilled with soil cuttings.

3.2 LABORATORY TESTING

F&R selected representative soil samples from the test borings and subjected them to geotech-nical index testing consisting of natural moisture content, sieve analyses, and Atterberg Limits determinations. The purpose of the index testing was to aid in our classification of the soil samples and development of engineering recommendations. The laboratory tests were performed in general accordance with applicable ASTM standards. The laboratory test results are presented in in Appendix III of this report.

4.0 SUBSURFACE CONDITIONS

4.1 SUBSURFACE CONDITIONS

4.1.1 General

The subsurface conditions discussed in the following paragraphs and those shown on the attached boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Data from the specific soil test borings are shown on the boring logs presented in Appendix II of this report.

Subsurface profiles have been prepared from the boring data to graphically illustrate the subsurface conditions encountered at the site. The subsurface profiles are presented as Figures 3 and 4 in Appendix I. Strata breaks designated on the boring logs and subsurface profiles represent approximate boundaries between soil types. The transition from one soil type to another may be gradual or occur between soil samples.

4.1.2 Surficial Materials

Surficial organic soils were encountered from the existing ground surface to depths ranging from about 0.1 to 0.4 feet, with an average depth of roughly 0.3 feet, in each boring with the exception of boring B-12. In nine (9) borings (B-1 to B-4, B-7, B-8, B-10, B-11, and B-15) roots were encountered just below the surficial organic soils and extended to depths of up to 6.5 feet, but were typically encountered to a depth of 2 feet below the existing ground surface.

The surficial organic soils generally consisted of dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. F&R has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed surficial organic soil materials. Therefore, the term *surficial organic soil* is not intended to indicate suitability for landscaping and/or other purposes.

The surficial organic soil depths provided in this report should be considered approximate. We note that the transition from surficial organic soil to underlying materials may be gradual, and therefore the observation and measurement of surficial organic soil depths is subjective. Actual surficial organic soil depths should be expected to vary.

4.1.3 Fill and Possible Fill Soils

Fill or material that F&R believes may possibly be fill (referred to as "possible fill" on the attached boring logs) was encountered in 12 of the test borings (B-4, B-5, B-7 to B-14, B-16, and B-17) below the surficial organic soils or at the ground surface in boring B-12, to depths ranging from 0.5 to 3.5 feet below the existing ground surface. Deeper layers of fill and possible fill soils were encountered in borings B-8 and B-12 that extended to depths of 6.5 and 11.5 feet, respectively, below the existing ground surface. The fill soils consisted of loose to very dense, silty and clayey sands (USCS – SM and SC), and soft to stiff, low plasticity sandy clays and low to high plasticity silts and clayey silts (USCS – CL, ML and MH). The fill encountered below the surficial materials and/or ground surface exhibited SPT N-values ranging from 3 to 23 blows per foot (bpf) with the exception of borings B-9 and B-12. In borings B-9 and B-12, a layer of fill encountered below the surficial soils and ground surface exhibited SPT N-values of 100+ blows per foot (bpf), and extend to depths of 0.5 and 2.0 feet, respectively, below the existing ground surface.

Fill and/or possible fill soils exhibiting SPT N-values of 4 bpf or less are generally indicative of fill with poor compaction, while soils exhibiting SPT N-values of 5 to 8 bpf are generally indicative of fill with moderate compaction. Well-compacted fill without gravel, rock fragments, or deleterious materials would generally be expected to exhibit N-values of 9 bpf or greater.

Based on the results of the test borings and a review of SPT N-values, it appears that a majority of the fill and possible fill soils appear to be moderately to well compacted. Poorly compacted fill was encountered in borings B-12 and B-13, with SPT N-values of 3 and 4 bpf, respectively. It should be noted that some of the SPT N-values observed in the fill soils may have been elevated due to the presence of fine to coarse gravel, rock fragments and roots. As such, the recorded SPT N-values may not be indicated of the true consistency of the fill materials. Evidence of poorly compacted fill soil conditions were not encountered in the borings, but may be present at other unexplored areas of the site.

4.1.4 Residual Soils

Extending below the surficial materials and/or fill and possible fill soils, residual soils were encountered in each boring with the exception of boring B-9. The residual soils typically consisted of very soft to very hard, low to high plasticity silts, sandy silts, clayey silts, and silty clays (USCS – ML, MH, and CL) with SPT N-values ranging from 2 to 80 bpf; medium dense to dense, silty sands (USCS – SM) with SPT N-values ranging from 20 to 49 bpf; and dense silty gravel/rock fragments (USCS - GM) with a SPT N-Value of 35 bpf.

Of the 17 borings, eight (8) encountered highly plastic clayey silt and silty clay (USCS – MH and CH) at depths ranging from just below the surficial and/or fill and possible soils and extending to depths ranging from 2.0 to 8.5 feet. Deeper layers of MH were encountered in borings B-2, B-4, and B-6 at depths ranging from 18.5 to 28.5 feet below the existing ground surface. In boring B-1, the highly plastic silt extended from just below the surficial soils to a depth of 28.5 feet. In borings B-7 and B-16, the highly plastic silt extended from just below the possible fill soils to depths of 30 and 25 feet, respectively.

Very hard (SPT N-values greater than 50 bpf) layers of sandy silt (ML) were encountered in boring B-11 at depths of 3.5 feet, 8.5 feet, and 23.5 feet below the existing ground surface. These layers ranged in thickness from 1.5 to 5.0 feet. A very hard layer of sandy silt (ML) was also encountered in boring B-1 at a depth of 33.5 feet that extended to the boring termination depth of 35 feet.

4.1.5 Partially Weathered Rock and Auger Refusal

PWR was encountered in nine (9) borings (B-8, B-9, B-10 through B-15, and B-17) at depths ranging from 0.5 to 12.0 feet. PWR is defined for engineering purposes as residual material that exhibits an SPT N-value of at least 100 blows per foot (bpf). The SPT N-values in the PWR ranged from 50 blows with 0” of split spoon penetration (50/0”) to 50/5.5”. The sampled PWR was typically described as sandy silt, silty/clayey sand, and/or sandy rock fragments. Intermediate layers of PWR were encountered in borings B-11 and B-12 at a depth of 12.0 feet and extended to a depth of 23.5 feet in both borings.

Auger refusal was encountered in six (6) borings (B-8, B-9, B-12, B-13, B-15, and B-17) at depths ranging from of 2.6 to 46.9 feet below the existing ground surface. Auger refusal is a designation applied to any material that cannot be penetrated by the soil auger and typically includes boulders, hard rock lenses/ledges, and bedrock. It is F&R's opinion that the auger refusal material encountered is likely bedrock.

4.2 SOIL MOISTURE AND GROUNDWATER CONDITIONS

A majority of the soil samples recovered from the borings were typically described as being dry to moist (i.e., within 3 to 5 percentage points of the estimated optimum moisture content). Wet and/or saturated soil conditions (5 to 6 percentage points or greater over the estimated optimum moisture content) were encountered in ten (10) borings (B-1 through B-6, and B-13 through B-17) at depths ranging from 2.0 to 13.5 feet and extended to depths ranging from 3.5 to 23.5 feet below the existing ground surface.

Groundwater level measurements were attempted at the termination of drilling in all of the borings. Immediately after drilling completion, groundwater was encountered in borings B-6, B-12, B-13, and B-14 at depths ranging from 4.3 to 27.4 feet below the existing ground surface. Groundwater levels were recorded again after a stabilization period of approximately 24-hours following the completion of drilling and were encountered in nine (9) borings (B-1, B-4, B-5, B-6, B-11, B-12, B-13, B-14, and B-15) at depths ranging from 4.0 to 31.9 feet below the existing ground surface. Temporary piezometers were installed in eight (8) borings to facilitate the measurement of stabilized groundwater levels.

It should be noted that the groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary from those described in this report. F&R notes that due to the presence of very dense or very hard soils, relatively impervious silty and clayey soils, and PWR noted on the project site, trapped or perched water conditions may be encountered during periods of inclement weather and during seasonally wet periods.

5.0 GEOTECHNICAL ENGINEERING RECOMMNEDATIONS

5.1 GENERAL CONSIDERATIONS

The conclusions and recommendations contained in this section of the report are based upon the results of the 17 soil test borings and laboratory testing performed by F&R, the information provided to F&R regarding the proposed development, and our experience with similar subsurface conditions and projects. It is our opinion that the subsurface conditions encountered at the project site will require improvement to construct the proposed structures from a geotechnical engineering perspective. Provided the recommendations presented in subsequent sections of this report are followed throughout the design and construction phases of this project, the site can be made suitable for the proposed development. As the design progresses, we request that F&R be afforded the opportunity to review proposed civil and structural plans for further evaluation of geotechnical considerations, for additional scope and fee. F&R also advises that additional geotechnical exploration be performed for other structures proposed on the site that did not have borings advanced within the proposed footprint. These structures include the ferric storage, sludge storage, thickened sludge pump station, and any future structures not referenced in this report.

The subsurface conditions revealed by the borings are relatively typical of this area and geologic setting. Stiff/medium dense residual soils and properly placed and compacted structural fill should be suitable for support of the proposed water treatment plant structures on mat and shallow foundations. There are certain subsurface conditions encountered in the borings that will be subsequently discussed and should be taken into consideration during the design and construction phases of the project.

<u>Foundation Considerations</u>: The proposed structures will be supported on mat and shallow foundations. The subsurface conditions at the anticipated subgrade elevations are fairly consistent, and typically consisted of stiff/medium dense residual soils and PWR. The subgrade soils are anticipated to mostly consist of silty and/or clayey materials, which contain sufficient fines content to be moisture sensitive and may become unstable during normal construction activities when in the presence of excess moisture. Highly plastic silt (MH) was encountered in at least one boring at the proposed foundation bearing elevation of each structure analyzed in this report. These highly plastic soils are considered poor material for direct support of building foundations. The highly plastic soils are also not desirable subgrade soils, and if present at finished subgrade (e.g., slab and foundation subgrades), undercutting and repair with lower plasticity materials will generally be recommended to create suitable subgrades for construction.

Stabilized Groundwater: Stabilized groundwater was encountered in nine (9) borings depths ranging from 4.0 to 31.9 feet below the existing ground surface. Dewatering measures will likely be required during excavation activities in the Clearwell 3 and Gravity Sludge Thickener areas of the project and will likely be required to maintain a stable, dry working platform during open cut operations. Depending upon the prevailing weather conditions at the time of construction, groundwater may be encountered at other areas of the site and at higher elevations than described in this report, and may require dewatering measures such as sumps or well points. Dewatering will be discussed in a subsequent section of this report.

Difficult Excavation: Partially Weathered Rock (PWR) was encountered in nine (9) borings at depths ranging from 0.5 to 12.0 feet below the existing ground surface. PWR excavation will likely be required during excavation activities at the Superpulsator/Flash Mix and Clearwell 3 areas of the project. PWR may be encountered at other areas of the site and at higher elevations than described in this report. Based on the consistency of the PWR as indicated by the SPT data, it appears that much of the PWR can be removed by ripping with a large dozer or excavating with a large track excavator equipped with rock teeth. However, areas of harder PWR could be encountered that may require the use of a ram hoe, blasting, or other techniques for removal. More detailed recommendations for PWR excavation are presented in section 6.3 of this report.

5.2 FOUNDATION DESIGN

5.2.1 Tank Foundations

The tank structures will be supported on reinforced concrete mat foundations that range in thickness from 1.5 to 2 feet; these structures include: Superpulsator/Flash Mixer, Gravity Sludge Thickener, and Clearwell 3. Based on the results of the test borings, the subgrades for these structures are anticipated to consist of generally stiff native soils, and/or PWR. For the Sludge Thickener, in particular, significant earth cuts of 10 feet or greater will be required to establish the mat subgrade elevation. F&R performed analysis to estimate settlements at the center and edge of the mats, and the results are indicated in the following table.

Structure	Proposed Slab Elevation (EL)	Cut (-) / Fill (+) Depths to subgrade	In-place Overburden Stress at Slab Subgrade	Estimated Subgrade Loading from Tank	Estimated Settlement at Center of Tank	Estimated Settlement at Edge of Tank
Superpulsator	717	-2.5’ to - 7.5’	300 – 900 psf	1,530 psf	1”	0.5”
Sludge Thickener	697	-10’ to - 22’	1,200 – 2,640 psf	1,680 psf	1”	0.5”
Clearwell 3	700	-11’ to - 23’	1,320 – 2,760 psf	1,780 psf	2.1”	1.1”

Based on the above results, repairs of the subgrade in Clearwell 3 area will be required to establish settlements of less than 1 inch at the center of the tank, and 0.5 inches at the edge. Additionally, highly plastic soils and shallow PWR encountered in both the Superpulsator/Flash Mix and Gravity Sludge Thickener borings will require subgrade repairs prior to construction. Provided that the site preparation and fill placement recommendations presented in the subsequent sections of this report are followed, the project site is suitable to support the tank structures on mat foundations.

The magnitude of differential settlements will be influenced by the variation in excavation requirements across the along mat footprint, the distribution of loads, and the variability of underlying soil and rock conditions. Our settlement analysis was performed on the basis of assumed structural loading. Actual settlements experienced by the structures and the time required for these soils to settle will be influenced by undetected variations in subsurface conditions, final grading plans, and the quality of fill placement and foundation construction. If the proposed structure loads are greater than indicated in section 2.2 of this report or if there are additional mat foundations proposed that F&R has not been apprised of, please provide pertinent structural information for F&R to review and comment.

In regard to a design subgrade modulus for design of the mat foundations, it is recommended that a coefficient of subgrade reaction, K, of 15 pci be utilized in the design. It is noted that a design subgrade modulus for relatively lightly loaded floor slabs are primarily related to the load influence in the upper 3 to 4 feet of the soil profile beneath the slab level and are often on the order 150 pci or more. However, for heavier large area loadings such as what occurs beneath large mats, the stresses extend much deeper and the approach for determining K becomes more of a large area load settlement evaluation and typically results in much lower K values than typically provided for lightly loaded slabs since it takes into consideration deeper soil conditions.

5.2.2 Shallow Spread Foundations

The project will include a new dewatering building that is proposed to be supported on shallow spread foundations, and F&R assumes that there may be other lightly loaded facility components that will be supported by shallow spread column or wall foundations. The stiff residual soils and compacted structural fill overlying approved residual soils are suitable to support the proposed building structures on conventional shallow spread foundations provided the site preparation and fill placement recommendations presented in this report are followed.

For foundations bearing on stiff native soils or properly compacted structural fill overlying approved native materials, F&R recommends the use of a net allowable soil bearing pressure of 2,000 pounds per square foot (psf) for the design of the foundations for the new dewatering building. Spread foundations should bear directly upon approved structural fill or native soils and should be embedded at least 18 inches below adjacent exterior grades for bearing capacity and frost protection considerations. Wall foundations should have a minimum width of at least 3 feet. Final foundation sizes should be determined by the project structural engineer based on actual design loads, building code requirements and other structural considerations.

For lightly loaded building foundations designed and constructed in accordance with the recommendations provided in this report, we have estimated that maximum total settlements will be on the order of 1 inch or less, and post-construction differential settlement should be ½ inch or less. If the proposed building loads are greater than indicated in section 2.2 of this report or if there are other shallow spread foundation proposed that F&R has not been apprised of, please provide pertinent structural information for F&R to review and comment.

5.3 Slab-on-Grade Design

The proposed dewatering building will be designed with a slab-on-grade floor. We recommend that a modulus of subgrade reaction (k) of 125 pounds per cubic inch (pci) be used for slab design. The subgrade soils for support of floor slabs should be prepared as outlined in subsequent sections of this report. The slab should be supported on at least 4 inches of NCDOT #57 washed stone to provide a uniformly well-compacted zone of material immediately beneath the slab. Interior building slab should be underlain by a vapor barrier to reduce the potential for floor slab dampness. Vapor barrier construction should be performed in accordance with applicable ACI guidelines.

Floor slab design and construction should incorporate isolation joints around columns, utility penetrations, and along bearing walls to allow for differential movement to occur without damage to the floor. Final slab design should be determined by the project structural engineer based on actual design loads, building code requirements and other structural considerations.

5.4 Site Seismic Classification

The following recommendations are based on the 2018 North Carolina Building Code (NCBC). Our scope of services did not include site specific soil shear wave velocity testing. F&R has evaluated the data obtained from the soil test borings for assignment of Seismic Site Class to this site.

In accordance with procedures outlined in the 2018 NC Building Code for determining Site Class, a weighted average of the soil conditions in the upper 100 feet was performed using SPT N-values with the assumption that very dense/very hard soils are present below the maximum 46.9 foot exploration depth. Based on this evaluation of the SPT N-values, the soil profile indicates a Site Class **"D"** is applicable to the project. It may be beneficial to consider performing shear wave testing to evaluate whether the site class may be upgraded to Site Class C if the upgrade would provide significant cost benefits to the project.

Although F&R has not performed a liquefaction evaluation, it is F&R's opinion that there does not appear to be a potential for liquefaction due to the presence of moderate consistency silty and clayey sands and sandy silts that typically exist over most of the site above the depths of exploration. In addition, the relatively high fines content of the finer grained silts and the silty and clayey sands encountered across the site also indicate that liquefaction is unlikely. If a detailed evaluation of liquefaction is desired, F&R would be available to perform such an evaluation at your request.

5.5 LATERALLY LOADED WALLS

The Clearwell 3, Gravity Sludge Thickener, and Superpulsator/Flash Mix structures will be partially embedded below adjacent site grades and the walls will therefore be laterally loaded. The embedment depths may be on the order of 3 to 6 feet for the Clearwell 3; 2.5 to 7.5 feet for the Superpulsator/Flash Mix; and 10 to 22 feet for the Gravity Sludge Thickener. F&R understands that the project does not contain any exterior, free standing retaining walls.

Conventional, cast-in-place concrete walls that are laterally loaded should be designed to resist applied earth pressures. Laterally loaded walls that are allowed to rotate should be designed based on active lateral earth pressures. If approved imported low plasticity silty and clayey sands (USCS – SM and SC) are used to backfill the walls, the walls should be designed using to resist active earth pressures using an active earth pressure coefficient (K_a) of 0.33. F&R recommends that an active earth pressure EFW of 60 pcf be used in design for approved imported structural fill used for wall backfill. Highly plastic clayey silts or silty clays (USCS –MH & CH) should not be used as backfill for laterally loaded walls. The above EFW is for walls that are above the groundwater table and not subject to hydrostatic pressures.

For sliding resistance along the base of retaining wall foundations, a friction factor (tan δ) of 0.30 should be utilized. For cases where passive earth pressure resisting forces are present, a passive earth pressure coefficient (k_p) of 1.5 can be used in design where foundation faces bear directly against undisturbed stiff native soils or well compacted structural fill; this coefficient incorporates a factor of safety of 2.0 to limit the amount of movement to mobilize the passive resistance. Assuming an in-situ density of approximately 120 pcf for imported structural fill, the passive earth pressure EFW would be 150 pcf. It is recommended that the upper 2 feet of soil not be considered as contributing to the passive resistance due to possible disturbances during construction (e.g., installation of utilities, re-grading, etc.).

Lateral earth pressures arising from surcharge loading, foundations in the backfill zone, earthquake loading, and groundwater should be added to the above soil earth pressures to determine the total lateral earth pressure, which the walls must resist. In addition, transient loads imposed on the walls by construction equipment during backfilling should be taken into account during design.

Compaction of backfill behind the walls should be on the order of 95 percent of the Standard Proctor maximum dry density in structural areas. In non-structural areas, backfill compaction can be reduced to 92 percent. Excessive compaction may cause damage to the walls. Walls should be adequately braced during compaction of the wall backfill. Heavy compaction equipment should not be allowed within 10 feet of the walls.

We recommend laterally loaded walls that are not designed to resist hydrostatic forces be provided with a drainage system to maintain the wall backfill in a drained condition at all times to prevent the build-up of hydrostatic pressures and intercept surface water (e.g., perched water) that could develop around the perimeter of the structure. We recommend that a 2-foot wide zone of free-draining washed stone be constructed adjacent to the back of the walls and extend down to a foundation drain (perforated drain pipe) located at the base of the footing. A geotextile filter fabric (Mirafi 180N or equivalent) should be placed between the washed stone drainage layer and the remaining backfill material. The foundation drain should be positively graded to allow drainage of any water that may collect in the wall backfill. It is assumed that the collection drain will be designed for gravity discharge of collected seepage in the backfill. It is recommended that the fabric-encased washed stone extend to within approximately 12 inches of the ground surface and be covered with more impermeable silty clayey soils in order to help prevent surface runoff or infiltration from rainfall being directed into the wall drain backfill.

5.6 PAVEMENT DESIGN

While final site plans have not been developed as of this report preparation, F&R understands additional access drives and/or roads will be constructed on the site to access new structures. At this time, the new access drives and/or roads may be designed as an asphalt surfaced drive. Based on information provided by HDR, the pavements will be subject to a limited amount of truck traffic that will include up to five 75,000 to 85,000 lb. tractor trailer heavy truck (assumed ESAL factor = 2.37) per week. An additional 30 tractor trailer heavy trucks per week arrive for sludge hauling purposes that F&R assumes occurs approximately 4 times per year.

Subgrade preparation in the proposed pavement areas should be performed as will be outlined in subsequent sections of this report. The design pavement section is dependent upon the anticipated traffic and soil subgrade strength. F&R performed pavement designs using the "NCDOT Pavement Design Procedure – AASHTO 1993 Method" dated January 4, 2019. The pavement design thickness recommendations below are based on a design life of 20 years. For the proposed pavements, a traffic volume of 1.0 daily 18-kip equivalent single axle loads (ESAL) was utilized. Due to the presence of high plasticity soils close proximity to the existing ground surface for portions of the site, a CBR value of 2 was used in the design process. Based on the above pavement design method, a required structural number of 2.26 was calculated which typically would yield a flexible pavement section over prepared subgrade consisting of 2.5 inches of surface course (Type SF9.5B) underlain by 10 inches of ABC stone resulting in a structural number of 2.50. However, due to the potential for variability in subgrade conditions, uncertainty in the ESAL factors for the expected traffic, and the potential for other traffic to use the access road, we recommend the following flexible pavement section over a prepared subgrade:

NCDOT Asphalt Surface Course, Type SF9.5C	NCDOT Asphalt Intermediate Course, Type I 19.0 B	NCDOT ABC Stone Base Course Thickness	Total Thickness
3"	-	10"	13"

5.7 Cut and Fill Slopes

While final project plans were not available as of this report preparation, if slopes are to be constructed at the site, F&R recommends designing the permanent project slopes at 3H:1V or flatter for slopes less than approximately 10.0 to 15.0 feet in height. The tops of the slopes should be located a minimum of 10.0 feet from structural limits. If steeper or higher slopes are planned, F&R should be contacted during early grading plan development to perform slope stability analyses prior to finalizing the grading plans. It is F&R's opinion that 3H:1V slopes will be stable from a slope stability standpoint provided the fill slopes are constructed of properly-compacted and tested structural fill and on subgrades approved by the geotechnical engineer. However, seepage and surface runoff may cause the slopes to slough and erode resulting in shallow surface failures. The slopes should be vegetated as soon as possible to minimize surface sloughing and erosion. A swale or shallow ditch should be constructed near the tops of slopes to prevent surface water from flowing onto the slopes. We recommend that all cut and fill slopes be observed by a geotechnical engineer or their representative during construction. Additional slope drainage and protection measures may be required in certain areas depending upon conditions observed at the time of slope construction.

6.0 GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

6.1 General Site Preparation

Initial site preparation should include removal of surficial organic soil and other deleterious materials from within the proposed development area. The initial clearing, grubbing and stripping should extend a distance of at least 5 feet beyond the building perimeter, but not less than the area within a 2H:1V slope projecting down to original grade from the perimeter of structures in fill areas, whichever is greater.

As part of general site preparation, subgrade repairs for various structures will need to be performed, and are outlined below:

Clearwell 3: Soft or very loose soils were encountered within the upper 12 feet of the soil profile in borings B-12 and B-13 in the clearwell area. The lower consistency soils are not suitable to adequately provide support of the clearwell tank and need to be repaired. Additionally, shallow PWR was encountered in borings B-14 and B-15 in the clearwell area at elevations above the proposed foundation bearing elevation. **To prevent differential settlement due to the presence of shallow PWR, and to remove the lower consistency soils beneath the proposed mat foundation, F&R recommends that the Clearwell 3 subgrade be undercut to an approximate elevation of EL 692 and backfilled with NC DOT ABC stone, No. 57 stone, or clean sand (less than 10 percent fines) to provide a stable subgrade.** To achieve this, PWR excavation will need to be performed in portions of the Clearwell 3 subgrade area. Based on the available boring data, portions of the PWR encountered may require chipping and/or blasting in order to be properly removed. Prior to excavation, dewatering of the area should be performed to a depth of approximately 3 feet below the maximum proposed excavation, or to an approximate elevation EL 689.

Gravity Sludge Thickener: Highly plastic soils were encountered in the boring B-4 in the gravity sludge thickener area. **Highly plastic soils are considered poor material for direct support of the building foundations and can become unstable at higher moisture contents; therefore, F&R recommends that a minimum of 3 feet of separation be maintained between stable high plasticity soils and proposed mat foundation subgrades by undercutting the subgrade to an approximate elevation EL 691.** The undercut high plasticity soils can be replaced with less moisture sensitive granular materials such as NC DOT ABC stone, No. 57 stone, or clean sand (less than 10 percent fines) in order to stabilize the subgrade. Dewatering of the area should be performed prior to any excavations to a depth of 3 feet below the maximum proposed excavation, or to an approximate elevation EL 688.

Superpulsator/Flash Mix: Shallow PWR was encountered in boring B-10 in the superpulsator area at depths above the proposed mat foundation bearing elevation. **To prevent differential settlement due to the presence of shallow PWR, F&R recommends that the Superpulsator/Flash Mix subgrade be undercut to an approximate elevation of EL 712.5 and backfilled with NC DOT ABC stone, No. 57 stone, or clean sand (less than 10 percent fines) to provide a stable subgrade.** To achieve this, PWR excavations will need to be performed in portions of the Superpulsator/Flash Mix area. Based on the available boring data, the PWR encountered should be rippable with heavy excavating equipment with ripping tools (e.g., D-8 dozer with single shank ripper or equivalent, and/or CAT 330 with rock teeth or equivalent).

Following stripping and subgrade repair, we recommend that all areas at or below final subgrade be observed and evaluated by the project geotechnical engineer or experienced representative working under the direction of the geotechnical engineer. The evaluation should include proofrolling exposed subgrades with a loaded tandem axle dump truck, scraper, or other similar heavy construction equipment to confirm the stability of the subgrade soils and detect the presence of soft or unstable areas. If proofrolling reveals unstable conditions, the method of repair should be as directed by the project geotechnical engineer. Methods of repair may include, but are not necessarily limited to: drying and re-compaction; undercutting and replacement with suitable structural fill; use of geo-textiles and/or geo-grids with select fill; use of lime stabilization; or other methods deemed appropriate by the project geotechnical engineer.

The on-site soils have sufficient silt/clay content to render them moisture sensitive. The on-site soils will become unstable (i.e., pump and rut) during normal construction activities when in the presence of excess moisture. Soils with a moisture content greater than 3 percentage points above the optimum moisture content are generally considered to have excessive moisture. During earthwork and construction activities, surface water runoff must be drained away from the construction areas to prevent water from ponding on or saturating the soils within excavations or on subgrades. This is especially important considering the moisture sensitivity of the soils at this site.

6.2 STRUCTURAL FILL PLACEMENT AND COMPACTION

It is expected that the low to moderate plasticity sandy silts and clayey and silty sands can be used as structural fill material. Low plasticity soils (USCS – ML, CL, SC, and SM) are generally considered fair to good materials for use as structural earth fill. Highly plastic clay and clayey silts (CH and MH) are considered poor materials for re-use as structural fill, and it is generally recommended that these materials be used in landscaped areas or in deeper roadway fills provided they are at a moisture content to achieve proper compaction. Based on the results obtained in the soil test borings, it is unlikely that the on-site shallow cut soils will be wet. As such, it is not anticipated that drying of cut soils will be required in order to properly compact these soils as structural fill. The grading contractor should be prepared to moisture condition soils prior to use as structural fill. As such, it is recommended that earthwork be performed during the seasonally drier late spring to early fall months (typically May through October) when weather conditions are more conducive to moisture conditioning of fill materials.

Structural earth fill should be compacted at a moisture content within $\pm$3 percentage points of the optimum moisture content. All structural earth fill should be placed in loose lifts not exceeding 8 inches and be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D-698. The top 12 inches of fill should be compacted to at least 98 percent of the Standard Proctor maximum dry density. All areas requiring grade increases that are steeper than a slope of 4H:1V should be plowed, stepped and leveled to assure that fill is placed on near level surfaces. All structural fill material should be placed and compacted under the full-time observation of a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer. The placement and compaction of all fill material should be tested at frequent intervals in order to confirm that the recommended degree of compaction is being achieved.

If imported borrow is required to grade the site, it should consist of granular or low plasticity soils (LL<35, PI <20) that have a maximum dry density of at least 100 pcf. F&R should approve borrow soils prior to them being transported to the site.

Excavated, ripped, or blasted PWR may also be used as structural fill material. Typically, the process of mechanical excavation, spreading with a dozer, and compacting with a large sheepsfoot roller will break down softer PWR into suitable particle sizes. Special placement and compaction procedures for the PWR should be provided by the project geotechnical engineer prior to earthwork operations. However, we generally recommend that the maximum particle size not exceed 3 inches. It is especially important when using PWR as structural fill to assure that there are no voids, and that rock pieces are not placed on top of each other or nested. All structural fill (soil/PWR) placement and compaction activities should be observed on a full-time basis by a geotechnical engineer or qualified engineering technician working under the supervision of the geotechnical engineer.

6.3 DEWATERING

As previously mentioned, groundwater was encountered in nine (9) borings at depths ranging from 4.0 to 31.9 feet. Additionally, wet and/or saturated soil conditions were encountered in ten (10) borings at depths ranging from 2.0 to 13.5 feet and extended to depths ranging from 3.5 to 23.5 feet below the existing ground surface. Once encountered, wet and/or saturated soil conditions generally extended until encountering PWR and/or to boring termination depths. As such, it is anticipated wet soils and/or groundwater may be encountered during construction in some areas and dewatering may be necessary in order to maintain drained, stable excavations and to prevent softening/loosening of the excavation subgrades. The groundwater should be lowered to a depth of at least 3 to 4 feet below the bottoms of the excavations. However, groundwater elevations will likely vary throughout the year, and will be elevated especially during the seasonally-wet months (October through April). If groundwater is encountered, dewatering may be able to be handled by sump and pumping techniques. However during periods of inclement weather, sump pits and pumping may not be sufficient to control both groundwater and surface water, and more extensive drainage/dewatering measures may be required. The method of surface water and groundwater control should be determined and designed by the contractor, but may require well points, sheet piling, or other means.

It should be noted that if groundwater levels are not effectively maintained below the base of the excavations during construction, unstable and loosened subgrade conditions could develop, which may cause excessive settlements to develop beneath the water line or require additional subgrade repair (*e.g.,* densification, undercutting & replacement with washed stone, etc.). Therefore, efforts should be incorporated in the construction sequence to properly control groundwater levels during construction. Additionally, it is recommended that only excavation contractors experienced in similar excavations and groundwater control should be allowed to perform this work.

6.4 PWR Excavation

Partially Weathered Rock (PWR) was encountered in nine (9) borings in the upper 12 feet of the soil profile and is expected to be encountered during grading and excavations in portions of the Clearwell 3 and Superpulsator/Flash Mix or in areas of utility excavations depending upon proposed invert elevations. It should also be noted that the surface of the PWR can vary in this geologic setting (as evidenced by the test borings) and as such, there is a possibility that PWR and/or hard rock could be encountered at shallow depths in unexplored areas of the site.

Mass Grading: Where PWR is encountered in mass grading areas, heavy excavating equipment with ripping tools (e.g., D-8 dozer with single shank ripper or equivalent) is typically effective in removing PWR with N-values of 50/3” to 50/6”. However, removal of harder PWR (i.e., PWR with N-values of 50/0” to 50/2”) and hard rock during mass grading in open areas will not likely be possible with ripping equipment and may require hammering, chipping, or blasting.

Trench/Foundation Excavation: Removal of softer PWR with N-values of 50/4” to 50/6” from confined excavations (e.g., utility excavations) may be able to be accomplished using a large track hoe (e.g., CAT 330 with rock teeth or equivalent); however, excavation will likely be slow. Removal of PWR with N-values of 50/0” to 50/3” and hard rock in confined excavations will not likely be possible with conventional equipment and typically requires hammering, chipping, or blasting.

6.5 Foundation Construction Recommendations

We recommend that all foundation subgrades and bearing grades be observed by a qualified geotechnical engineer or their representative prior to placement of reinforcing steel and concrete. The purpose of the engineering observation would be to determine that the foundations bear in suitable soils at the proper embedment depths, and that unsuitable soft or loose materials are undercut and backfilled with approved structural fill material. Hand auguring and Dynamic Cone Penetrometer (DCP) testing should be performed at the direction of the project geotechnical engineer to verify the consistency of the subgrade soils and underlying support soils.

It is recommended that a smooth bladed backhoe bucket be used to remove the final 6 to 12 inches of soils above the subgrade in order to prevent disturbing soils below the subgrade and/or prevent gouging narrow grooves in the subgrade as may occur with a toothed-end bucket.

If soft, very loose, or otherwise unsuitable soils are encountered at the subgrade elevation, undercutting and repair may be required. If undercutting is performed, the undercut excavations should be backfilled with materials approved by the project geotechnical engineer. We anticipate that most undercuts can be backfilled with clean sands (less than 10 percent fines), NCDOT ABC stone, and/or No. 57 washed stone up to the planned subgrade. If ABC stone is utilized, it may be placed in 12 inch thick lifts and compacted to at least 93 percent of the Modified Proctor maximum dry density (ASTM D-1557). If clean sand is used, it may be placed in a single 8 to 12 inch thick lifts and compacted to at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698). The washed stone thickness should not exceed 2 feet before the surface of the washed stone is densified with a heavy vibratory plate compactor to the satisfaction of the geotechnical engineer or their representative. In some circumstances, the geotechnical engineer may recommend that the undercuts be backfilled with lean concrete or flowable fill.

Exposure to the environment may weaken the soils at the subgrade level if excavations remain open for long periods of time. The subgrade surface should be level or suitably benched and free of loose soil, ponded water, and debris. If the subgrade soils are softened by surface water intrusion or exposure, the softened soils must be removed from the excavation immediately prior to placement of concrete. Excavations must be maintained in a drained/de-watered condition throughout the foundation construction process. If the foundation excavations must remain open overnight, or if rainfall becomes imminent while the subgrade soils are exposed, we strongly recommend that a 2 to 3 inch thick “mud mat” of lean concrete (2,000 psi) be placed on the subgrade before placing the reinforcing steel. In addition, F&R stresses the need for positive perimeter surface drainage around structure areas to direct all runoff water away from structures and foundations.

6.6 SLAB-ON-GRADE CONSTRUCTION RECOMMENDATIONS

The subgrade soils for support of floor slabs should be prepared as outlined in sections 6.1 and 6.2 of this report. Utility and other construction excavations performed in the prepared slab subgrade should be backfilled with properly compacted structural fill to aid in providing uniform slab support. Prior to base course placement, the subgrade should be evaluated by the project engineer and soft, wet, or otherwise unsuitable subgrade soils should be removed. To reduce the risks of unsightly slab cracking, F&R recommends that concrete quality control testing be performed during concrete placement, control joints (as designed by the structural engineer) be cut into the slab as soon as possible after the concrete placement, and the slab be cured as appropriate for the prevailing weather conditions.

6.7 PAVEMENT CONSTRUCTION RECOMMENDATIONS

Pavement subgrades should be prepared as outlined in previous sections of this report. All base course stone beneath flexible pavement, or if a full depth ABC stone section is selected, should be compacted to at least 100 percent of the modified Proctor maximum dry density (ASTM D-1557).

We emphasize that good base course drainage is essential for successful pavement performance. The ABC stone should be maintained in a drained condition at all times. Water build-up in the base course could result in premature failures. Proper drainage may be aided by the construction of swales adjacent to pavements and by grading the site such that surface water is directed away from pavements. All pavements should be graded such that surface water is directed towards the outer limits of the paved areas or to catch basins located such that surface water does not remain on the pavement.

Flexible asphalt pavements and bases should be constructed in accordance with the guidelines of the latest applicable NCDOT Standard Specifications for Roads and Structures. Materials, weather limitations, placement and compaction are specified under appropriate sections of this publication.

6.8 TEMPORARY EXCAVATION RECOMMENDATIONS

Mass excavations and other excavations required for construction of this project should be performed in accordance with the United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring requirements. The OSHA guidelines require daily inspections of excavations, adjacent areas and protective systems by a "competent person" for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions. All excavated soils, equipment, building supplies, etc., should be placed away from the edges of the excavation at a distance equaling or exceeding the depth of the excavation. F&R cautions that the actual excavation slopes will need to be evaluated frequently each day by the "competent person" and flatter slopes or the use of shoring may be required to maintain a safe excavation depending upon excavation specific circumstances. The contractor is responsible for providing the "competent person" and all aspects of site safety. F&R can evaluate specific excavation slope situations if we are informed and requested by the owner, designer or contractor's "competent person".

F&R assumes that most excavation at this site will be open excavations that are safely sloped. If insufficient space is available to use a sloped or benched excavation, then some type of excavation support (shoring) system will be required to keep the sides of the deep excavation stable. Shoring systems such as soldier pile walls (with lagging and tie-back anchors), internally braced sheeting and soil nailing are appropriate shoring systems where space is limited. All shoring systems should be designed and installed by a specialty contractor retained by the contractor. The shoring system design, including assumptions, calculations, plans, specifications and testing requirements, should be prepared by a licensed professional engineer retained by the contractor and submitted for review.

7.0 CONTINUATION OF SERVICES

As previously discussed, a geotechnical engineer should be retained to monitor and test earthwork activities, and observe subgrade preparations for slopes, foundations, floor slabs, and pavements. It should be noted that the actual soil conditions at the various subgrade levels and footing bearing grades will vary across this site and thus the presence of the geotechnical engineer and/or his representative during construction will serve to validate the subsurface conditions and recommendations presented in this report. A geotechnical engineer should be employed to monitor the earthwork and foundation construction, and to report that the recommendations contained in this report are completed in a satisfactory manner. The continued geotechnical engineering involvement on the project will aid in the proper implementation of the recommendations discussed herein. The following is a recommended scope of services:

- Review of project plans and construction specifications to verify that the recommendations presented in this report have been properly interpreted and implemented;
- Observe the earthwork process to document that subsurface conditions encountered during construction are consistent with the conditions anticipated in this report;
- Observe the subgrade conditions before placing structural fill including proofroll observations;
- Observe the placement and compaction of any structural fill and backfill, and perform laboratory and field compaction testing of the fill;
- Observe all foundation excavations and tank, mat, and spread foundation subgrades for compliance with the recommended design soil bearing capacity. We also stress the importance of conducting hand auger and DCP testing at, and extending several feet below, the subgrade in order to give an indication of the anticipated subsurface conditions and define areas that should be undercut and repaired as outlined in this report; and,
- Perform additional explorations across the site, if considered necessary depending on finalized design considerations including building and other structure layouts, finished grades and building/structure loads.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of HDR. for specific application to the referenced project. This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. Our evaluations and recommendations are based on design information furnished to us; the data obtained from the subsurface exploration program, and generally accepted geotechnical engineering practice. The evaluations and recommendations do not reflect variations in subsurface conditions which could exist intermediate of the boring locations or in unexplored areas of the site.

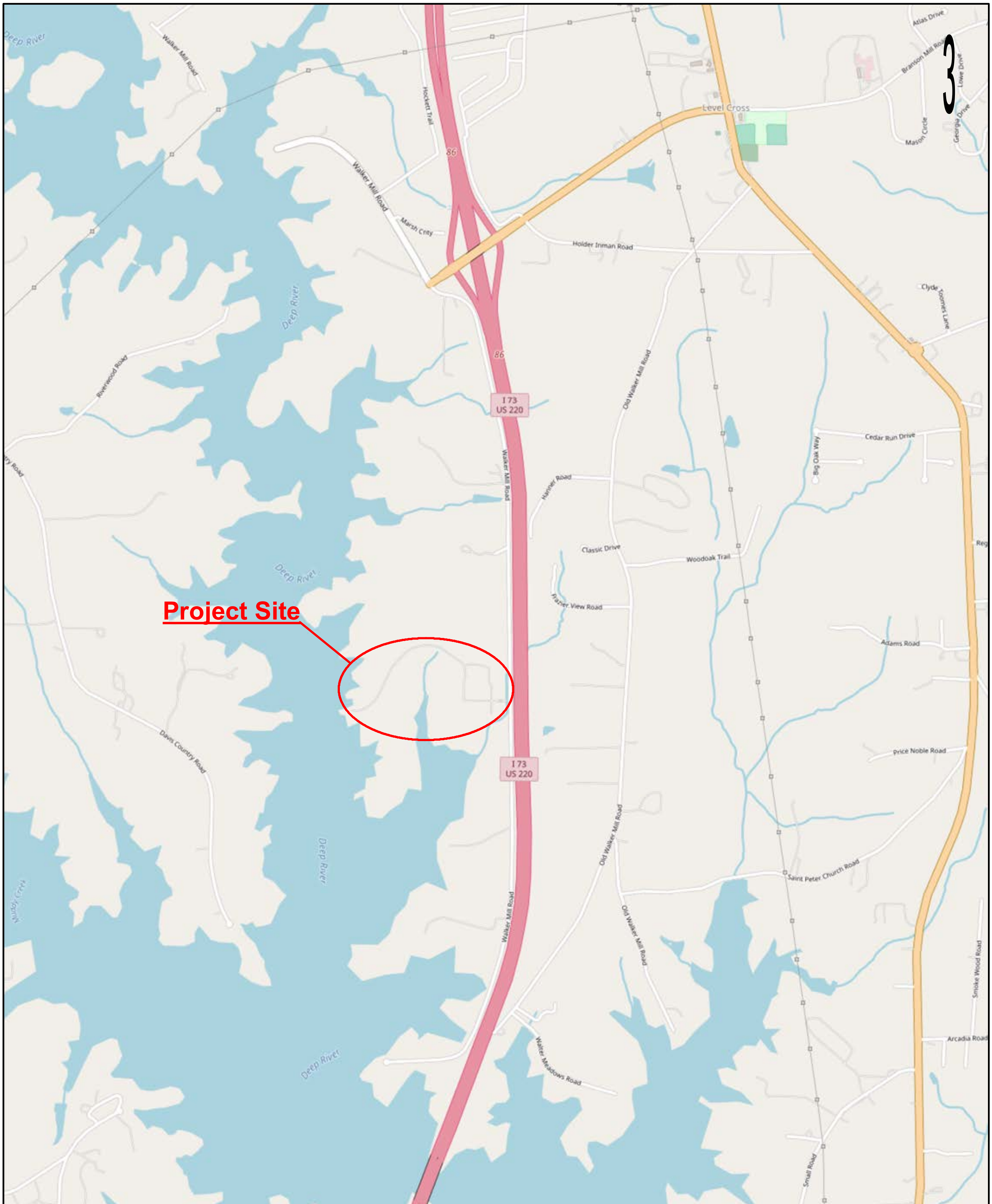
There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by GBA, which is included in Appendix IV. We ask that you please review this GBA information.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork, pavement, and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the proposed construction, the recommendations presented in the report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified and/or verified in writing. If this report is copied or transmitted to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

APPENDIX I

FIGURES



Site Vicinity Map

0 500 1,000 2,000 3,000 4,000 Feet

FROEHLING & ROBERTSON
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310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	HDR
Project:	PTRWA BES Site
Location	Randleman, Randolph County, NC
Project Number:	66A-0144
Data:	Open Street
Date:	May 2023
Scale:	1 inch = 2,000 feet

FIGURE No.: 1

Boring Location Plan

0 75 150 300 450 600 Feet

FROEHLING & ROBERTSON
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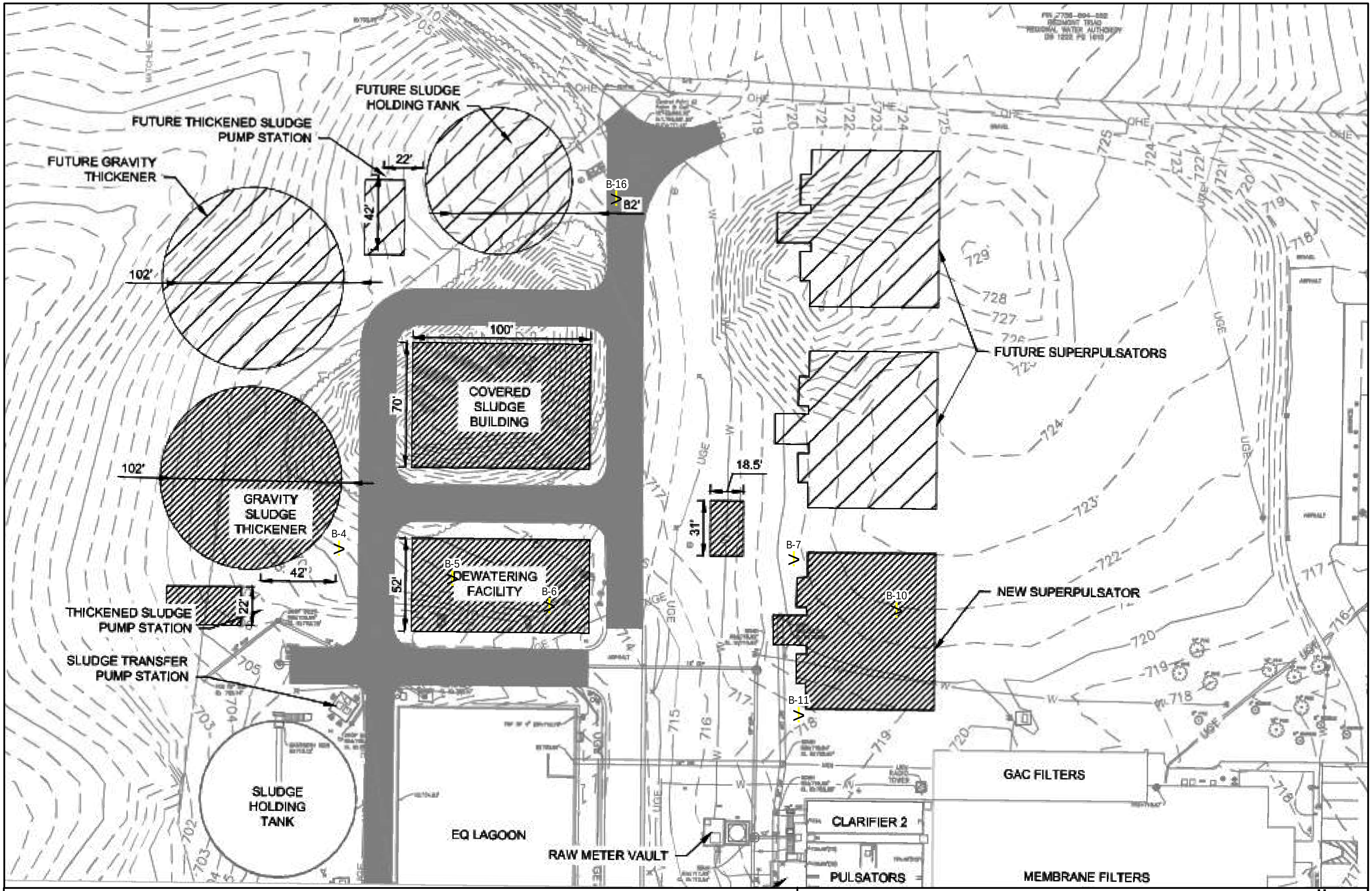
310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	HDR
Project:	PTRWA BES Site
Location	Randleman, Randolph County, NC
Project Number:	66A-0144
Data:	NCOne Map Aerial 2018
Date:	May 2023
Scale:	1 inch = 300 feet

FIGURE No.: 2A



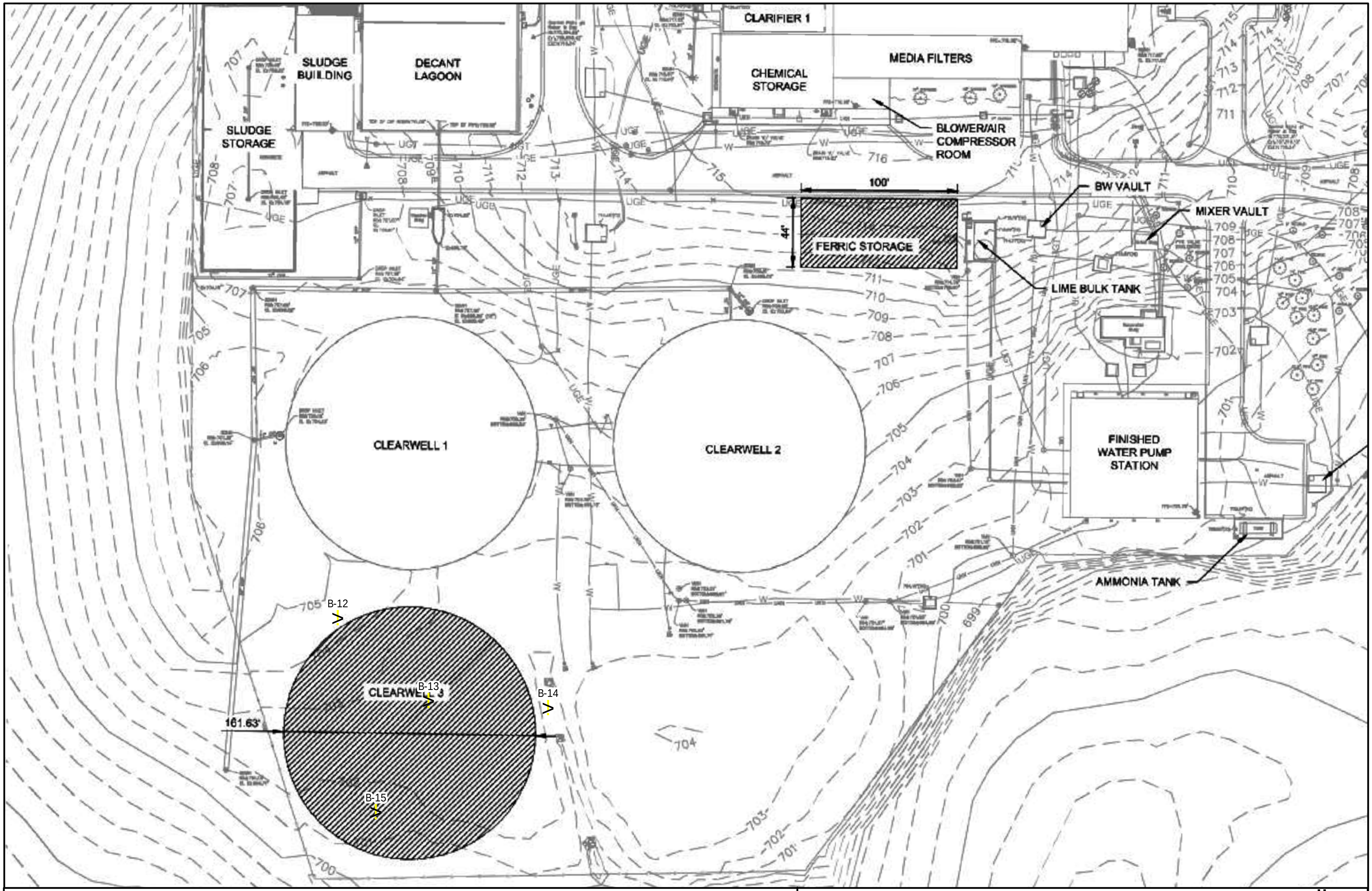
Boring Location Plan

FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	HDR
Project:	PTRWA BES Site
Location	Randleman, Randolph County, NC
Project Number:	66A-0144
Data:	Client Provided Plan
Date:	May 2023
Scale:	1 inch = 75 feet

FIGURE No.: 2B



Boring Location Plan

FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	HDR
Project:	PTRWA BES Site
Location	Randleman, Randolph County, NC
Project Number:	66A-0144
Data:	Client Provided Plan
Date:	May 2023 — Scale: 1 inch = 85 feet

FIGURE No.: 2C

FROEHLING & ROBERTSON
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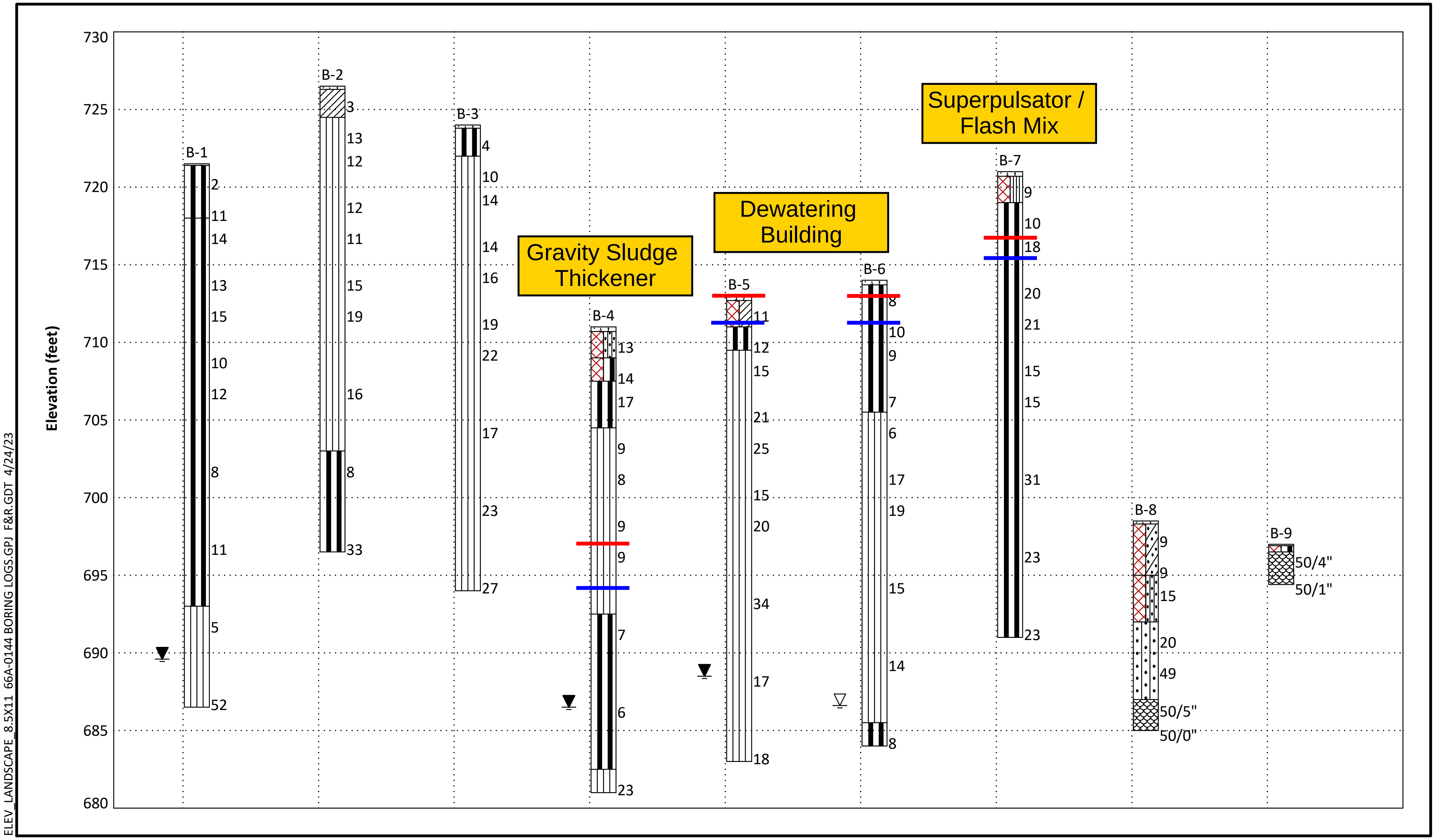
SUBSURFACE PROFILE

Plot Based on Elevation
Profile Name: Figure No. 3

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

= Approximate Proposed Finished Floor Elevation

= Approximate Proposed Foundation Bearing Elevation



ELEV_LANDSCAPE 8.5X11 66A-0144 BORING LOGS.GPJ F&R.GDT 4/24/23

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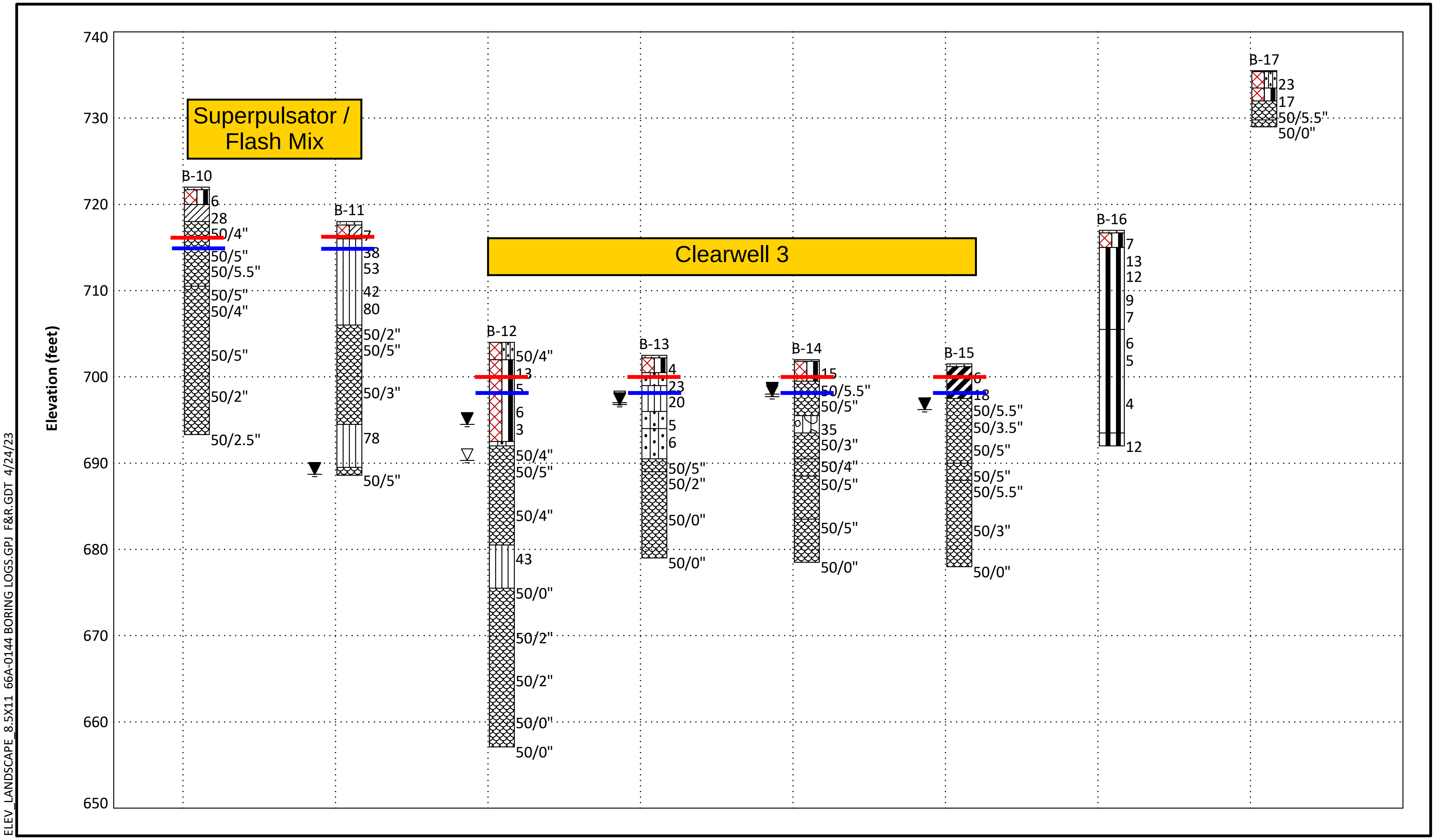
SUBSURFACE PROFILE
Plot Based on Elevation
Profile Name: Figure No. 4

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

= Approximate Proposed Finished Floor Elevation

= Approximate Proposed Foundation Bearing Elevation



APPENDIX II

BORING LOGS

Table 1: Boring Coordinates		
Boring	Northing	Easting
B-1	770998	1756777
B-2	771005	1756850
B-3	770949	1756812
B-4	770624	1756521
B-5	770607	1756585
B-6	770591	1756640
B-7	770618	1756778
B-8	770168	1755015
B-9	770114	1754994
B-10	770589	1756836
B-11	770530	1756781
B-12	770023	1756538
B-13	769970	1756596
B-14	769966	1756672
B-15	769899	1756562
B-16	770821	1756678
B-17	771149	1756048

KEY TO SOIL CLASSIFICATION

Correlation of Penetration Resistance with Relative Density and Consistency

Sands and Gravels

No. of Blows, N	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
Over 50	Very dense

Silts and Clays

No. of Blows, N	Relative Density
0 - 2	Very soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very stiff
31 - 50	Hard
Over 50	Very hard

Particle Size Identification (Unified Classification System)

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	**Coarse** - 3/4 to 3 inches diameter **Fine** - 4.76 mm to 3/4 inch diameter
Sand:	**Coarse** - 2.0 mm to 4.76 mm diameter **Medium** - 0.42 mm to 2.0 mm diameter **Fine** - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

Approximate Content	Modifiers
≤ 5%:	Trace
5% to 12%:	Slightly silty, slightly clayey, slightly sandy
12% to 30%:	Silty, clayey, sandy
30% to 50%:	Very silty, very clayey, very sandy

Field Moisture	Description
Saturated:	Usually liquid; very wet, usually from below the groundwater table
Wet:	Semisolid; requires drying to attain optimum moisture
Moist:	Solid; at or near optimum moisture
Dry:	Requires additional water to attain optimum moisture

Ground Water

▽ Water Level in Bore Hole Immediately after Drilling

▼ Static Water Level after 24 Hours

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION					*TYPICAL NAMES*
	GRAVELS More than 50% of coarse fraction larger than No. 4 sieve	*CLEAN GRAVEL* (little or no fines)		GW	Well graded gravels
				GP	Poorly graded gravels
		GRAVELS with fines		GM	Silty gravels
				GC	Clayey gravels
	SANDS More than 50% of coarse fraction smaller than No. 4 sieve	*CLEAN SAND* (little or no fines)		SW	Well graded sands
				SP	Poorly graded sands
		SAND with fines		SM	Silty sands, sand/silt mixtures
				SC	Clayey sands, sand/clay mixtures
	SILTS AND CLAYS Liquid Limit is less than 50			ML	Inorganic silts, sandy and clayey silts with slightly plasticity
				CL	Sandy or silty clays of low to medium plasticity
				OL	Organic silts of low plasticity
	SILTS AND CLAYS Liquid Limit is greater than 50			MH	Inorganic silts, sandy micaceous or clayey elastic silts
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils
MISCELLANEOUS MATERIALS					PWR (Partially Weathered Rock)
					Rock
					Asphalt
					ABC Stone
					Concrete
					Surficial Organic Soil

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Engineering Stability Since 1881

BORING LOG

Boring: B-1 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 721.5 ±
Total Depth: 35.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/28/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
721.4	0.1	SURFICIAL ORGANIC SOILS	WOH-1-1	0.0 - 1.5	2	GROUNDWATER DATA: 0 Hr: Dry inside PVC; 24 Hrs: 31.9' inside PVC
		RESIDUAL: Very Soft to Stiff, Moist, Light Brown and Red-Brown, Clayey SILT (MH) with Fine Sand and Roots	3-4-7	2.0 - 3.5	11	
718.0	3.5	Firm to Very Hard, Moist to Wet, Red-Brown, Yellow-Brown, and Gray, Clayey SILT (MH) with Trace Fine Sand	3-6-8	3.5 - 5.0	14	
			3-6-7	6.5 - 8.0	13	
			3-6-9	8.5 - 10.0	15	
			3-4-6	11.5 - 13.0	10	
			3-5-7	13.5 - 15.0	12	
			2-3-5	18.5 - 20.0	8	
		Wet at 23.5'	3-4-7	23.5 - 25.0	11	
693.0	28.5	Firm to Very Hard, Wet, Brown, Clayey SILT (ML)	1-3-2	28.5 - 30.0	5	
			11-17-35	33.5 - 35.0	52	
686.5	35.0	Boring Terminated at 35.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING_LOG 66A-0144 BORING LOGS.GPJ F&R.GDT 4/24/23

BORING LOG

Boring: B-2 (1 of 1)

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Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 726.5 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/28/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
726.3	0.2	SURFICIAL ORGANIC SOILS	1-1-2	0.0 - 1.5	3	GROUNDWATER DATA: 0 Hr: Dry, Caved at 26.4'; 24 Hrs: Dry, Caved at 26.3'
		RESIDUAL: Soft, Moist, Red-Brown, Slightly Silty CLAY (CL) with Trace Roots				
724.5	2.0	Firm to Hard, Moist to Wet, Orangish Tan, SILT (ML) with Trace Clay and Trace Fine Sand	3-6-7	2.0 - 3.5	13	
			3-5-7	3.5 - 5.0	12	
			6-6-6	6.5 - 8.0	12	
			3-4-7	8.5 - 10.0	11	
			4-6-9	11.5 - 13.0	15	
			3-9-10	13.5 - 15.0	19	
		Wet at 18.5'	3-7-9	18.5 - 20.0	16	
703.0	23.5	Firm to Hard, Wet, Light Gray and Brown, Clayey SILT (MH) with Trace Fine Sand	3-3-5	23.5 - 25.0	8	
			9-12-21	28.5 - 30.0	33	
696.5	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-3 (1 of 1)

FROEHLING & ROBERTSON
Engineering Stability Since 1881

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 724 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/28/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
723.8	0.2	SURFICIAL ORGANIC SOILS	1-1-3	0.0 - 1.5	4	GROUNDWATER DATA: 0 Hr: Dry, Caved at 25.8' 24 Hrs: Dry, Caved at 25.7'
722.0	2.0	RESIDUAL: Soft, Red-Brown, Moist, Clayey SILT (MH) with Trace Sand and Roots				
		Stiff to Very Stiff, Moist to Wet, Light Gray-Green, Red-Brown, and Light Brown, Slightly Clayey SILT (ML) with Trace Fine Sand	2-4-6	2.0 - 3.5	10	
			4-7-7	3.5 - 5.0	14	
			3-5-9	6.5 - 8.0	14	
			5-6-10	8.5 - 10.0	16	
			6-8-11	11.5 - 13.0	19	
			5-8-14	13.5 - 15.0	22	
			4-8-9	18.5 - 20.0	17	
			6-11-12	23.5 - 25.0	23	
		Wet at 28.5'	11-13-14	28.5 - 30.0	27	
694.0	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-4 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 711 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/21/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
710.7	0.3	SURFICIAL ORGANIC SOILS	2-5-8	0.0 - 1.5	13	GROUNDWATER DATA: 0 Hr: Dry, Caved at 27.3' 24 Hrs: 24.5', Caved at 25.0'
709.0	2.0	FILL: Medium Dense, Moist, Brown and Blue-Gray, Slightly Clayey Silty Fine to Coarse SAND (SM) with Fine to Coarse Gravel and Trace Roots	7-7-7	2.0 - 3.5	14	
707.5	3.5	Stiff, Moist, Red-Brown, Clayey SILT (MH) with Trace Fine to Coarse SAND	5-7-10	3.5 - 5.0	17	
		RESIDUAL: Very Stiff, Moist, Red-Yellow-Brown, Clayey SILT (MH) with Trace Fine to Coarse SAND				
704.5	6.5	Firm to Very Stiff, Moist to Wet, SILT (ML) with Trace Clay and Trace Fine to Medium Sand	3-4-5	6.5 - 8.0	9	
			2-3-5	8.5 - 10.0	8	
			3-3-6	11.5 - 13.0	9	
		Wet at 13.5'	2-4-5	13.5 - 15.0	9	
692.5	18.5	Firm, Wet, Orangish Brown, Clayey SILT (MH)	2-3-4	18.5 - 20.0	7	
			2-2-4	23.5 - 25.0	6	
682.5	28.5	Very Stiff, Wet, Gray, Clayey SILT (ML) with Trace Fine Sand	5-9-14	28.5 - 30.0	23	
681.0	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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BORING LOG

Boring: B-5 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 713 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/21/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
712.7	0.3	SURFICIAL ORGANIC SOILS	2-6-5	0.0 - 1.5	11	GROUNDWATER DATA: 0 Hr: Dry inside PVC 24 Hrs: 24.5', Caved at 24.0'
711.0	2.0	FILL: Stiff, Wet, Blue-Gray and Red-Brown, Fine to Coarse Sandy CLAY (CL) with Silt and Trace Fine to Coarse Gravel	4-5-7	2.0 - 3.5	12	
709.5	3.5	RESIDUAL: Stiff, Moist, Red and Light Yellow-Brown, Clayey SILT (MH) with Fine to Medium Sand	4-6-9	3.5 - 5.0	15	
		Stiff to Hard, Moist to Wet, Light Brown, Light Red-Brown, and Light Red-Yellow-Brown, SILT (ML) with Trace Clay and Trace Fine Sand	6-9-12	6.5 - 8.0	21	
			7-11-14	8.5 - 10.0	25	
			6-6-9	11.5 - 13.0	15	
		Wet at 13.5'	5-9-11	13.5 - 15.0	20	
			8-13-21	18.5 - 20.0	34	
			8-8-9	23.5 - 25.0	17	
			6-7-11	28.5 - 30.0	18	
683.0	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING_LOG 66A-0144 BORING LOGS.GPJ F&R.GDT 4/24/23

BORING LOG

Boring: B-6 (1 of 1)

FROEHLING & ROBERTSON
Engineering Stability Since 1881

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 714 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/21/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
713.7	0.3	SURFICIAL ORGANIC SOILS	2-3-5	0.0 - 1.5	8	GROUNDWATER DATA: 0 Hr: 27.4', Caved at 27.5' 24 Hrs: 19.5', Caved at 19.5'
		RESIDUAL: Firm to Very Stiff, Moist, Red-Brown, Light Brown, and Brown, Clayey SILT (MH) with Trace Fine to Medium Sand	2-4-6	2.0 - 3.5	10	
			2-4-5	3.5 - 5.0	9	
			3-3-4	6.5 - 8.0	7	
705.5	8.5	Moist, Red-Brown to Gray, Clayey SILT (ML) with Trace Fine Sand	2-2-4	8.5 - 10.0	6	
			6-7-10	11.5 - 13.0	17	
			5-8-11	13.5 - 15.0	19	
			4-6-9	18.5 - 20.0	15	
			4-5-9	23.5 - 25.0	14	
685.5	28.5	Firm, Wet, Grayish Yellow Clayey SILT (MH)	3-3-5	28.5 - 30.0	8	
684.0	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-7 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 721 ±
Total Depth: 30.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/27/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
720.7	0.3	SURFICIAL ORGANIC SOILS	2-4-5	0.0 - 1.5	9	GROUNDWATER DATA: 0 Hr: Dry, Caved at 24.5' 24 Hrs: Dry, Caved at 23.5'
719.0	2.0	POSSIBLE FILL: Stiff, Moist, Red-Brown, SILT (ML) with Fine Sand and Trace Roots	4-4-6	2.0 - 3.5	10	
		RESIDUAL: Stiff to Hard, Moist, Red-Brown, Light Gray, and Brown, Clayey SILT (MH) with Fine Sand and Trace Mica	4-8-10	3.5 - 5.0	18	
			4-8-12	6.5 - 8.0	20	
			7-9-12	8.5 - 10.0	21	
			3-6-9	11.5 - 13.0	15	
			3-6-9	13.5 - 15.0	15	
			9-13-18	18.5 - 20.0	31	
			6-9-14	23.5 - 25.0	23	
			6-10-13	28.5 - 30.0	23	
691.0	30.0	Boring Terminated at 30.0 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-8 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 698.5 ±
Total Depth: 13.5'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/28/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
698.3	0.2	SURFICIAL ORGANIC SOILS	2-5-4	0.0 - 1.5	9	GROUNDWATER DATA: 0 Hr: Dry inside PVC 24 Hrs: Dry inside PVC
		FILL: Loose, Moist, Brown, Very Clayey Fine to Coarse SAND (SC) with Silt, Fine to Coarse Gravel, and Trace Roots	2-3-6	2.0 - 3.5	9	
695.0	3.5	POSSIBLE FILL: Medium Dense, Moist, Light Brown and Yellow-Brown, Very Silty Fine to Coarse SAND (SM) with Fine to Coarse Gravel and Trace Roots	8-7-8	3.5 - 5.0	15	
692.0	6.5	RESIDUAL: Medium Dense to Dense, Moist, Light Brown, Brown, and Red-Brown, Very Silty Fine to Coarse SAND (SM) with Trace Clay and Trace Rock Fragments	4-8-12	6.5 - 8.0	20	
			18-24-25	8.5 - 10.0	49	
687.0	11.5	PARTIALLY WEATHERED ROCK: Sampled as Dry to Moist, Gray, Silty Fine to Coarse SAND with Fine to Coarse Rock Fragments	50/5"	11.5 - 11.9	100+	
685.0	13.5	Boring Terminated by Auger Refusal at 13.5 feet.	50/0"	13.5	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-9 (1 of 1)

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Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 697 ±
Total Depth: 2.6'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/28/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
696.9	0.1	SURFICIAL ORGANIC SOILS	5-50/4"	0.0	100+	GROUNDWATER DATA:
696.5	0.5	POSSIBLE FILL: Firm, Moist, Red-Brown and Light Brown, Fine to Coarse Sandy Clayey SILT (MH) with Trace Rock Fragments		0.8		0 Hr: Dry, Caved at 0.6'
		PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Gray and Red-Brown, Fine to Coarse SAND with Clay and Fine to Coarse Gravel				24 Hrs: Dry, Caved at 0.6'
			18-50/1"	2.0	100+	
694.4	2.6	Boring Terminated by Auger Refusal at 2.6 feet.		2.6		

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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BORING LOG

Boring: B-10 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 722 ±
Total Depth: 28.7'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/27/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)
721.7	0.3	SURFICIAL ORGANIC SOILS
720.0	2.0	FILL: Firm, Moist, Brown, Clayey SILT (MH) with Fine to Coarse Sand, Trace Fine Gravel, and Trace Roots
718.0	4.0	RESIDUAL: Very Stiff, Moist, Green-Brown and Green-Gray, Slightly Silty CLAY (CL) with Fine to Medium Sand
710.5	11.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Brown and Green-Gray, Fine to Medium Very Sandy SILT
693.3	28.7	PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Brown and Brown, Very Silty SAND with Trace Fine to Coarse Rock Fragments
		Boring Terminated at 28.7 feet.

* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)
2-2-4	0.0 – 1.5	6
2-8-20	2.0 – 3.5	28
24-45-50/4"	3.5 – 4.8	100+
40-50/5"	6.5 – 7.4	100+
50/5.5"	8.5	100+
50/5"	11.5	100+
50/4"	13.5	100+
50/5"	18.5	100+
50/2"	23.5	100+
50/2.5"	28.5	100+

Remarks:
GROUNDWATER DATA:
0 Hr: Dry inside PVC
24 Hrs: Dry inside PVC

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-11 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 718 ±
Total Depth: 29.4'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/27/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
717.6	0.4	SURFICIAL ORGANIC SOILS	2-3-4	0.0 – 1.5	7	GROUNDWATER DATA: 0 Hr: Dry inside PVC; 24 Hrs: 29.3' inside PVC
716.0	2.0	FILL: Firm, Moist, Brown, Slightly Silty CLAY (CL) with Fine to Coarse Sand and Trace Roots	8-17-21	2.0 – 3.5	38	
		RESIDUAL: Hard to Very Hard, Moist, Light Green-Gray, Fine Slightly Sandy SILT (ML)	14-22-31	3.5 – 5.0	53	
			12-18-24	6.5 – 8.0	42	
			16-30-50	8.5 – 10.0	80	
706.0	12.0		14-50-50/2"	11.5 – 12.7	100+	
		PARTIALLY WEATHERED ROCK: Sampled as Moist, Light Green-Gray, Fine to Medium Sandy SILT	50/5"	13.5	100+	
			49-50/3"	18.5 – 19.3	100+	
694.5	23.5	RESIDUAL: Very Hard, Moist, Brown, SILT (ML) with Trace Fine Sand and Trace Clay	17-28-50	23.5 – 25.0	78	
689.5	28.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Light Green-Gray, Fine to Medium Very Sandy SILT	50-50/5"	28.5 – 29.4	100+	
688.6	29.4	Boring Terminated at 29.4 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING_LOG 66A-0144 BORING LOGS.GPJ F&R.GDT 4/24/23

BORING LOG

FROEHLING & ROBERTSON
Engineering Stability Since 1881

Boring: B-12 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 704 ±
Total Depth: 46.9'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/20/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Very Dense, Moist, Green-Gray and Brown, Very Silty Fine to Coarse SAND (SM) with Clay and Fine to Coarse Gravel	17-50/4"	0.0 / 1.5	100+	GROUNDWATER DATA: 0 Hr: 13.7' inside PVC 24 Hrs: 9.5' inside PVC
702.0	2.0	Soft to Firm, Moist, Brown, Clayey SILT (MH) with Fine to Coarse Sand and Trace Fine Gravel	14-9-4	2.0 / 3.5	13	
			3-2-3	3.5 / 5.0	5	
			2-3-3	6.5 / 8.0	6	
			1-1-2	8.5 / 10.0	3	
692.5	11.5	RESIDUAL: Medium Dense, Moist, Brown and Green-Brown, Silty Fine to Coarse SAND (SM)	19-37-50/4"	11.5 / 12.8	100+	
692.0	12.0	PARTIALLY WEATHERED ROCK: Sampled as Moist, Brown and Green-Brown, Very Silty Fine to Coarse SAND	39-50/5"	13.5 / 14.4	100+	
			41-42-50/4"	18.5 / 19.8	100+	
680.5	23.5	RESIDUAL: Hard, Moist, Brown and Green-Brown, Slightly Clayey SILT (ML) with Fine to Coarse Sand	24-17-26	23.5 / 25.0	43	
675.5	28.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Gray, Fine to coarse Sandy SILT with Fine to Coarse Rock Fragments	50/0"	28.5	100+	
			50/2"	33.5	100+	
			50/2"	38.5	100+	
			50/0"	43.5	100+	
657.1	46.9	Boring Terminated by Auger Refusal at 46.9 feet.	50/0"	46.9	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-13 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 702.5 ±
Total Depth: 23.5'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/20/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		SURFICIAL ORGANIC SOILS	1-2-2	0.0	4	GROUNDWATER DATA: 0 Hr: 5.5', Caved at 10.3' 24 Hrs: 5.7', Caved at 10.1'
702.2	0.3	FILL: Soft, Moist, Brown, Clayey SILT (MH) with Fine to Coarse Sand and Trace Fine Gravel		1.5		
700.5	2.0	RESIDUAL: Medium Dense, Moist, Brown and Green-Gray, Silty Fine to Coarse SAND (SM) with Fine Gravel	3-6-17	2.0	23	
699.0	3.5	Very Stiff, Moist, Green-Gray and Brown, Fine to Coarse Sandy SILT (ML) with Trace Rock Fragments	11-8-12	3.5 5.0	20	
696.0	6.5	Loose, Moist, Green-Gray, Silty Fine to Coarse SAND (SM) with Fine Rock Fragments	4-2-3	6.5 8.0	5	
694.0	8.5	Loose, Saturated, Brown and Red-Brown, Fine to Coarse Gravelly Silty Fine to Coarse SAND (SM) with Clay	4-3-3	8.5 10.0	6	
			19-15-50/5"	11.5	100+	
690.5	12.0	PARTIALLY WEATHERED ROCK: Sampled as Wet, Green-Gray-Brown, Silty Fine to Coarse SAND with Fine to Coarse Rock Fragments		12.9		
689.0	13.5	PARTIALLY WEATHERED ROCK: Sampled as Green-Gray, Silty Fine to Coarse SAND with Fine Rock Fragments	50/2"	13.5	100+	
			50/0"	18.5	100+	
679.0	23.5	Boring Terminated by Auger Refusal at 23.5 feet.	50/0"	23.5	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

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Engineering Stability Since 1881

BORING LOG

Boring: B-14 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 702 ±
Total Depth: 23.5'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/21/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
701.8	0.2	SURFICIAL ORGANIC SOILS	2-2-13	0.0	15	GROUNDWATER DATA: 0 Hr: 4.3', Caved at 9.3' 24 Hrs: 4.0', Caved at 6.5'
		FILL: Very Stiff, Moist, Brown and Green-Gray, Fine to Coarse Sandy Clayey SILT (MH) with Fine to Coarse Gravel		1.5		
699.5	2.5		13-38-50/5.5"	2.0	100+	
		PARTIALLY WEATHERED ROCK: Sampled as Moist, Light Green-Gray, Fine to Coarse Gravelly Fine to Coarse SAND with Silt	50/5"	3.5	100+	
695.5	6.5	RESIDUAL: Dense, Saturated, Green-Gray, Fine to Coarse ROCK FRAGMENTS (GM) with Silt	24-11-24	6.5	35	
				8.0		
693.5	8.5	PARTIALLY WEATHERED ROCK: Sampled as Saturated, Greem-Gray, Fine to Coarse Sandy ROCK FRAGMENTS with Silt	50/3"	8.5	100+	
690.5	11.5	PARTIALLY WEATHERED ROCK: Sampled as Wet, Green-Gray, Silty Fine to Coarse SAND with Fine to Coarse Rock Fragments	50/4"	11.5	100+	
688.5	13.5	PARTIALLY WEATHERED ROCK: Sampled as Wet, Green-Gray, Fine to Coarse ROCK FRAGMENTS with Silt	50/5"	13.5	100+	
683.5	18.5	PARTIALLY WEATHERED ROCK: Sampled as Wet, Green-Gray, Silty Fine to Coarse SAND with Fine to Coarse Rock Fragments	50/5"	18.5	100+	
678.5	23.5	Boring Terminated at 23.5 feet.	50/0"	23.5	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-15 (1 of 1)

Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 701.5 ±
Total Depth: 23.5'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/20/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
701.2	0.3	SURFICIAL ORGANIC SOILS	1-2-4	0.0 - 1.5	6	GROUNDWATER DATA: 0 Hr: Dry inside PVC 24 Hrs: 5.3' inside PVC
		RESIDUAL: Firm to Very Stiff, Moist, Green and Green-Brown, Silty CLAY (CH) with Fine to Medium Sand, Trace Rock Fragments, and Trace Roots	2-9-9	2.0 - 3.5	18	
697.5	4.0		12-50/5.5"	3.5 - 4.5	100+	
		PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Gray and Green-Brown, Fine to Coarse Very Sandy SILT	50/3.5"	6.5	100+	
			40-50/5"	8.5 - 9.4	100+	
690.0	11.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Brown and Green-Brown, Fine to Coarse Sandy Clayey SILT with Trace Rock Fragments	14-50/5"	11.5 - 12.4	100+	
688.0	13.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Green-Gray, Very Silty Fine to Coarse SAND with Fine Rock Fragments	50/5.5"	13.5	100+	
			50/3"	18.5	100+	
678.0	23.5	Boring Terminated by Auger Refusal at 23.5 feet.	50/0"	23.5	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-16 (1 of 1)

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Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 717 ±
Total Depth: 25.0'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/21/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
716.7	0.3	SURFICIAL ORGANIC SOILS	5-4-3	0.0 - 1.5	7	GROUNDWATER DATA: 0 Hr: Dry inside PVC 24 Hrs: Dry, Caved at 22.5'
		FILL: Firm, Moist, Red-Brown and Dark Gray, Fine to Coarse Sandy Clayey SILT (MH)				
715.0	2.0	RESIDUAL: Stiff, Moist, Red-Brown, Clayey SILT (MH) with Fine to Medium Sand	4-5-8	2.0 - 3.5	13	
			3-5-7	3.5 - 5.0	12	
			2-4-5	6.5 - 8.0	9	
			2-3-4	8.5 - 10.0	7	
705.5	11.5	Soft to Firm, Moist, Red-Brown and Yellow-Brown, Clayey SILT (MH) with Fine Sand	2-3-3	11.5 - 13.0	6	
		Wet at 13.5'	1-2-3	13.5 - 15.0	5	
			1-2-2	18.5 - 20.0	4	
693.5	23.5	Stiff, Moist, Yellow-Brown and Light Brown, Slightly Clayey SILT (MH) with Fine Sand	2-3-9	23.5 - 25.0	12	
692.0	25.0	Boring Terminated at 25.0 feet.				

BORING_LOG 66A-0144 BORING LOGS.GPJ F&R.GDT 4/24/23

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

BORING LOG

Boring: B-17 (1 of 1)

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Project No: 66A-0144
Client: HDR
Project: PTRWA-BES Site
City/State: Randleman, NC

Elevation: 735.5 ±
Total Depth: 6.5'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 12/27/22
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
735.4	0.1	SURFICIAL ORGANIC SOILS FILL: Medium Dense, Moist, Blue-Gray and Green-Brown, Silty Fine to Coarse SAND (SM) with Fine to Coarse Gravel	10-11-12	0.0 1.5	23	GROUNDWATER DATA: 0 Hr: Dry, Caved at 3.8' 24 Hrs: Dry
733.5	2.0	Very Stiff, Wet, Dark Brown, Fine to Coarse Sandy Clayey SILT (MH) with Trace Fine to Coarse Gravel and Trace Roots	11-8-9	2.0	17	
732.0	3.5	PARTIALLY WEATHERED ROCK: Sampled as Moist, Brown-White and Light Brown, Silty Fine to Coarse SAND with Fine to Coarse Gravel	50/5.5"	3.5 4.0	100+	
729.8	5.7	PARTIALLY WEATHERED ROCK: Sampled as Dry, White, Silty Fine to Coarse SAND				
729.0	6.5	Boring Terminated by Auger Refusal at 6.5 feet.	50/0"	6.5	100+	

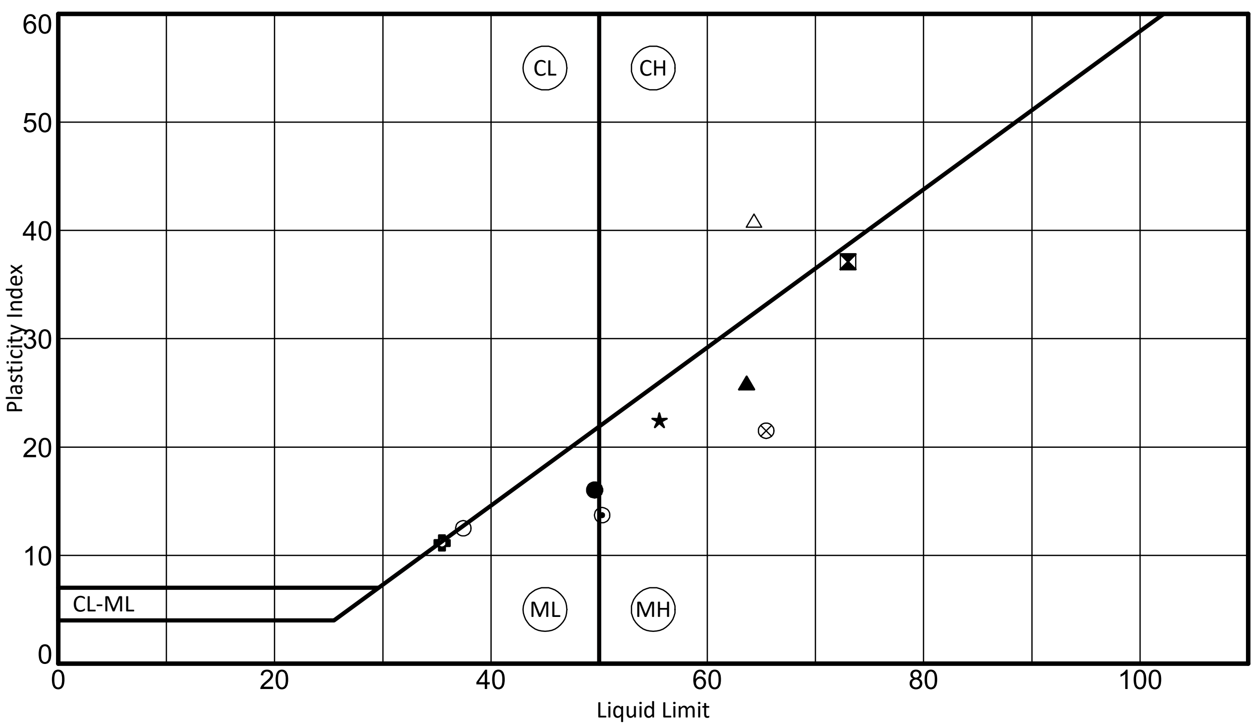
*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

APPENDIX III

LABORATORY TEST RESULTS

ATTERBERG LIMITS

Project No: 66A-0144
Client: HDR
Project: Piedmont Triad Regional Water Authority BES Site
City/State: Randleman, NC



Boring No.	Depth	LL	PL	PI	Fines	Classification	% Natural Water Content
● B-1	3.5' - 5.0'	50	34	16	98.3	ELASTIC SILT (MH)	19.8
⧗ B-3	0.0' - 1.5'	73	36	37	98.7	ELASTIC SILT (MH)	29.8
▲ B-4	3.5' - 5.0'	64	38	26	99.4	ELASTIC SILT (MH)	27.4
★ B-5	2.0' - 3.5'	56	33	23	97.2	ELASTIC SILT (MH)	23.4
⊙ B-7	3.5' - 5.0'	50	37	13	99.8	ELASTIC SILT (MH)	17.9
✿ B-10	2.0' - 3.5'	35	24	11	69.6	SANDY LEAN CLAY (CL)	12.1
○ B-13	3.5' - 5.0'	37	25	12	70.5	SILT with SAND (ML)	19.5
△ B-15	0.0' - 1.5'	64	23	41	92.3	FAT CLAY (CH)	25.9
⊗ B-16	3.5' - 5.0'	65	44	21	99.4	ELASTIC SILT (MH)	31.0

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PERCENT PASSING #200 SIEVE

Project No: 66A-0144
Client: HDR
Project: Piedmont Triad Regional Water Authority BES Site
City/State: Randleman, NC

BORING NUMBER	DEPTH	LOCATION	% FINES	NATURAL MOISTURE
B-8	3.5' - 5.0'	B-8	44.1	6.5

#200_WASH_ONLY LAB TESTING- 66A-0144.GPJ F&R.GDT 2/1/23

APPENDIX IV

GBA DOCUMENT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Project

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependen

e recommendations included in this report – including any options or alternatives – are con rmation-dependent. In other words, *they are not nal*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can nalize the recommendations *only a er observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer con rms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *e geotechnical engineer who prepared this report cannot assume responsibility or liability for con rmation-dependent recommendations if you fail to retain that engineer to perform construction observation*.

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop speci cations,
- review pertinent elements of other design professionals' plans and speci cations, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shi unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the speci c times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about speci c project requirements, including options selected from the report, *only* from the design drawings and speci cations. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the nancial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. at lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

e personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – di er signi cantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental ndings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a di erent client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mol

While your geotechnical engineer may have addressed groundwater, water in ltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance de ciencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be su cient to prevent moisture in ltration.*** Confront the risk of moisture in ltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

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Appendix E. Expansion OPCC

John F. Kime Water Treatment Plant Expansion

April 21, 2023

Basis of Estimate

This estimate utilizes the following financial data for all pricing included. The direct costs and indirect cost percentages are based on experience, current market conditions, and historical data.

Scope of Work

This project includes an expansion of an existing water treatment plant. The project is located in Randleman, NC and the project owner is the Piedmont Triad Regional Water Authority. The project includes modifications to an existing raw water pump station by addition of a 4th pump. Approximately 2,323 LF of 42" diameter raw water piping (DIP) will be routed from the existing pump station to the water treatment plant site. The pipeline will include 3 air release valves within vaults. The pipeline will increase in size from 42" diameter to 54" diameter before routing through a new cast-in-place concrete splitter box at the water treatment plant site. The project will include construction of superpulsators with flash mix as part of the clarification process. A ferric sulfate storage facility will be constructed along with a new dewatering building, sludge storage facility, sludge thickener and thickened sludge pump station. A sludge holding tank with a sludge transfer pump station will be modified and upgraded. This Opinion of Probable Construction Cost is based on 30% design plans.

Cost Summary

Summary of Opinion of Probable Construction Cost		
High Range		Low Range
+50%	Construction Cost	-30%
$ 83,255,000	$ 55,503,000	$ 38,853,000

Process Equipment:

- Raw Water Feed Pump (1) – 7,107 GPM @ 79', 200 HP
- Vacuum Pump for Superpulsator (3) – 450 SCFM, 3,500 RPM, 7.5 HP
- Superpulsators (2) – 8 MGD/EA
- Flash Mixer (1) – 18 MGD, 15 HP
- Sample Pump (2) – 40 GPM @ 40', 0.17 HP
- Ferric Sulfate Day Tank (1) – 5,000 Gal
- Ferric Sulfate Bulk Tank (4) – 12,000 Gal
- Magnetic Drive Pump (2) – 150 GPM, 10 HP
- Diaphragm Pump (3) – 100 GPH
- Progressive Cavity Pump (3) – 200 GPM, 50 PSI
- Wet-Pit Submersible Pump (2) – 500 GPM
- Gravity Sludge Thickener (1) – 200 GPM/SF, 4 LB/DAY/SF
- Superpulsator Sludge Holding Tank

- Floating Mixing System
- Dry Polymer Feed System (2)– 20 LB/HR
- Belt Filter Press (2) – 1,800 LB/HR, 160 GPM @ 2% Solids
- Sludge Grinders (3) – 3 HP
- Shaftless Screw Conveyor (3) – 100 CF/HR
- Dry Pit Submersible Pump (2) – 400 GPM

Direct Cost Methodology

- A combination of HDR database pricing, similar project costs, and historical data were used to establish direct costs.
- Labor rates include all burden and fringes.
- All labor is done on normal 8-hour days, 5 days a week Monday through Friday.
- Fluctuations in labor, material, and equipment rental pricing have yet to be adjusted due to market stability. Single mobilization.

Indirect Cost Methodology

- General Contractor Mobilization & Demobilization – (4%)
- General Contractor Home Office Overhead – (4%)
- General Contractor Field General Conditions – (12%)
- Sales Tax – N/A
- General Contractor Fee/Profit – (15%)
- Design contingency – (30%)
- General Contractor Bonds & Insurance – (2.5%)
- Escalation Factor (11.54%) – Material, Labor, Construction Equipment, and Fuel
- Market Volatility Adjustment Factor (5%) – Supply-chain issues, Price Volatility, Transportation Issues, Labor Shortages, Premiums on Labor to Keep and Retain Craft Labor, Russian Invasion of Ukraine, Longer Lead Times Than Normal, and Covid Mandates.

Allowances:

- Electrical – 12%
- I & C – 6%
- HVAC – Dewatering Building - $40/SF
- Plumbing – Dewatering Building - $15/SF
- Site Work (various items) - $3,630,000
- Utility Relocation - $320,000

Quotes:

- Raw Water Feed Pump - $301,311/EA
- Belt Filter Press - $520,250/EA
- FRP Tanks (12,000 Gal) - $78,394/EA
- Dry Polymer Feed System - $349,000/LS
- Gravity Thickener - $565,500/LS
- EQ Transfer Pumps - $62,000/EA
- Sludge Grinder - $18,447/EA
- Sludge Transfer Pumps - $21,191/EA
- Screw Conveyors - $141,000/EA
- Superpulsators - $1,320,000/EA

Assumptions:

- This work will be completed uninterrupted, only one mobilization and demobilization per construction stage for the Prime Contractor and sub-contractor.
- This project will be worked on a standard work week.
- Project to be competitively bid, with a minimum of 3 bidders.
- All regulatory approvals will be obtained by others prior to mobilization.
- Subcontractors and trade labor can be procured locally or within a radius that does not require per diem upcharges.
- Location provides for sufficient lay-down and staging area.
- All procurement by the general contractor and its subcontractor's.
- Any/all environmental impact studies and associated permitting will be completed by others prior to mobilization.
- Water and Power for construction activities is available on site at no cost to the contractor.
- Contractor provides generator and fuel for duration of temporary dewatering facility operation.
- Landfill for disposal of non-contaminated construction debris is within 10-mile round trip of the project site.

Exclusions:

- Cost associated with accelerated schedules.
- All permits, regulatory fees, environmental fees or requirements and acquisition of such.
- Off-site storage facilities.
- Extended warranty costs.
- Extreme weather conditions that would affect working days/lost productivity.
- Cost increases related to recently imposed tariffs.
- Cost/work associated with hazardous and/or contaminated materials.
- Costs associated with endangered species mitigation.
- Cost associated with change orders during construction.
- Non-Construction Costs.
- Owner Costs.
- 24-hour security.
- Cost associated with temporary construction power for work activities within the building or a construction compound.
- Spare Parts.

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Roll Up Report

Project name	**John F. Kime Water Treatment Plant Expansion Rev02 - MF**
Estimator	Feuerhelm, Matt / MPS
Labor rate table	HDR_2023_Union
Equipment rate table	HDR_EQ_2023
Project	Water Treatment
Notes	OPCC Caveat

Any opinions of probable construction cost or cost estimates provided by HDR, Inc. are made based on information available to HDR, Inc. and based on the cost estimator's experience and qualifications and represents its judgment as an experienced and qualified professional engineer. However, HDR, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over the contractor(s') methods of determining prices, or over competitive bidding or market conditions. HDR, Inc. does not guarantee that proposals, bids, or actual project or construction cost will not vary from opinions of probable cost or cost estimates prepared by HDR, Inc.

A recent AGC report indicated that Jan. of 2020 and Jan. of 2021 saw a 21% increase in residential construction spending, while private, non-residential construction spending tumbled 10% during that same period. Also, during this period, substantial material prices increase in primary materials such as wood, steel and concrete, copper, and PVC. Contractors are experiencing supply-chain issues, transportation issues, short pricing guarantees (1 to 7 days), longer than average fabrication durations, and limited availability of material supplies. This combination has produced a potentially volatile situation for owners as general contractors are drastically recovering costs. A project owner would be wise to ask many questions, work to obtain as much bid competition as possible, and retain a higher than usual contingency.

Report format
Sorted by 'WBS_MAIN'
'WBS_MAIN' summary
Allocate addons

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
006 SITEWORK	1.00	LS	132,379	202,403	3,627,048	55,692		4,017,522.36 /LS	4,017,522
007 YARD PIPING	2,522.00	LF	550,668	3,975,981		285,767	317,738	2,034.161/LF	5,130,154
083 RAW WATER PUMP STATION	1.00	LS	50,274	812,841		16,178		879,292.52 /LS	879,293
095 SPLITTER BOX	1.00	LS	231,089	665,895		36,564	176	933,724.70 /LS	933,725
100 SUPER PULSATORS	1.00	LS	942,837	1,606,248	3,930,136	68,187		6,547,407.84 /LS	6,547,408
165 FERRIC SULFATE STORAGE	1.00	LS	559,604	739,963	121,708	36,862	547,816	2,005,953.33 /LS	2,005,953
400 SLUDGE HOLDING TANK	1.00	LS	89,171	579,764		42,109	593	711,636.23 /LS	711,636
412 THICKENED SLUDGE PUMP STATION	1.00	LS	969,648	773,791	74,851	89,383	1,603	1,909,276.19 /LS	1,909,276
500 SLUDGE THICKENER	1.00	LS	535,203	1,283,607		112,037		1,930,847.44 /LS	1,930,847
547 SLUDGE STORAGE	1.00	LS	523,703	1,079,632		142,165		1,745,500.39 /LS	1,745,500
700 DEWATERING BUILDING	1.00	LS	568,838	3,389,248	425,765	43,330	27	4,427,206.95 /LS	4,427,207

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Roll Up Report

Estimate Totals

Description	Amount	Totals	Rate
Labor	5,153,414		
Material	15,109,374		
Build America, Buy America Act			
Equipment	928,274		
Subcontract	8,179,508		
Other	867,953		
Subtotal Field Const Costs	**30,238,523**	**30,238,523**	
Sales Tax Estimate (Mat & Eq)			
Subtotal Field Const Costs		**30,238,523**	
Design Contingency	8,747,985		30.000 %
Subtotal Field Const Costs	**8,747,985**	**38,986,508**	
Escalation Project (Year)	4,374,576		11.540 %
Construction Subtotal	**4,374,576**	**43,361,084**	
Market Volatility Adjustment Factor	2,166,979		5.000 %
Construction Subtotal	**2,166,979**	**45,528,063**	
I&C Allowance	3,329,748		6.000 %
Electrical Allowance	6,659,495		12.000 %
Factored Allowance	**9,989,243**	**55,517,306**	
Total		***55,517,306***	

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Project name	**John F. Kime Water Treatment Plant Expansion Rev02 - MF**
Estimator	Feuerhelm, Matt / MPS
Labor rate table	HDR_2023_Union
Equipment rate table	HDR_EQ_2023
Project	Water Treatment
Notes	OPCC Caveat

Any opinions of probable construction cost or cost estimates provided by HDR, Inc. are made based on information available to HDR, Inc. and based on the cost estimator's experience and qualifications and represents its judgment as an experienced and qualified professional engineer. However, HDR, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over the contractor(s') methods of determining prices, or over competitive bidding or market conditions. HDR, Inc. does not guarantee that proposals, bids, or actual project or construction cost will not vary from opinions of probable cost or cost estimates prepared by HDR, Inc.

A recent AGC report indicated that Jan. of 2020 and Jan. of 2021 saw a 21% increase in residential construction spending, while private, non-residential construction spending tumbled 10% during that same period. Also, during this period, substantial material prices increase in primary materials such as wood, steel and concrete, copper, and PVC. Contractors are experiencing supply-chain issues, transportation issues, short pricing guarantees (1 to 7 days), longer than average fabrication durations, and limited availability of material supplies. This combination has produced a potentially volatile situation for owners as general contractors are drastically recovering costs. A project owner would be wise to ask many questions, work to obtain as much bid competition as possible, and retain a higher than usual contingency.

Report format Sorted by 'WBS_MAIN/MF04_DIV/Work Activity'
'Work Activity' summary
Allocate addons

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
006 SITEWORK									
DIVISION 02 EXISTING CONDITIONS									
02.41.00.005 Demo Existing Fence	491.00	LF	1,561			218		3.624/LF	1,780
02.41.00.025 Site - Additional Site Demo Allowance	1.00	LS			608,541			608,540.800/LS	608,541
DIVISION 02 EXISTING CONDITIONS			**1,561**		**608,541**	**218**		**610,320.34 /LS**	**610,320**
1.00 LS									
13.240 Labor hours									
4.414 Equipment hours									
DIVISION 31 EARTHWORK									
31.11.00.005 Site - Clearing and Grubbing - 1.25 Ac	2.59	ACRE	14,786			11,736		10,240.293/ACR	26,522
31.23.10.005 Overall Site - Cut/Fill and Haul Off-Site	75,000.00	CY			794,344			10.591/CY	794,344
31.25.00.005 Erosion Control Allowance	1.00	LS			238,303			238,303.18 /LS	238,303
DIVISION 31 EARTHWORK			**14,786**		**1,032,647**	**11,736**			**1,059,170**
127.966 Labor hours									
105.566 Equipment hours									
DIVISION 32 EXTERIOR IMPROVEMENTS									
32.12.16.005 Site - Asphalt Paving, Site Roads, 4" Thick - 2,436 SY	2,436.00	SY	38,134	125,647	794,344	33,665		407.139/SY	991,791
32.16.13.005 Site - Concrete Curb & Gutter, Site Roads, 2' wide x 6" thick - 1,984 LF	1,984.00	LF	11,756	28,210		4,534		22.429/LF	44,500
32.31.13.005 Security Fence, Chain Link, 8' High	665.00	LF	9,373	40,674		1,561		77.607/LF	51,608
32.92.00.005 Site - Seeding - 11,010 SY	11,010.00	SY	56,769	7,871		3,978		6.232/SY	68,617
DIVISION 32 EXTERIOR IMPROVEMENTS			**116,032**	**202,403**	**794,344**	**43,738**		**1,156,516.49 /LS**	**1,156,516**
1.00 LS									
1,049.755 Labor hours									
372.475 Equipment hours									
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)									
33.05.19.055 Site - Potable Water System Allowance	1,000.00	LF			476,606			476.606/LF	476,606
33.05.39.010 Site - Storm Sewer	2,000.00	LF			714,910			357.455/LF	714,910
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)					**1,191,516**			**397.172/LF**	**1,191,516**
3,000.00 LF									
006 SITEWORK			***132,379***	***202,403***	***3,627,048***	***55,692***	***0***	***4,017,522.34 /LS***	***4,017,522***
1.00 LS									
1,190.962 Labor hours									
482.454 Equipment hours									
007 YARD PIPING									
DIVISION 31 EARTHWORK									
31.11.00.010 (RW) - Clearing and Grubbing - 1.0 Ac	2.02	ACRE	12,719			13,318		12,889.515/ACRE	26,037

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Description	Quantity	Unit	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 31 EARTHWORK			**12,719**			**13,318**			**26,037**
103.149 Labor hours									
103.149 Equipment hours									
DIVISION 32	**EXTERIOR IMPROVEMENTS**								
32.92.00.010 (RW) - Seeding - 13,890 SY	13,890.00	SY	71,618	9,930		5,018		6.232/SY	86,566
DIVISION 32 EXTERIOR IMPROVEMENTS			**71,618**	**9,930**		**5,018**		**86,566.16 /LS**	**86,566**
1.00 LS									
666.72 Labor hours									
111.12 Equipment hours									
DIVISION 33	**UTILITIES (BURIED PIPE AND VALVES)**								
33.00.00.005 (RW) Remove & Relocate Chemical Feed/Fiber Optic Lines - 1 LS	1.00	LS					317,738	317,737.61 /LS	317,738
33.05.19.005 (RW) 42" DIP and Fittings, Fully Restrained, 5' cover - 2,284 LF	2,323.00	LF	404,000	3,296,982		227,445		1,691.101/LF	3,928,427
33.05.19.010 (RW) 54" DIP and Fittings, Fully Restrained, 5' cover - 250 LF	191.00	LF	44,441	447,315		27,903		2,720.727/LF	519,659
33.05.19.015 (RW) Connection to Existing System - 2 EA	8.00	LF	3,753	118		10,498		1,796.083/LF	14,369
33.05.71.005 (RW) ARV, 3" on 42" DIP- 3 EA	3.00	EA	14,137	221,637		1,585		79,119.59 /EA	237,359
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**466,331**	**3,966,051**		**267,431**	**317,738**	**1,989.513/LF**	**5,017,551**
2,522.00 LF									
3,961.924 Labor hours									
2,368.992 Equipment hours									
007 YARD PIPING			***550,668***	***3,975,981***	***0***	***285,767***	***317,738***	***2,034.161/LF***	***5,130,154***
2,522.00 LF									
4,731.793 Labor hours									
2,583.261 Equipment hours									

083 RAW WATER PUMP STATION

Description	Quantity	Unit	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 02	**EXISTING CONDITIONS**								
02.41.00.010 (10) Raw Water Pump Station, Demo Process Piping, 36" Blind Flange and Steel Plate Cover	1.00	DAY	5,847	129		11,902		17,877.12 /DAY	17,877
DIVISION 02 EXISTING CONDITIONS			**5,847**	**129**		**11,902**		**17,877.12 /LS**	**17,877**
1.00 LS									
48.205 Labor hours									
56.205 Equipment hours									
DIVISION 40	**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**								
33.05.15.005 (10) Flow Meter Vault, 10' x 5' x 6' - 1 EA	1.00	EA	2,966	26,796		1,553		31,315.09 /EA	31,315
40.05.17.005 (10) Exposed Pipe - RW - Copper Air Release - 01" Dia	13.00	LF	676	269		4		73.042/LF	950
40.05.19.005 (10) Exposed Pipe - RW - 24" - 6 LF	6.00	LF	4,987	20,950		2		4,323.048/LF	25,938
40.05.19.125 (10) Exposed Pipe - RW - 36"x24" Reducer - 1 EA	1.00	EA	2,377	15,791				18,167.330/EA	18,167
40.05.52.005 (10) Exposed Pipe - RW - Air Release Valve - 04" Dia	1.00	EA	485	3,691				4,175.860/EA	4,176
40.05.62.020 (10) Exposed Pipe - RW - Plug Valve - 24" Dia - 4 EA	4.00	EA	7,485	126,462		1,089		33,759.132/EA	135,037
40.05.63.005 (10) Exposed Pipe - RW - Ball Valve - 04" Dia	1.00	EA	707	3,052				3,758.54 /EA	3,759
40.05.66.005 (10) Exposed Pipe - RW - Check Valve - 24" Dia	1.00	EA	658	25,616		272		26,546.39 /EA	26,546
40.71.00.010 (10) Exposed Pipe - RW - Flow Meter - 54" Dia	1.00	EA	6,432	39,105				45,537.05 /EA	45,537
40.71.00.015 (10) Exposed Pipe - RW - Flow Meter - 30" Dia	1.00	EA	3,675	13,100				16,775.12 /EA	16,775

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Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**30,447**	**274,833**		**2,920**		**16,221.039/LF**	**308,200**
19.00 LF									
234.133 Labor hours									
14.304 Equipment hours									
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT									
26.29.23.005 (10) Variable Frequency Drive, For RW Pump, 200 HP - 1 EA	1.00	EA	9,401	89,321		1,032		99,754.93 /EA	99,755
43.23.31.005 (10) Raw Water PS - (P-10-4) Raw Water Feed Pump, 200 HP, 7107 GPM @ 79'	1.00	EA	4,579	448,558		323		453,460.71 /EA	453,461
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**13,981**	**537,879**		**1,356**		**276,607.82 /EA**	**553,216**
2.00 EA									
108.966 Labor hours									
15.793 Equipment hours									
083 RAW WATER PUMP STATION			***50,274***	***812,841***	***0***	***16,178***	***0***	***879,292.50 /LS***	***879,293***
1.00 LS									
391.304 Labor hours									
86.302 Equipment hours									

095 SPLITTER BOX

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 CONCRETE									
03.11.13.005 (11) Splitter Box - Base Slab - 575 sf - 18" Thick	32.00	CY	10,609	17,315		1,011		904.231/CY	28,935
03.11.13.010 (11) Splitter Box - Walls - 21' High - 12" Thick - 134 LF	105.00	CY	125,036	68,655		1,452		1,858.507/CY	195,143
DIVISION 03 CONCRETE			**135,645**	**85,970**		**2,464**		**1,635.611/CY**	**224,079**
137.00 CY									
1,163.935 Labor hours									
43.162 Equipment hours									
DIVISION 05 METALS									
05.50.00.005 (11) Splitter Box - Aluminum Grating - 2" Thick - 340 SF	340.00	SF	7,019	45,072		92		153.479/SF	52,183
05.50.00.035 (11) Splitter Box - Metal Ladder into Splitter Box Cells, 21 LF - 5 EA	105.00	LF	5,852	9,767		336		151.948/LF	15,955
05.50.00.040 (11) Splitter Box - Metal Stairs, Exterior - 32 Riser	32.00	RISR	5,161	29,933		296		1,105.955/RISR	35,391
05.52.02.005 (11) Splitter Box - Aluminum Handrail - 3-Rail - 4' High - 95 LF	95.00	LF	3,285	15,774		189		202.606/LF	19,248
DIVISION 05 METALS			**21,316**	**100,546**		**913**			**122,775**
144.493 Labor hours									
26.866 Equipment hours									
DIVISION 31 EARTHWORK									
31.23.10.015 (11) Splitter Box, Excavation, Backfill and Haul Off-Site	195.80	CY	2,229			2,356		23.419/CY	4,585
DIVISION 31 EARTHWORK			**2,229**			**2,356**		**23.419/CY**	**4,585**
195.80 CY									
18.828 Labor hours									
18.477 Equipment hours									
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)									

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Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33.05.15.010 (11) Flow Meter Vault, 10' x 5' x 6' - 1 EA	1.00	EA	3,111	28,596		1,657		33,364.57 /EA	33,365
33.05.19.020 (11) Buried Pipe, INF - 54" Dia - 11 LF	11.00	LF	5,936	120,130		3,629		11,790.417/LF	129,695
33.05.19.025 (11) Buried Pipe, PSG - 30" Dia - 156 LF	156.00	LF	31,927	140,313		11,387		1,177.094/LF	183,627
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**40,974**	**289,039**		**16,673**		**2,075.963/LF**	**346,686**
167.00 LF									
347.933 Labor hours									
114.041 Equipment hours									
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)									
40.05.19.010 (11) Exposed Pipe - INF - 54" Dia - Wall Pipe	2.00	LF	2,902	41,952		1		22,427.525/LF	44,855
40.05.19.015 (11) Exposed Pipe - PSG - 30" Dia - Wall Pipe	8.00	LF	5,592	54,466		3		7,507.616/LF	60,061
40.05.59.005 (11) Water Control Gates - 60" x 36"	30.00	SF	7,393	32,602		14,155	176	1,810.879/SF	54,326
40.05.64.005 (11) Exposed Valves - PSG - Butterfly Valve - 30" Dia - 2 EA	2.00	EA	11,363	48,219				29,790.95 /EA	59,582
40.71.00.020 (11) Exposed Pipe - PSG - Flow Meter - 30" Dia	1.00	EA	3,675	13,100				16,775.12 /EA	16,775
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**30,924**	**190,340**		**14,158**	**176**	**23,559.938/LF**	**235,599**
10.00 LF									
226.764 Labor hours									
62.66 Equipment hours									
095 SPLITTER BOX			***231,089***	***665,895***	***0***	***36,564***	***176***	***933,724.69 /LS***	***933,725***
1.00 LS									
1,901.953 Labor hours									
265.206 Equipment hours									

100 SUPER PULSATORS

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 CONCRETE									
03.11.13.015 (15) Super Pulsators - Base Slab - 7,255 sf - 18" Thick	404.00	CY	122,148	216,267		12,892		869.573/CY	351,308
03.11.13.020 (15) Super Pulsators - Walls - 17'-6" High - 18" Thick - 228 LF	222.00	CY	193,807	135,886		3,070		1,498.933/CY	332,763
03.11.13.025 (15) Super Pulsators - Walls - 12'-6" High - 18" Thick - 85 LF	60.00	CY	50,955	34,810		790		1,442.584/CY	86,555
03.11.13.030 (15) Super Pulsators - Walls - 21' High - 14" Thick - 69 LF	63.00	CY	65,132	37,730		829		1,645.901/CY	103,692
03.11.13.035 (15) Super Pulsators - Walls - 17' High - 12" Thick - 54 LF	34.00	CY	40,058	21,116		448		1,812.407/CY	61,622
03.11.13.040 (15) Super Pulsators - Walls - 20' High - 12" Thick - 72 LF	54.00	CY	62,890	33,297		711		1,794.409/CY	96,898
03.11.13.045 (15) Super Pulsators - Walls - 21' High - 12" Thick - 69 LF	54.00	CY	63,206	33,309		711		1,800.473/CY	97,226
03.11.13.050 (15) Super Pulsators - Walls - 4'-7" High - 8" Thick - 78 LF	9.00	CY	15,060	6,781		118		2,439.906/CY	21,959
03.11.13.055 (15) Super Pulsators - Walls - 3'-6" High - 8" Thick - 674 LF	59.00	CY	100,363	46,028		777		2,494.365/CY	147,168
03.11.13.060 (15) Super Pulsators - Colunm Footings - 16"x16"x 16" Thick - 4 EA	5.00	CY	1,642	2,287		58		797.366/CY	3,987
03.11.13.065 (15) Super Pulsators - Colunms for Effluent Trough - 12"x12"x 6'-4" High - 4 EA	0.938	CY	1,563	3,745		28		5,688.93 /CY	5,336
03.11.13.070 (15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick	59.00	CY	40,756	42,120		857		1,419.205/CY	83,733
03.11.13.075 (15) Super Pulsators - Elevated Slab - 1,341 SF - 8" Thick	33.00	CY	32,982	26,546		515		1,819.470/CY	60,043
03.11.13.080 (15) Super Pulsators - Elevated Slab - 1,493 SF - 6" Thick	28.00	CY	36,240	24,829		465		2,197.639/CY	61,534
03.11.13.085 (15) Super Pulsators - Grout Topping - 6" Thick - 2,521 SF	47.00	CY	2,401	6,997		266		205.597/CY	9,663
DIVISION 03 CONCRETE			**829,202**	**671,749**		**22,534**		**1,345.909/CY**	**1,523,485**
1,131.938 CY									
7,079.405 Labor hours									
394.460 Equipment hours									
DIVISION 05 METALS									
05.12.00.005 (15) Super Pulsators - Structural Beams - W4x13 - 10 LF	10.00	LF	136	374		52		56.16 /LF	562
05.50.00.010 (15) Super Pulsators - Aluminum Grating - 2" Thick - 184 SF	184.00	SF	4,410	24,475		50		157.256/SF	28,935

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.50.00.015 (15) Super Pulsators - Metal Access Hatch - 3'-6" Long x 3'-6" Wide - 2 EA	2.00	EA	1,335	12,171				6,753.08 /EA	13,506
DIVISION 05 METALS			**5,881**	**37,020**		**102**		**43,002.95 /LS**	**43,003**
1.00 LS									
40.193 Labor hours									
1.605 Equipment hours									
DIVISION 31 EARTHWORK									
31.23.10.010 (15) Super Pulsators, Excavation, Backfill and Haul Off-Site	2,323.00	CY	26,472			27,976		23.439/CY	54,448
DIVISION 31 EARTHWORK			**26,472**			**27,976**		**23.439/CY**	**54,448**
2,323.00 CY									
223.572 Labor hours									
219.410 Equipment hours									
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)									
33.05.19.030 (15) Buried Pipe, IN - 30" Dia - 4 LF	4.00	LF	2,004	18,197		768		5,242.37 /LF	20,969
33.05.19.035 (15) Buried Pipe, RW - 24" Dia - 70 LF	70.00	LF	13,209	52,659		4,316		1,002.618/LF	70,183
33.05.19.040 (15) Buried Pipe, DR - 12" Dia - 18 LF	18.00	LF	2,282	6,884		781		552.564/LF	9,946
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**17,494**	**77,740**		**5,865**		**1,098.901/LF**	**101,099**
92.00 LF									
151.065 Labor hours									
58.998 Equipment hours									
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)									
40.05.19.020 (15) Exposed Pipe - SW - 42" Dia	20.00	LF	9,558	132,451		7		7,100.750/LF	142,015
40.05.19.025 (15) Exposed Pipe - IN - 30" Dia - Wall Pipe	2.00	LF	1,398	13,616		1		7,507.62 /LF	15,015
40.05.19.030 (15) Exposed Pipe - RW - 24" Dia - Wall Pipe	8.00	LF	4,387	33,524		3		4,739.253/LF	37,914
40.05.19.035 (15) Exposed Pipe - RW - 24" Dia	30.00	LF	5,921	42,396		10		1,610.901/LF	48,327
40.05.19.040 (15) Exposed Pipe - DR - 12" Dia - Wall Pipe	4.00	LF	1,089	5,911		1		1,750.425/LF	7,002
40.05.19.045 (15) Exposed Pipe - GTD - 12" Dia	30.00	LF	1,838	15,980		10		594.255/LF	17,828
40.05.19.105 (15) Exposed Pipe - PLI - 3" Dia - 34 LF	34.00	LF	3,459	10,730		11		417.675/LF	14,201
40.05.19.110 (15) Exposed Pipe - SHC - 3" Dia - 16 LF	16.00	LF	1,535	4,682		5		388.878/LF	6,222
40.05.19.115 (15) Exposed Pipe - FS - 3" Dia - 57 LF	57.00	LF	3,565	13,036		19		291.585/LF	16,620
40.05.19.120 (15) Exposed Pipe - LM - 3" Dia - 14 LF	14.00	LF	2,187	5,530		5		551.579/LF	7,722
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**34,937**	**277,857**		**72**		**1,455.191/LF**	**312,866**
215.00 LF									
279.156 Labor hours									
3.44 Equipment hours									
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT									
43.21.02.010 (15) Sample Pump - (SP-12B, SP-15B) 0.17HP, 40GPM @ 40'	3.00	EA	8,243	22,330		1,940		10,837.63 /EA	32,513
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**8,243**	**22,330**		**1,940**		**10,837.63 /EA**	**32,513**
3.00 EA									
72.00 Labor hours									
12.00 Equipment hours									
DIVISION 46 WATER AND WASTEWATER EQUIPMENT									
46.01.70.005 (15) Superpulsators - (SP-15C, SP-15D)	2.00	EA	9,159		3,930,136	3,233		1,971,263.905/EA	3,942,528
46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)	1.00	LS	11,448	519,552		6,466		537,466.200/LS	537,466

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Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**20,607**	**519,552**	**3,930,136**	**9,699**		**2,239,997.005/EA**	**4,479,994**
2.00 EA									
180.00 Labor hours									
60.00 Equipment hours									
100 SUPER PULSATORS			***942,837***	***1,606,248***	***3,930,136***	***68,187***	***0***	***6,547,407.84 /LS***	***6,547,408***
1.00 LS									
8,025.390 Labor hours									
749.913 Equipment hours									

165 FERRIC SULFATE STORAGE

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 CONCRETE									
03.11.13.090 (52) Ferric Sulfate Storage - Slab on Grade - 5,442 SF - 12" Thick	200.00	CY	69,794	111,471		8,100		946.829/CY	189,366
03.11.13.095 (52) Ferric Sulfate Storage - Thickened Edge Footing - 1'-9" Thick x 1'-6" Wide - 311 LF	31.00	CY	18,060	18,335		906		1,203.251/CY	37,301
03.11.13.100 (52) Ferric Sulfate Storage - Tank Pads - 2,091 SF - 12" Thick	78.00	CY	28,224	39,823		1,158		887.248/CY	69,205
03.11.13.105 (52) Ferric Sulfate Storage - Wall - 8 LF - 1'-6" High - 18" Thick	1.00	CY	704	729		13		1,446.37 /CY	1,446
03.11.13.110 (52) Ferric Sulfate Storage - Wall - 106 LF - 3'-6" High - 12" Thick	14.00	CY	16,810	9,601		184		1,899.685/CY	26,596
03.11.13.110a (52) Ferric Sulfate Storage - Wall - 208 LF x 28'-4" High - 18" Thick	328.00	CY	285,979	187,989		4,536		1,458.856/CY	478,505
03.11.13.115 (52) Ferric Sulfate Storage - Wall - 10 LF - 5'-6" High - 12" Thick	3.00	CY	2,659	1,901		39		1,533.10 /CY	4,599
03.11.13.120 (52) Ferric Sulfate Storage - Wall - 17 LF - 3'-6" High - 8" Thick	2.00	CY	2,642	1,500		26		2,083.975/CY	4,168
DIVISION 03 CONCRETE			**424,872**	**371,349**		**14,964**		**1,234.682/CY**	**811,186**
657.00 CY									
3,632.233 Labor hours									
253.008 Equipment hours									
DIVISION 04 MASONRY									
04.22.00.005 (52) CMU Block 8" Wall - 10' High x 48 LF	480.00	SF	14,214	9,520		258		49.985/SF	23,993
DIVISION 04 MASONRY			**14,214**	**9,520**		**258**		**49.985/SF**	**23,993**
480.00 SF									
114.457 Labor hours									
5.921 Equipment hours									
DIVISION 05 METALS									
05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF	16.00	SF	610	2,159		4		173.332/SF	2,773
05.50.00.025 (52) Ferric Sulfate Storage - Aluminum Stairs - 20 Risers	20.00	RISR	3,548	21,431		204		1,259.141/RISR	25,183
DIVISION 05 METALS			**4,158**	**23,590**		**208**		**27,956.13 /LS**	**27,956**
1.00 LS									
28.138 Labor hours									
6.120 Equipment hours									
DIVISION 08 OPENINGS									
08.11.19.015 (52) Ferric Sulfate Storage - Doors - Steel 6'x7'	1.00	EA	1,203	5,257				6,459.55 /EA	6,460
DIVISION 08 OPENINGS			**1,203**	**5,257**				**6,459.55 /EA**	**6,460**
1.00 EA									
9.157 Labor hours									

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Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 08 OPENINGS			**1,203**	**5,257**				**6,459.55 /EA**	**6,460**
1.00 EA									
9.157 Labor hours									
DIVISION 13 SPECIAL CONSTRUCTION									
13.34.19.010 (52) Pre-Engineered Metal Building, Ferric Sulfate Storage	180.00	SF	7,319	21,907		2,823		178.057/SF	32,050
DIVISION 13 SPECIAL CONSTRUCTION			**7,319**	**21,907**		**2,823**		**178.057/SF**	**32,050**
180.00 SF									
50.40 Labor hours									
7.20 Equipment hours									
DIVISION 31 EARTHWORK									
31.23.10.020 (52) Ferric Sulfate Storage, Excavation, Backfill and Haul Off-Site	1,146.00	CY	13,047			13,789		23.417/CY	26,836
DIVISION 31 EARTHWORK			**13,047**			**13,789**		**23.417/CY**	**26,836**
1,146.00 CY									
110.189 Labor hours									
108.135 Equipment hours									
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)									
40.05.23.005 (52) Exposed Pipe - PSG - 2" Dia - 44 LF	44.00	LF	7,187	11,040		133		417.281/LF	18,360
40.05.23.010 (52) Exposed Pipe - PSG - 1.5" Dia - 124 LF	124.00	LF	18,372	28,047		41		374.684/LF	46,461
40.05.23.015 (52) Exposed Pipe - PSG - 1.25" Dia - 48 LF	48.00	LF	6,642	9,948		16		345.945/LF	16,605
40.05.23.020 (52) Exposed Pipe - FS - 2" Dia - 85 LF	85.00	LF	13,048	20,952		28		400.341/LF	34,029
40.05.23.025 (52) Exposed Pipe - - 1.5" Dia - 212 LF	212.00	LF	32,135	49,765		71		386.658/LF	81,971
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**77,385**	**119,753**		**289**		**384.848/LF**	**197,427**
513.00 LF									
585.747 Labor hours									
13.820 Equipment hours									
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT									
43.21.02.015 (52) Magnetic Drive Transfer Pump - (TP-52A, TP-52B) 150 GPM, 10 HP	2.00	EA	3,503	59,548			744	31,897.56 /EA	63,795
43.21.02.020 (52) Diaphragm Ferric Sulfate Pump - (P-52A, P-52B, P-52C) 100 GPH, 3 HP	3.00	EA	5,255	66,991			1,117	24,454.11 /EA	73,362
43.21.02.025 (52) Diaphragm Ferric Sulfate Pump, for Existng Chemical Tank Rehab - 100 GPH, 3 HP - 2	2.00	EA	3,503	44,661			744	24,454.12 /EA	48,908
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**12,261**	**171,199**			**2,605**	**26,580.813/EA**	**186,066**
7.00 EA									
84.00 Labor hours									
7.00 Equipment hours									
DIVISION 54 STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED									
54.16.23.005 (52) Ferric Sulfate Bulk Tank (BTK-52A, BTK-52B, BTK-52C, BTK-52D), 12,000 Gal - 4 EA	4.00	EA	4,115			3,021	545,211	138,086.485/EA	552,346
54.16.23.010 (52) Ferric Sulfate Day Tank (TK-52A), 5,000 Gal - 1 EA	1.00	EA	1,029	17,387		1,510		19,925.810/EA	19,926
54.16.24.010 (52) Ferric Sulfate Storage - Rehab of Existing Chemical Tank - 2 EA	2.00	EA			121,708			60,854.08 /EA	121,708
DIVISION 54 STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED			**5,143**	**17,387**	**121,708**	**4,531**	**545,211**	**99,139.987/EA**	**693,980**
7.00 EA									
40.00 Labor hours									
24.00 Equipment hours									

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

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Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
165 FERRIC SULFATE STORAGE			*559,604*	*739,963*	*121,708*	*36,863*	*547,816*	*2,005,953.34 /LS*	*2,005,953*
1.00 LS									
4,654.321 Labor hours									
425.204 Equipment hours									

400 SLUDGE HOLDING TANK

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 02 — EXISTING CONDITIONS									
02.41.00.030 (71) Sludge Holding Tank - Demo and Rehab	1.00	LS	59,883	156,482		34,774		251,138.95 /LS	251,139
DIVISION 02 EXISTING CONDITIONS			**59,883**	**156,482**		**34,774**		**251,138.95 /LS**	**251,139**
1.00 LS									
DIVISION 40 — PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)									
40.05.19.050 (71) Exposed Pipe - PSG - 6" Dia - 7 LF	7.00	LF	4,863	8,905		2		1,967.156/LF	13,770
40.05.62.005 (71) Exposed Pipe - PSG - Plug Valve - 06" Dia	2.00	EA	1,192	2,755		630		2,288.48 /EA	4,577
40.05.66.010 (71) Exposed Pipe - PSG - Check Valve - 06" Dia	2.00	EA	1,947					973.625/EA	1,947
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**8,002**	**11,660**		**632**		**2,899.186/LF**	**20,294**
7.00 LF									
61.011 Labor hours									
4.112 Equipment hours									
DIVISION 43 — PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT									
43.25.13.005 (71) Dry Pit Submersible Pump, Sludge Transfer Pump (P-71-1, P-71-2), 400 GPM - 2 EA	2.00	EA	4,579	184,597		323	592	95,046.215/EA	190,092
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**4,579**	**184,597**		**323**	**592**	**95,046.215/EA**	**190,092**
2.00 EA									
40.00 Labor hours									
2.00 Equipment hours									
DIVISION 46 — WATER AND WASTEWATER EQUIPMENT									
46.41.00.005 (71) Sludge Holding Tank - Mixing System	1.00	EA	16,706	227,025		6,379		250,110.56 /EA	250,111
DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**16,706**	**227,025**		**6,379**		**250,110.56 /EA**	**250,111**
1.00 EA									
135.00 Labor hours									
19.00 Equipment hours									
400 SLUDGE HOLDING TANK			*89,171*	*579,764*	*0*	*42,109*	*592*	*711,636.24 /LS*	*711,636*
1.00 LS									
236.011 Labor hours									
25.112 Equipment hours									

412 THICKENED SLUDGE PUMP STATION

DIVISION 03 — **CONCRETE**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.210 (75) Thickened Sludge Pump Station - Buried Slab, 1,050 SF - 12" Thick	40.00	CY	14,466	22,372		1,598		960.876/CY	38,435
03.11.13.215 (75) Thickened Sludge Pump Station - Walls, 22' High, 124 LF - 12" Thick	102.00	CY	119,016	62,741		1,343		1,795.091/CY	183,099
DIVISION 03 CONCRETE			**133,482**	**85,113**		**2,940**		**1,560.101/CY**	**221,534**

142.00 CY

1,142.754 Labor hours
50.848 Equipment hours

DIVISION 05 METALS

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.12.00.010 (75) Thickened Sludge Pump Station - Structural Columns - HSS8x8x3/8 - 10' High - 6 EA	60.00	LF	1,606	5,112		214		115.529/LF	6,932
05.12.00.015 (75) Thickened Sludge Pump Station - Roof Joists - W10x19 - 145 LF	145.00	LF	1,965	9,076		758		81.374/LF	11,799
05.50.00.030 (75) Canopy over Thickened Sludge Pump Station	861.00	SF			74,851			86.934/SF	74,851
05.52.02.010 (75) Thickened Sludge Pump Station - Aluminum Handrail - 3-Rail - 4' High - 116 LF	116.00	LF	4,011	19,261		230		202.606/LF	23,502
DIVISION 05 METALS			**7,582**	**33,449**	**74,851**	**1,202**		**117,083.75 /LS**	**117,084**

1.00 LS

51.646 Labor hours
9.252 Equipment hours

DIVISION 31 EARTHWORK

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31.23.10.025 (75) Thickened Sludge Pump Station, Excavation, Backfill and Haul Off-Site	2,501.00	CY	28,499			30,117		23.437/CY	58,616
31.23.19.005 (75) Thickened Sludge Pump Station, Wellpoint Dewatering - 160 LF - 4 Months	160.00	HDR	672,182	132,941				5,032.019/HDR	805,123
31.62.17.005 (75) Thickened Sludge Pump Station, Sheeting and Shoring - 148 LF x 32' Deep - 4,736 SF	90.00	TON	61,679	145,842		43,175		2,785.510/TON	250,696
DIVISION 31 EARTHWORK			**762,359**	**278,783**		**73,293**		**445.596/CY**	**1,114,435**

2,501.00 CY

6,015.158 Labor hours
353.757 Equipment hours

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40.05.19.085 (75) Exposed Pipe - TS - 8" Dia - Wall Pipe	4.00	LF	849	3,412		1		1,065.645/LF	4,263
40.05.19.090 (75) Exposed Pipe - TS - 8" Dia - 12 LF	12.00	LF	7,716	15,658		4		1,948.112/LF	23,377
40.05.19.095 (75) Exposed Pipe - TS - 6" Dia - Wall Pipe	4.00	LF	713	2,405		1		780.028/LF	3,120
40.05.19.100 (75) Exposed Pipe - TS - 6" Dia - 60 LF	60.00	LF	25,061	61,043		20		1,435.412/LF	86,125
40.05.62.010 (75) Exposed Pipe - TS - Plug Valve - 08" Dia	3.00	EA	1,788	6,066		945		2,932.95 /EA	8,799
40.05.62.015 (75) Exposed Pipe - TS - Plug Valve - 06" Dia	19.00	EA	11,324	26,174		5,983		2,288.482/EA	43,481
40.05.66.015 (75) Exposed Pipe - TS - Check Valve - 06" Dia	3.00	EA	1,341	5,282		630		2,417.707/EA	7,253
40.71.00.005 (75) Exposed Pipe - TS - Flow Meter - 06" Dia	2.00	EA	946	9,825				5,385.89 /EA	10,772
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**49,739**	**129,866**		**7,584**		**2,339.871/LF**	**187,190**

80.00 LF

401.101 Labor hours
49.280 Equipment hours

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
43.23.57.005 (75) Progressive Cavity Pump - (P-75-1, P-75-2, P-75-3), 200 GPM, 50 PSI	3.00	EA	13,738	164,195		485	1,603	60,007.06 /EA	180,021
DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**13,738**	**164,195**		**485**	**1,603**	**60,007.06 /EA**	**180,021**

3.00 EA

120.00 Labor hours
3.00 Equipment hours

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46.24.23.005 (75) Sludge Grinder - (SG-75-1, SG-75-2, SG-75-3), 3 HP	3.00	EA	2,748	82,385		3,879		29,670.837/EA	89,013
DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**2,748**	**82,385**		**3,879**		**29,670.837/EA**	**89,013**
3.00 EA									
24.00 Labor hours									
24.00 Equipment hours									
412 THICKENED SLUDGE PUMP STATION			***969,648***	***773,791***	***74,851***	***89,383***	***1,603***	***1,909,276.18 /LS***	***1,909,276***
1.00 LS									
7,754.660 Labor hours									
490.136 Equipment hours									

500 SLUDGE THICKENER

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 — CONCRETE									
03.11.13.180 (74) Sludge Thickener - Center Slab, 9' Dia, 77 SF - 27" Thick	5.00	CY	2,487	2,643		102		1,046.426/CY	5,232
03.11.13.185 (74) Sludge Thickener - Bottom Slab, 105' Dia, 8630 SF - 12" Thick	321.00	CY	116,123	163,685		11,644		907.948/CY	291,451
03.11.13.190 (74) Sludge Thickener - Thickened Edge Footing, 330' x 5'-3" Wide, 642 SF - 12" Thick	64.167	CY	29,173	32,869		2,331		1,003.215/CY	64,373
03.11.13.195 (74) Sludge Thickener - Walls, 15' High, 319 LF - 18" Thick	266.00	CY	228,054	153,857		3,501		1,448.918/CY	385,412
03.11.13.200 (74) Sludge Thickener - Elevated Trough Wall, 2'-6" High, 295 LF - 8" Thick	19.00	CY	32,051	15,653		250		2,523.886/CY	47,954
03.11.13.205 (74) Sludge Thickener - Elevated Trough Slab, 3'-4" Wide, 1,040 SF - 12" Thick	39.00	CY	26,876	27,813		565		1,416.764/CY	55,254
DIVISION 03 CONCRETE			**434,764**	**396,519**		**18,393**		**1,189.745/CY**	**849,676**
714.167 CY									
3,691.907 Labor hours									
299.616 Equipment hours									
DIVISION 31 — EARTHWORK									
31.23.10.030 (74) Sludge Thickener, Excavation, Backfill and Haul Off-Site	7,513.00	CY	85,597			90,461		23.434/CY	176,058
DIVISION 31 EARTHWORK			**85,597**			**90,461**		**23.434/CY**	**176,058**
7,513.00 CY									
722.920 Labor hours									
709.458 Equipment hours									
DIVISION 33 — UTILITIES (BURIED PIPE AND VALVES)									
33.05.19.045 (74) Buried Pipe, SLG - 12" Dia - 64 LF	64.00	LF	5,583	13,268		1,817		322.935/LF	20,668
33.05.19.050 (74) Buried Pipe, TS - 8" Dia - 55 LF	55.00	LF	2,858	5,933		1,356		184.500/LF	10,148
DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**8,441**	**19,201**		**3,174**		**258.953/LF**	**30,815**
119.00 LF									
72.130 Labor hours									
38.067 Equipment hours									
DIVISION 40 — PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)									
40.05.19.065 (74) Exposed Pipe - GTD - 12" Dia - Wall Pipe	2.00	LF	544	2,956		1		1,750.43 /LF	3,501
40.05.19.070 (74) Exposed Pipe - SLG - 12" Dia - Wall Pipe	2.00	LF	544	2,956		1		1,750.43 /LF	3,501
40.05.19.075 (74) Exposed Pipe - TS - 8" Dia - Wall Pipe	2.00	LF	425	1,706		1		1,065.635/LF	2,131
40.05.19.080 (74) Exposed Pipe - GTD - 12" Dia - 21 LF	21.00	LF	4,087	18,418		7		1,071.984/LF	22,512

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**5,601**	**26,035**		**9**		**1,172.024/LF**	**31,645**
27.00 LF									
43.596 Labor hours									
0.432 Equipment hours									
DIVISION 46 — WATER AND WASTEWATER EQUIPMENT									
46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA	1.00	EA	800	841,853				842,653.04 /EA	842,653
DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**800**	**841,853**				**842,653.04 /EA**	**842,653**
1.00 EA									
100.00 Labor hours									
20.00 Equipment hours									
500 SLUDGE THICKENER			***535,203***	***1,283,607***	***0***	***112,037***	***0***	***1,930,847.44 /LS***	***1,930,847***
1.00 LS									
4,630.554 Labor hours									
1,067.573 Equipment hours									

547 SLUDGE STORAGE

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 — CONCRETE									
03.11.13.145 (73) Sludge Storage - Buried Slab, Drainage Structure Base, 71 SF - 12" Thick	2.667	CY	1,309	1,391		97		1,048.673/CY	2,797
03.11.13.150 (73) Sludge Storage - Wall, Drainage Structure, 2' High - 24 LF - 24" Thick	4.00	CY	2,728	2,522		53		1,325.638/CY	5,303
03.11.13.155 (73) Sludge Storage - Slab on Grade - 6,750 SF - 12" Thick	260.00	CY	90,053	144,731		10,508		943.428/CY	245,291
03.11.13.160 (73) Sludge Storage - Thickened Edge Footing, 1'6" Wide - 99 LF - 12" Thick	6.00	CY	3,621	3,645		224		1,248.255/CY	7,490
03.11.13.165 (73) Sludge Storage - Cont. Footing, 48" Wide - 242 LF - 12" Thick	35.852	CY	17,519	18,498		1,297		1,040.778/CY	37,314
03.11.13.170 (73) Sludge Storage - Wall, 10' High, 238 LF - 12" Thick	89.00	CY	104,669	56,110		1,171		1,819.675/CY	161,951
03.11.13.175 (73) Sludge Storage - Entrance Curb, 6" High, 98 LF - 6" Thick	1.00	CY	1,223	778		60		2,060.69 /CY	2,061
DIVISION 03 CONCRETE			**221,122**	**227,675**		**13,409**		**1,159.809/CY**	**462,206**
398.519 CY									
1,885.019 Labor hours									
225.786 Equipment hours									
DIVISION 13 — SPECIAL CONSTRUCTION									
13.34.19.005 (73) Pre-Engineered Metal Building, Sludge Storage	7,000.00	SF	284,644	851,957		109,799		178.057/SF	1,246,401
DIVISION 13 SPECIAL CONSTRUCTION			**284,644**	**851,957**		**109,799**		**178.057/SF**	**1,246,401**
7,000.00 SF									
1,960.000 Labor hours									
280.00 Equipment hours									
DIVISION 31 — EARTHWORK									
31.23.10.035 (73) Sludge Storage, Excavation, Backfill and Haul Off-Site	1,576.00	CY	17,937			18,957		23.410/CY	36,894
DIVISION 31 EARTHWORK			**17,937**			**18,957**		**23.410/CY**	**36,894**
1,576.00 CY									
151.485 Labor hours									
148.659 Equipment hours									

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
547 SLUDGE STORAGE			***523,703***	***1,079,632***	***0***	***142,165***	***0***	***1,745,500.37 /LS***	***1,745,500***
1.00 LS									
3,996.504 Labor hours									
654.444 Equipment hours									

700 DEWATERING BUILDING

Description	Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03 CONCRETE									
03.11.13.125 (72) Dewatering Building - Slab on Grade - 5,198 SF -12" Thick	189.00	CY	64,145	105,126		7,729		936.511/CY	177,001
03.11.13.130 (72) Dewatering Building - Cont. Footing - 300 LF - 3'-0' Wide x 12" Thick	33.333	CY	17,807	17,331		1,202		1,090.212/CY	36,340
03.11.13.135 (72) Dewatering Building - Cont. Footing - 137 LF - 1'-8" Wide x 8" Thick	5.677	CY	4,103	3,161		260		1,325.237/CY	7,523
03.11.13.140 (72) Dewatering Building - CIP Curb, 1'-6" High - 169 LF - 8" Wide	7.00	CY	7,588	4,443		68		1,728.35 /CY	12,098
03.41.33.005 (72) Dewatering Building - Precast Double Tee Roof, 10DT32, 5,200 SF	5,200.00	SF	5,765	89,798		2,225		18.805/SF	97,787
DIVISION 03 CONCRETE			**99,407**	**219,859**		**11,483**		**1,407.387/CY**	**330,750**
235.01 CY									
840.532 Labor hours									
159.631 Equipment hours									
DIVISION 04 MASONRY									
04.22.00.010 (72) CMU Block 12" Wall - 24' High x 178 LF	4,272.00	SF	151,267	104,851		2,386		60.511/SF	258,504
04.22.00.015 (72) CMU Block 12" Wall - 12' High x 96 LF	1,152.00	SF	41,878	29,367		660		62.417/SF	71,905
04.22.00.020 (72) CMU Block 12" Wall - 18' High x 24 LF	432.00	SF	15,273	10,894		243		61.134/SF	26,410
04.22.00.025 (72) CMU Block 8" Wall - 20' High x 124 LF	2,480.00	SF	67,855	37,204		1,302		42.888/SF	106,361
04.22.00.030 (72) CMU Block 8" Wall - 13' High x 22 LF	286.00	SF	7,998	4,654		152		44.772/SF	12,805
DIVISION 04 MASONRY			**284,271**	**186,970**		**4,743**		**55.206/SF**	**475,985**
8,622.00 SF									
2,318.759 Labor hours									
108.868 Equipment hours									
DIVISION 07 THERMAL, MOISTURE PROTECTION									
07.53.25.005 (72) Dewatering Building - Membrane Roofing System - EPDM - 4,994 SF	10,400.00	SF	101,004	94,812				18.828/SF	195,816
DIVISION 07 THERMAL, MOISTURE PROTECTION			**101,004**	**94,812**				**36.035/SF**	**195,816**
5,434.00 SF									
796.102 Labor hours									
DIVISION 08 OPENINGS									
08.11.00.005 (72) Dewatering Building - Interior Door - Steel 3'x7' - 3 EA	3.00	EA	1,938	8,289				3,408.963/EA	10,227
08.11.00.010 (72) Dewatering Building - Interior Door - Steel 6'x7' - 2 EA	2.00	EA	2,406	10,513				6,459.555/EA	12,919
08.11.19.005 (72) Dewatering Building - Doors - Steel 3'x7'	6.00	EA	3,875	16,579				3,408.975/EA	20,454
08.11.19.010 (72) Dewatering Building - Doors - Steel 6'x7'	1.00	EA	1,203	5,257				6,459.53 /EA	6,460
08.36.15.005 (72) Dewatering Building - Overhead Door - Steel 12' Wide x 12' High	1.00	EA	2,415	8,090				10,504.89 /EA	10,505
08.36.15.010 (72) Dewatering Building - Overhead Door - Steel 14' Wide x 12' High	6.00	EA	20,330	64,143				14,078.908/EA	84,473
08.51.13.005 (72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA	2.00	EA	584	1,426				1,004.97 /EA	2,010
DIVISION 08 OPENINGS			**32,751**	**114,297**				**7,002.270/EA**	**147,048**
21.00 EA									
231.410 Labor hours									

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Work Activity Report

Description		Quantity		Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 22	**PLUMBING**									
22.20.00.005 (74) Plumbing Allowance		5,200.00	SF			116,118			22.330/SF	116,118
DIVISION 22 PLUMBING						**116,118**			**22.330/SF**	**116,118**
5,200.00 SF										
DIVISION 23	**HEATING, VENTILATING & AIR-CONDITIONING (HVAC)**									
23.00.00.005 (74) HVAC Allowance		5,200.00	SF			309,647			59.548/SF	309,647
DIVISION 23 HEATING, VENTILATING & AIR-CONDITIONING (HVAC)						**309,647**			**59.548/SF**	**309,647**
5,200.00 SF										
DIVISION 31	**EARTHWORK**									
31.23.10.040 (72) Dewatering Building, Excavation, Backfill and Haul Off-Site		1,170.00	CY	13,325			14,082		23.425/CY	27,407
DIVISION 31 EARTHWORK				**13,325**			**14,082**		**23.425/CY**	**27,407**
1,170.00 CY										
112.537 Labor hours										
110.440 Equipment hours										
DIVISION 40	**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**									
40.05.19.055 (72) Exposed Pipe - TS - 6" Dia - 260 LF		260.00	LF	14,249	70,252		87		325.336/LF	84,587
40.05.19.060 (72) Exposed Pipe - TS - 6" Dia - Wall Pipe		8.00	LF	1,427	4,811		3		780.031/LF	6,240
DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)				**15,676**	**75,063**		**89**		**338.909/LF**	**90,828**
268.00 LF										
125.729 Labor hours										
4.288 Equipment hours										
DIVISION 46	**WATER AND WASTEWATER EQUIPMENT**									
41.12.13.005 (72) Shaftless Screw Conveyor (SCW-72-1, SCW-72-2, SCW-72-3), 100 CF/H		3.00	EA	1,796	629,715			27	210,512.68 /EA	631,538
46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)		1.00	LS	11,448	519,552		6,466		537,466.180/LS	537,466
46.76.21.005 (72) Belt Filter Press (BF-72-1, BFP-72-2), 1,800 LB/H, 160 GPM @ 2% Solids		2.00	EA	9,159	1,548,980		6,466		782,302.12 /EA	1,564,604
DIVISION 46 WATER AND WASTEWATER EQUIPMENT				**22,403**	**2,698,247**		**12,931**	**27**	**546,721.692/EA**	**2,733,608**
5.00 EA										
195.69 Labor hours										
80.00 Equipment hours										
700 DEWATERING BUILDING				***568,838***	***3,389,248***	***425,765***	***43,330***	***27***	***4,427,206.99 /LS***	***4,427,207***
1.00 LS										
4,620.758 Labor hours										
463.226 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Work Activity Report

Estimate Totals

Description	Amount	Totals	Rate
Labor	5,153,414		
Material	15,109,374		
Build America, Buy America Act			
Equipment	928,273		
Subcontract	8,179,508		
Other	867,953		
Subtotal Field Const Costs	**30,238,522**	**30,238,522**	
Sales Tax Estimate (Mat & Eq)			
Subtotal Field Const Costs		**30,238,522**	
Design Contingency	8,747,985		30.000 %
Subtotal Field Const Costs	**8,747,985**	**38,986,507**	
Escalation Project (Year)	4,374,576		11.540 %
Construction Subtotal	**4,374,576**	**43,361,083**	
Market Volatility Adjustment Factor	2,166,979		5.000 %
Construction Subtotal	**2,166,979**	**45,528,062**	
I&C Allowance	3,329,748		6.000 %
Electrical Allowance	6,659,495		12.000 %
Factored Allowance	**9,989,243**	**55,517,305**	
Total		***55,517,305***	

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Project name	**John F. Kime Water Treatment Plant Expansion Rev02 - MF**
Estimator	Feuerhelm, Matt / MPS
Labor rate table	HDR_2023_Union
Equipment rate table	HDR_EQ_2023
Project	Water Treatment
Notes	OPCC Caveat

Any opinions of probable construction cost or cost estimates provided by HDR, Inc. are made based on information available to HDR, Inc. and based on the cost estimator's experience and qualifications and represents its judgment as an experienced and qualified professional engineer. However, HDR, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over the contractor(s') methods of determining prices, or over competitive bidding or market conditions. HDR, Inc. does not guarantee that proposals, bids, or actual project or construction cost will not vary from opinions of probable cost or cost estimates prepared by HDR, Inc.

A recent AGC report indicated that Jan. of 2020 and Jan. of 2021 saw a 21% increase in residential construction spending, while private, non-residential construction spending tumbled 10% during that same period. Also, during this period, substantial material prices increase in primary materials such as wood, steel and concrete, copper, and PVC. Contractors are experiencing supply-chain issues, transportation issues, short pricing guarantees (1 to 7 days), longer than average fabrication durations, and limited availability of material supplies. This combination has produced a potentially volatile situation for owners as general contractors are drastically recovering costs. A project owner would be wise to ask many questions, work to obtain as much bid competition as possible, and retain a higher than usual contingency.

Report format Sorted by 'WBS_MAIN/MF04_DIV/Work Activity/HDR04SPEC'

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

'Detail' summary
Allocate addons

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		006 SITEWORK										
DIVISION 02		**EXISTING CONDITIONS**										
02.41.00.005		*Demo Existing Fence*										
02 41 00.010		*General Site Demolition*										
	0600	Selective demolition, chain link fences & gates, fence, 6' high	491.00	LF	1,561	-	-		218	-	3.624 /LF	1,780
		02 41 00.010 General Site Demolition	*1.00*	*LS*	*1,561*				*218*		*1,779.54 /LS*	*1,780*
		13.240 Labor hours 4.414 Equipment hours										
		02.41.00.005 Demo Existing Fence	*491.00*	*LF*	*1,561*	*0*	*0*		*218*	*0*	*3.624/LF*	*1,780*
		13.240 Labor hours 4.414 Equipment hours										
02.41.00.025		*Site - Additional Site Demo Allowance*										
02 41 00.010		*General Site Demolition*										
n	0900	Project Allowance_Additional Site Demo	1.00	LS			608,541				608,540.800 /LS	608,541
		02 41 00.010 General Site Demolition	*1.00*	*LS*			*608,541*				*608,540.800/LS*	*608,541*
		02.41.00.025 Site - Additional Site Demo Allowance	*1.00*	*LS*	*0*	*0*	*608,541*		*0*	*0*	*608,540.800/LS*	*608,541*
		DIVISION 02 EXISTING CONDITIONS	**1.00**	**LS**	**1,561**	**0**	**608,541**		**218**	**0**	**610,320.34 /LS**	**610,320**
		13.240 Labor hours 4.414 Equipment hours										
DIVISION 31		**EARTHWORK**										
31.11.00.005		*Site - Clearing and Grubbing - 1.25 Ac*										
31 11 00.000		*Clearing and Gubbing*										
	0020	Clearing & grubbing, cut & chip light trees, to 6" diameter	1.40	ACRE	7,293	-	-		3,891	-	7,988.464 /ACRE	11,184

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 11 00.000		*Clearing and Gubbing*										
	0260	Clearing & grubbing, dense brush, including stumps, clear and grub	1.19	ACRE	7,493	-	-		7,845	-	12,889.504 /ACRE	15,339
		31 11 00.000 Clearing and Gubbing			*14,786*				*11,736*		*10,240.293/ACRE*	*26,522*
		2.59 ACRE										
		127.966 Labor hours										
		105.566 Equipment hours										
		31.11.00.005 Site - Clearing and Grubbing - 1.25 Ac			*14,786*	*0*	*0*		*11,736*	*0*	*10,240.293/ACRE*	*26,522*
		2.59 ACRE										
		127.966 Labor hours										
		105.566 Equipment hours										
31.23.10.005		***Overall Site - Cut/Fill and Haul Off-Site***										
31 23 10.008		*Mass Excavation - Cut/Fill and Haul Off-Site*										
n	0900	Project Allowance_Earthwork Allowance	1.00	LS			794,344				794,344.00 /LS	794,344
		31 23 10.008 Mass Excavation - Cut/Fill and Haul Off-Site					*794,344*				*10.591/CY*	*794,344*
		75,000.00 CY										
		31.23.10.005 Overall Site - Cut/Fill and Haul Off-Site			*0*	*0*	*794,344*		*0*	*0*	*10.591/CY*	*794,344*
		75,000.00 CY										
31.25.00.005		***Erosion Control Allowance***										
31 25 00.000		*Erosion and Sedimentation Controls*										
n	0900	Project Allowance_Erosion Controls	1.00	LS			238,303				238,303.18 /LS	238,303
		31 25 00.000 Erosion and Sedimentation Controls					*238,303*				*19.003/SY*	*238,303*
		12,540.00 SY										
		31.25.00.005 Erosion Control Allowance			*0*	*0*	*238,303*		*0*	*0*	*238,303.18 /LS*	*238,303*
		1.00 LS										
		DIVISION 31 EARTHWORK			**14,786**	**0**	**1,032,647**		**11,736**	**0**		**1,059,170**
		127.966 Labor hours										
		105.566 Equipment hours										

DIVISION 32 — EXTERIOR IMPROVEMENTS

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32.12.16.005		***Site - Asphalt Paving, Site Roads, 4" Thick - 2,436 SY***										
32 12 16.000		*Asphalt Vehicular Paving*										
n	0900	Project Allowance_Site Roads Paving	1.00	LS			794,344				794,344.00 /LS	794,344

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32 12 16.000		*Asphalt Vehicular Paving*										
	0100	Aggregate for earthwork, bank run gravel, spread with 200 H.P. dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	812.00	lcy	4,557	35,475	-		6,061	-	56.765 /lcy	46,093
	0012	Fine grading, finish grading, small area, to be paved with grader	2,436.00	sy	11,466	-	-		10,931	-	9.194 /sy	22,397
	5020	Compaction, riding, vibrating roller, 3 passes, 6" lifts	812.00	ecy	521	-	-		345	-	1.066 /ecy	866
	0160	Plant-mix asphalt paving, for highways and large paved areas, binder course, 3" thick, no hauling included	2,436.00	SY	4,862	42,957	-		2,266	-	20.561 /SY	50,086
	0460	Plant-mix asphalt paving, for highways and large paved areas, wearing course, 3" thick, no hauling included	2,436.00	sy	5,398	47,215	-		2,467	-	22.611 /sy	55,080
n	0560	Hauling, asphalt material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	467.00	lcy	11,330	-	-		11,595	-	49.089 /lcy	22,925
		32 12 16.000 Asphalt Vehicular Paving			*38,134*	*125,647*	*794,344*		*33,665*		*407.139/SY*	*991,791*
		2,436.00 SY 326.795 Labor hours 207.648 Equipment hours										
		32.12.16.005 Site - Asphalt Paving, Site Roads, 4" Thick - 2,436 SY			*38,134*	*125,647*	*794,344*		*33,665*	*0*	*407.139/SY*	*991,791*
		2,436.00 SY 326.795 Labor hours 207.648 Equipment hours										
32.16.13.005		*Site - Concrete Curb & Gutter, Site Roads, 2' wide x 6" thick - 1,984 LF*										
32 16 13.010		*Concrete Curb and Gutter*										
	0446	Cast-in place concrete curbs & gutters, radius, machine formed, 6" high curb, 6" thick gutter, 24" wide, includes concrete	1,984.00	LF	11,756	28,210	-		4,534	-	22.429 /LF	44,500
		32 16 13.010 Concrete Curb and Gutter			*11,756*	*28,210*			*4,534*		*22.429/LF*	*44,500*
		1,984.00 LF 105.813 Labor hours 17.636 Equipment hours										
		32.16.13.005 Site - Concrete Curb & Gutter, Site Roads, 2' wide x 6" thick - 1,984 LF			*11,756*	*28,210*	*0*		*4,534*	*0*	*22.429/LF*	*44,500*
		1,984.00 LF 105.813 Labor hours 17.636 Equipment hours										
32.31.13.005		*Security Fence, Chain Link, 8' High*										
32 31 13.200		*Security Fence*										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32 31 13.200		*Security Fence*										
	0920	Fence, chain link industrial, galvanized steel, 6 ga. wire, 2-1/2" posts @ 10' OC, 8' high, includes excavation, in concrete, excludes barbed wire	665.00	LF	9,373	40,674	-		1,561	-	77.607 /LF	51,608
		32 31 13.200 Security Fence			*9,373*	*40,674*			*1,561*		*77.607/LF*	*51,608*
		665.00 LF										
		88.667 Labor hours										
		59.111 Equipment hours										
		32.31.13.005 Security Fence, Chain Link, 8' High			*9,373*	*40,674*	*0*		*1,561*	*0*	*77.607/LF*	*51,608*
		665.00 LF										
		88.667 Labor hours										
		59.111 Equipment hours										
32.92.00.005		*Site - Seeding - 11,010 SY*										
32 92 00.005		*Seeding*										
	0310	Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	11,010.00	SY	56,769	7,871	-		3,978	-	6.232 /SY	68,617
		32 92 00.005 Seeding			*56,769*	*7,871*			*3,978*		*6.232/SY*	*68,617*
		11,010.00 SY										
		528.48 Labor hours										
		88.08 Equipment hours										
		32.92.00.005 Site - Seeding - 11,010 SY			*56,769*	*7,871*	*0*		*3,978*	*0*	*6.232/SY*	*68,617*
		11,010.00 SY										
		528.48 Labor hours										
		88.08 Equipment hours										
		DIVISION 32 EXTERIOR IMPROVEMENTS			**116,032**	**202,403**	**794,344**		**43,738**	**0**	**1,156,516.49 /LS**	**1,156,516**
		1.00 LS										
		1,049.755 Labor hours										
		372.475 Equipment hours										
DIVISION 33		**UTILITIES (BURIED PIPE AND VALVES)**										
33.05.19.055		*Site - Potable Water System Allowance*										
33 05 19.008		*Buried Pipe, Ductile Iron, 08" Dia*										
n	0900	Project Allowance_Potable Water System, Allowance	1.00	LS			476,606				476,606.38 /LS	476,606

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.008 Buried Pipe, Ductile Iron, 08" Dia					*476,606*				*476.606/LF*	*476,606*
		1,000.00 LF										
		33.05.19.055 Site - Potable Water System Allowance			*0*	*0*	*476,606*		*0*	*0*	*476.606/LF*	*476,606*
		1,000.00 LF										
33.05.39.010		*Site - Storm Sewer*										
33 05 39.124		*Buried Pipe, RCP, 24" Dia*										
n	0900	Project Allowance_Storm Sewer System, Allowance	1.00	LS			714,910				714,909.59 /LS	714,910
		33 05 39.124 Buried Pipe, RCP, 24" Dia					*714,910*				*357.455/LF*	*714,910*
		2,000.00 LF										
		33.05.39.010 Site - Storm Sewer			*0*	*0*	*714,910*		*0*	*0*	*357.455/LF*	*714,910*
		2,000.00 LF										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**0**	**0**	**1,191,516**		**0**	**0**	**397.172/LF**	**1,191,516**
		3,000.00 LF										
		006 SITEWORK			***132,379***	***202,403***	***3,627,048***		***55,692***	***0***	***4,017,522.34 /LS***	***4,017,522***
		1.00 LS										
		1,190.962 Labor hours										
		482.454 Equipment hours										

007 YARD PIPING

DIVISION 31 EARTHWORK

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31.11.00.010		*(RW) - Clearing and Grubbing - 1.0 Ac*										
31 11 00.000		*Clearing and Gubbing*										
	0260	Clearing & grubbing, dense brush, including stumps, clear and grub	2.02	ACRE	12,719	-	-		13,318	-	12,889.515 /ACRE	26,037
		31 11 00.000 Clearing and Gubbing			*12,719*				*13,318*		*12,889.515/ACRE*	*26,037*
		2.02 ACRE										
		103.149 Labor hours										
		103.149 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		31.11.00.010 (RW) - Clearing and Grubbing - 1.0 Ac			*12,719*	*0*	*0*		*13,318*	*0*	*12,889.515/ACRE*	*26,037*
		2.02 ACRE										
		103.149 Labor hours										
		103.149 Equipment hours										
		DIVISION 31 EARTHWORK			**12,719**	**0**	**0**		**13,318**	**0**		**26,037**
		103.149 Labor hours										
		103.149 Equipment hours										

DIVISION 32 EXTERIOR IMPROVEMENTS

32.92.00.010 (RW) - Seeding - 13,890 SY

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32 92 00.005		*Seeding*										
	0310	Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	13,890.00	SY	71,618	9,930	-		5,018	-	6.232 /SY	86,566
		32 92 00.005 Seeding			*71,618*	*9,930*			*5,018*		*6.232/SY*	*86,566*
		13,890.00 SY										
		666.72 Labor hours										
		111.12 Equipment hours										
		32.92.00.010 (RW) - Seeding - 13,890 SY			*71,618*	*9,930*	*0*		*5,018*	*0*	*6.232/SY*	*86,566*
		13,890.00 SY										
		666.72 Labor hours										
		111.12 Equipment hours										
		DIVISION 32 EXTERIOR IMPROVEMENTS			**71,618**	**9,930**	**0**		**5,018**	**0**	**86,566.16 /LS**	**86,566**
		1.00 LS										
		666.72 Labor hours										
		111.12 Equipment hours										

DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)

33.00.00.005 (RW) Remove & Relocate Chemical Feed/Fiber Optic Lines - 1 LS

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 00 00.075		*Utility, Relocation - Allowance*										
n	0900	Project Allowance_Remove and Relocate Chemical Feed/Fiber Optic Lines for 42" RW installation	1.00	LS						317,738	317,737.61 /LS	317,738
		33 00 00.075 Utility, Relocation - Allowance								*317,738*	*317,737.61 /LS*	*317,738*
		1.00 LS										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33.00.00.005 (RW) Remove & Relocate Chemical Feed/Fiber Optic Lines - 1 LS			*0*	*0*	*0*		*0*	*317,738*	*317,737.61 /LS*	*317,738*
		1.00 LS										
	33.05.19.005	*(RW) 42" DIP and Fittings, Fully Restrained, 5' cover - 2,284 LF*										
	33 05 19.042	*Buried Pipe, Ductile Iron, 42" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2,323.00	lf	12,145	277	-		826	-	5.703 /lf	13,248
	7060	Rent trench box, 9500 lbs, 8' x 20'	23.00	day	-	-	-		5,709	-	248.233 /day	5,709
	1371	Excavating, trench or continuous footing, common earth, 1-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	7,098.00	bcy	24,346	-	-		17,129	-	5.843 /bcy	41,476
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	3,718.00	lcy	6,093	-	-		10,501	-	4.463 /lcy	16,594
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	3,160.00	ecy	7,171	-	-		15,948	-	7.316 /ecy	23,118
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	3,514.00	lcy	61,969	173,062	-		8,463	-	69.293 /lcy	243,495
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	4,052.00	lcy	98,307	-	-		100,602	-	49.089 /lcy	198,909
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	3,056.00	ecy	25,699	-	-		2,476	-	9.220 /ecy	28,175
n	3246	Distribution piping,DIP,cement lined,fastite,20' lengths, 42"dia, Press Class 250, Excludes excavation, backfill, bedding	2,323.00	LF	136,018	2,306,576	-		57,519	-	1,076.243 /LF	2,500,113
n	4112	Distribution Piping,DIP,Flex-Ring Joint,42"dia,additional per linear foot of restrained pipe	2,323.00	lf		378,869	-			-	163.095 /lf	378,869
	8060	Fitting, 90 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	1,488	33,055	-		922	-	35,465.050 /ea	35,465
	8060	Fitting, 90 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	1,488	33,055	-		922	-	35,465.03 /ea	35,465
	8160	Fitting, tee, DIP, cement lined, MJ,42" diameter, C110 water piping	1.00	ea	2,181	28,281	-		896	-	31,358.36 /ea	31,358
	8260	Fitting, 45 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	1,488	14,425	-		922	-	16,835.440 /ea	16,835
	8360	Fitting, 22.5 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	3.00	ea	4,465	37,049	-		2,766	-	14,759.98 /ea	44,280
	8674	Fitting, dished plug,DIP,cement lined,MJ,42"dia,C110 water piping	2.00	ea	2,976	19,496	-		1,844	-	12,158.345 /ea	24,317
n	4713	DIP,Polywrap 8 mil LDT 360ft,42"dia	7.00	roll	829	16,951	-		-	-	2,539.951 /roll	17,780
	8460	Fitting,11.25 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	12.00	ea	17,336	255,885	-			-	22,768.38 /ea	273,221

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.042 Buried Pipe, Ductile Iron, 42" Dia			*404,000*	*3,296,982*			*227,445*		*1,691.101/LF*	*3,928,427*
		2,323.00 LF										
		3,432.001 Labor hours										
		2,053.877 Equipment hours										
		33.05.19.005 (RW) 42" DIP and Fittings, Fully Restrained, 5' cover - 2,284 LF			*404,000*	*3,296,982*	*0*		*227,445*	*0*	*1,691.101/LF*	*3,928,427*
		2,323.00 LF										
		3,432.001 Labor hours										
		2,053.877 Equipment hours										
33.05.19.010		*(RW) 54" DIP and Fittings, Fully Restrained, 5' cover - 250 LF*										
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	191.00	lf	999	23	-		68	-	5.703 /lf	1,089
	7060	Rent trench box, 9500 lbs, 8' x 20'	4.00	day	-	-	-		993	-	248.233 /day	993
	1372	Excavating, trench or continuous footing, common earth, 2-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	729.00	bcy	1,500	-	-		2,075	-	4.904 /bcy	3,575
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	346.00	lcy	567	-	-		977	-	4.463 /lcy	1,544
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	294.00	ecy	667	-	-		1,484	-	7.316 /ecy	2,151
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	363.00	lcy	6,401	17,878	-		874	-	69.293 /lcy	25,153
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	432.00	lcy	10,481	-	-		10,726	-	49.089 /lcy	21,206
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	316.00	ecy	2,657	-	-		256	-	9.220 /ecy	2,913
n	3286	Distribution piping,DIP,cement lined,fastite,20' lengths, 54"dia, Press Class 250, Excludes excavation, backfill, bedding	191.00	LF	14,911	251,497	-		6,306	-	1,427.821 /LF	272,714
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	191.00	lf		50,171	-			-	262.674 /lf	50,171
	8171	Fitting, tee reducing, DIP, cement lined, LKR,54" x 42" diameter, C153 water piping	1.00	ea	2,580	57,798	-		1,774	-	62,152.37 /ea	62,152
	8270	Fitting, 45 degree bend,DIP,cement lined,LKR,54"dia,C153 water piping	1.00	ea	1,720	39,966	-		1,185	-	42,871.60 /ea	42,872
	8554	Fitting, reducer, DIP,cement lined,LKR, 54" x 48" diameter,C153-CC water piping	1.00	ea	1,720	26,037	-		1,185	-	28,941.96 /ea	28,942
n	4715	DIP,Polywrap 8 mil LDT 220ft,54"dia	2.00	roll	237	3,946	-		-	-	2,091.550 /roll	4,183
		33 05 19.054 Buried Pipe, Ductile Iron, 54" Dia			*44,441*	*447,315*			*27,903*		*2,720.727/LF*	*519,659*
		191.00 LF										
		376.438 Labor hours										
		225.580 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33.05.19.010 (RW) 54" DIP and Fittings, Fully Restrained, 5' cover - 250 LF			*44,441*	*447,315*	*0*		*27,903*	*0*	*2,720.727/LF*	*519,659*
		191.00 LF										
		376.438 Labor hours										
		225.580 Equipment hours										
33.05.19.015		*(RW) Connection to Existing System - 2 EA*										
33 05 19.042		*Buried Pipe, Ductile Iron, 42" Dia*										
	5500	Rent trash pump self-prime 2" diameter gas drive	4.00	day	-	-	-		495	-	123.695 /day	495
	3000	Utility removal, pipe, sewer/water, 42" diameter, remove, excludes excavation, hauling	4.00	LF	1,834	-	-		4,952	-	1,696.40 /LF	6,786
	3000	Utility removal, pipe, sewer/water, 42" diameter, remove, excludes excavation, hauling	4.00	LF	1,834	-	-		4,952	-	1,696.398 /LF	6,786
	0100	Selective demolition, dump charges, typical urban city, building construction materials, includes tipping fees only	1.00	ton	-	118	-		-	-	117.57 /ton	118
n	1250	Hauling,demolished material, loose cubic yards, 10 mile round trip, 0.75 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	10.00	lcy	86	-	-		99	-	18.512 /lcy	185
		33 05 19.042 Buried Pipe, Ductile Iron, 42" Dia			*3,753*	*118*			*10,498*		*1,796.083/LF*	*14,369*
		8.00 LF										
		32.727 Labor hours										
		65.455 Equipment hours										
		33.05.19.015 (RW) Connection to Existing System - 2 EA			*3,753*	*118*	*0*		*10,498*	*0*	*1,796.083/LF*	*14,369*
		8.00 LF										
		32.727 Labor hours										
		65.455 Equipment hours										
33.05.71.005		*(RW) ARV, 3" on 42" DIP- 3 EA*										
33 05 71.006		*Buried Valves, Air and Vacuum Relief, 06" Dia*										
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	9.00	CY	-	2,645	-		-	-	293.907 /CY	2,645
	1800	Roof hatch, 3'-0" x 3'-0"	3.00	ea	-	2,145	-		-	-	714.907 /ea	2,145
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	5.00	ea	108	46	-		-	-	30.744 /ea	154
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	6.00	ea	660	150	-		-	-	134.97 /ea	810
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	1.00	ea	242	83	-		-	-	324.67 /ea	325
	0900	Aggregate for earthwork, aggregate or sand, spread with 200 HP dozer, includes load at pit and haul, round trip, for 5 mile haul add	2.00	lcy	9	-	-		10	-	9.57 /lcy	19

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 71.006		*Buried Valves, Air and Vacuum Relief, 06" Dia*										
	0520	Utility structures, utility vaults precast concrete, meter pit, 5' x 5', 6' deep, excludes excavation and backfill	3.00	ea	6,613	20,256	-		903	-	9,257.353 /ea	27,772
n	1130	Water utility distribution valve, air release & vacuum valve, 3" diameter, excludes excavation and backfill	3.00	EA	835	8,936	-		-	-	3,257.003 /EA	9,771
n	0001	DIP,FLGxFLG,3"dia,1'-0" long,class 53,excl excav, backfill	3.00	ea	391	2,154	-		-	-	848.333 /ea	2,545
n	1428	Fitting,DIP,FLG,Tee,42"dia,c 110 water piping	3.00	ea	2,842	181,107	-		-	-	61,316.173 /ea	183,949
n	1606	Fitting,DIP,FLG, Tapped Blind Flange,8"dia, water piping	3.00	ea	515	1,289	-		-	-	601.273 /ea	1,804
n	2520	Fitting,DIP,FLG,Conc. Reducer,8"x3",c 110 water piping	3.00	ea	515	1,479	-		-	-	664.827 /ea	1,994
n	0501	Gate Valve Flange Res Wedge: 3" / Handwheel Operator NRS	3.00	ea	1,407	1,348	-		672	-	1,142.217 /ea	3,427
		33 05 71.006 Buried Valves, Air and Vacuum Relief, 06" Dia *3.00 EA* 120.758 Labor hours 24.080 Equipment hours			*14,137*	*221,637*			*1,585*		*79,119.59 /EA*	*237,359*
		33.05.71.005 (RW) ARV, 3" on 42" DIP- 3 EA *3.00 EA* 120.758 Labor hours 24.080 Equipment hours			*14,137*	*221,637*	*0*		*1,585*	*0*	*79,119.59 /EA*	*237,359*
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES) **2,522.00 LF** 3,961.924 Labor hours 2,368.992 Equipment hours			**466,331**	**3,966,051**	**0**		**267,431**	**317,738**	**1,989.513/LF**	**5,017,551**
		007 YARD PIPING ***2,522.00 LF*** 4,731.793 Labor hours 2,583.261 Equipment hours			***550,668***	***3,975,981***	***0***		***285,767***	***317,738***	***2,034.161/LF***	***5,130,154***

083 RAW WATER PUMP STATION

DIVISION 02 EXISTING CONDITIONS

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
02.41.00.010		*(10) Raw Water Pump Station, Demo Process Piping, 36" Blind Flange and Steel Plate Cover*										
02 41 00.150		*Process Pipe Demolition*										
n	0005	Site Demolition Crew with Demolition Equipment (6 men x 8 hrs per day) (7 equip hours x 8 hrs per day)	1.00	DAY	5,821	-	-		11,875	-	17,695.330 /DAY	17,695
	0100	Selective demolition, dump charges, typical urban city, building construction materials, includes tipping fees only	1.00	ton	-	129	-		-	-	128.68 /ton	129
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1.00	lcy	26	-	-		27	-	53.11 /lcy	53
		02 41 00.150 Process Pipe Demolition			*5,847*	*129*			*11,902*		*893.856/LF*	*17,877*
		20.00 LF										
		48.205 Labor hours										
		56.205 Equipment hours										
		02.41.00.010 (10) Raw Water Pump Station, Demo Process Piping, 36" Blind Flange and Steel Plate Cover			*5,847*	*129*	*0*		*11,902*	*0*	*17,877.12 /DAY*	*17,877*
		1.00 DAY										
		48.205 Labor hours										
		56.205 Equipment hours										
		DIVISION 02 EXISTING CONDITIONS			**5,847**	**129**	**0**		**11,902**	**0**	**17,877.12 /LS**	**17,877**
		1.00 LS										
		48.205 Labor hours										
		56.205 Equipment hours										
DIVISION 40		**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
33.05.15.005		*(10) Flow Meter Vault, 10' x 5' x 6' - 1 EA*										
33 05 15.020		*Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep*										
	0100	Utility structures, utility vaults precast concrete, 5' x 10' x 6' high, I.D., 6" thick, excludes excavation and backfill	1.00	EA	2,966	26,796	-		1,553	-	31,315.09 /EA	31,315
		33 05 15.020 Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep			*2,966*	*26,796*			*1,553*		*31,315.09 /EA*	*31,315*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item	Description	Takeoff Qty	Unit	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	33.05.15.005 (10) Flow Meter Vault, 10' x 5' x 6' - 1 EA			*2,966*	*26,796*	*0*		*1,553*	*0*	*31,315.09 /EA*	*31,315*
	1.00 EA										
	28.00 Labor hours										
	4.00 Equipment hours										
40.05.17.005	*(10) Exposed Pipe - RW - Copper Air Release - 01" Dia*										
40 05 17.001	*Pipe and Fittings - Copper, 1/2" to 1" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	13.00	LF	65	1	-		4	-	5.426 /LF	71
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	14.30	lf	31	2	-		-	-	2.292 /lf	33
1114	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 1" pipe	5.00	ea	72	21	-		-	-	18.608 /ea	93
2200	Pipe, copper, tubing, solder, 1" diameter, type L, includes coupling & clevis hanger assembly 10' O.C.	13.00	lf	220	162	-		-	-	29.38 /lf	382
0130	Elbow, 90 Deg., copper, wrought, copper x copper, 1"	4.00	ea	288	83	-		-	-	92.81 /ea	371
	40 05 17.001 Pipe and Fittings - Copper, 1/2" to 1" Dia			*676*	*269*			*4*		*73.042/LF*	*950*
	13.00 LF										
	4.850 Labor hours										
	0.208 Equipment hours										
	40.05.17.005 (10) Exposed Pipe - RW - Copper Air Release - 01" Dia			*676*	*269*	*0*		*4*	*0*	*73.042/LF*	*950*
	13.00 LF										
	4.850 Labor hours										
	0.208 Equipment hours										
40.05.19.005	*(10) Exposed Pipe - RW - 24" - 6 LF*										
40 05 19.024	*Pipe and Fittings - Ductile Iron, 24" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	6.00	LF	30	1	-		2	-	5.422 /LF	33
7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	34.10	sf	278	38	-		-	-	9.259 /sf	316
01084	Pipe Support, 24", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	1.00	ea	1,060	1,308	-		-	-	2,368.21 /ea	2,368
1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.924 /ea	170
0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	2,427	2,025	-		-	-	1,112.803 /ea	4,451
02009	24" DIP Filler Flange 3" thick	1.00	ea	163	347	-		-	-	509.72 /ea	510
n 0420	DIP,FLGxFLG,24"dia,5'-0" long,class 53,excl excav, backfill	1.00	ea	457	10,299	-		-	-	10,756.44 /ea	10,756
n 1022	Fitting,DIP,FLG,90 degree bend,24"dia,c 110 water piping	1.00	ea	457	6,878	-		-	-	7,334.83 /ea	7,335

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia			*4,987*	*20,950*			*2*		*4,323.048/LF*	*25,938*
		6.00 LF										
		38.210 Labor hours 0.096 Equipment hours										
		40.05.19.005 (10) Exposed Pipe - RW - 24" - 6 LF			*4,987*	*20,950*	*0*		*2*	*0*	*4,323.048/LF*	*25,938*
		6.00 LF										
		38.210 Labor hours 0.096 Equipment hours										
40.05.19.125		*(10) Exposed Pipe - RW - 36"x24" Reducer - 1 EA*										
40 05 19.036		*Pipe and Fittings - Ductile Iron, 36" Dia*										
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	1.00	ea	607	506	-		-	-	1,112.81 /ea	1,113
	0830	Gasket and bolt set, for flanges, 150 lb., 36" pipe size	1.00	ea	1,048	2,494	-		-	-	3,541.39 /ea	3,541
n	2620	Fitting,DIP,FLG,Conc. Reducer,36"x24",c 110 water piping	1.00	EA	722	12,791	-		-	-	13,513.13 /EA	13,513
		40 05 19.036 Pipe and Fittings - Ductile Iron, 36" Dia			*2,377*	*15,791*					*18,167.330/LF*	*18,167*
		1.00 LF										
		17.883 Labor hours										
		40.05.19.125 (10) Exposed Pipe - RW - 36"x24" Reducer - 1 EA			*2,377*	*15,791*	*0*		*0*	*0*	*18,167.330/EA*	*18,167*
		1.00 EA										
		17.883 Labor hours										
40.05.52.005		*(10) Exposed Pipe - RW - Air Release Valve - 04" Dia*										
40 05 52.105		*Misc Valves - Air Release Valve, 04" Dia*										
	6000	Nipple, 316 stainless steel, threaded, standard weight, 2"x 4" long	1.00	ea	61	7	-		-	-	67.30 /ea	67
n	1140	Water utility distribution valve, air release & vacuum valve, 4" diameter, excludes excavation and backfill	1.00	EA	424	3,685	-		-	-	4,108.560 /EA	4,109
		40 05 52.105 Misc Valves - Air Release Valve, 04" Dia			*485*	*3,691*					*4,175.860/EA*	*4,176*
		1.00 EA										
		3.621 Labor hours										
		40.05.52.005 (10) Exposed Pipe - RW - Air Release Valve - 04" Dia			*485*	*3,691*	*0*		*0*	*0*	*4,175.860/EA*	*4,176*
		1.00 EA										
		3.621 Labor hours										

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40.05.62.020		*(10) Exposed Pipe - RW - Plug Valve - 24" Dia - 4 EA*										
40 05 62.024		*Exposed Valves - Plug, Eccentric, Cast Iron, 24" Dia*										
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	8.00	ea	4,853	4,049	-		-	-	1,112.806 /ea	8,902
n	0510	Plug Valve Flange: 24" / Handwheel or Lever Operator / Includes Gear Operator	4.00	EA	2,632	122,413	-		1,089	-	31,533.52 /EA	126,134
		40 05 62.024 Exposed Valves - Plug, Eccentric, Cast Iron, 24" Dia			*7,485*	*126,462*			*1,089*		*33,759.132/EA*	*135,037*
		4.00 EA										
		57.684 Labor hours										
		8.00 Equipment hours										
		40.05.62.020 (10) Exposed Pipe - RW - Plug Valve - 24" Dia - 4 EA			*7,485*	*126,462*	*0*		*1,089*	*0*	*33,759.132/EA*	*135,037*
		4.00 EA										
		57.684 Labor hours										
		8.00 Equipment hours										
40.05.63.005		*(10) Exposed Pipe - RW - Ball Valve - 04" Dia*										
40 05 63.204		*Exposed Valves - AWWA C507, Cast Iron Ball Valve, 04" Dia*										
	5560	Valves, steel, forged, ball, flanged, 150 lb., 4"	1.00	EA	707	3,052	-		-	-	3,758.54 /EA	3,759
		40 05 63.204 Exposed Valves - AWWA C507, Cast Iron Ball Valve, 04" Dia			*707*	*3,052*					*3,758.54 /EA*	*3,759*
		1.00 EA										
		5.333 Labor hours										
		40.05.63.005 (10) Exposed Pipe - RW - Ball Valve - 04" Dia			*707*	*3,052*	*0*		*0*	*0*	*3,758.54 /EA*	*3,759*
		1.00 EA										
		5.333 Labor hours										
40.05.66.005		*(10) Exposed Pipe - RW - Check Valve - 24" Dia*										
40 05 66.124		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 24" Dia*										
n	010	Check Valve Flange, Swing: 24" / No Lever	1.00	EA	658	25,616	-		272	-	26,546.39 /EA	26,546
		40 05 66.124 Exposed Valves - Cushioned Swing Check, Ductile Iron, 24" Dia			*658*	*25,616*			*272*		*26,546.39 /EA*	*26,546*
		1.00 EA										
		6.00 Labor hours										
		2.00 Equipment hours										
		40.05.66.005 (10) Exposed Pipe - RW - Check Valve - 24" Dia			*658*	*25,616*	*0*		*272*	*0*	*26,546.39 /EA*	*26,546*
		1.00 EA										

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	40.05.66.005 (10) Exposed Pipe - RW - Check Valve - 24" Dia	*1.00*	*EA*	*658*	*25,616*	*0*		*272*	*0*	*26,546.39 /EA*	*26,546*
	6.00 Labor hours; 2.00 Equipment hours										
40.71.00.010	*(10) Exposed Pipe - RW - Flow Meter - 54" Dia*										
40 71 00.154	*Flow Meter Magnetic, 54"*										
0833	Gasket and bolt set, for flanges, 150 lb., 54" pipe size	2.00	ea	3,187	7,842	-		-	-	5,514.855 /ea	11,030
0200	Flow Meter Magnetic, 54"	1.00	EA	3,245	31,262					34,507.340 /EA	34,507
	40 71 00.154 Flow Meter Magnetic, 54"	*1.00*	*EA*	*6,432*	*39,105*					*45,537.05 /EA*	*45,537*
	46.122 Labor hours										
	40.71.00.010 (10) Exposed Pipe - RW - Flow Meter - 54" Dia	*1.00*	*EA*	*6,432*	*39,105*	*0*		*0*	*0*	*45,537.05 /EA*	*45,537*
	46.122 Labor hours										
40.71.00.015	*(10) Exposed Pipe - RW - Flow Meter - 30" Dia*										
40 71 00.130	*Flow Meter Magnetic, 30"*										
0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	2.00	ea	1,647	2,680	-		-	-	2,163.13 /ea	4,326
0180	Flow Meter Magnetic, 30"	1.00	EA	2,028	10,421					12,448.86 /EA	12,449
	40 71 00.130 Flow Meter Magnetic, 30"	*1.00*	*EA*	*3,675*	*13,100*					*16,775.12 /EA*	*16,775*
	26.429 Labor hours										
	40.71.00.015 (10) Exposed Pipe - RW - Flow Meter - 30" Dia	*1.00*	*EA*	*3,675*	*13,100*	*0*		*0*	*0*	*16,775.12 /EA*	*16,775*
	26.429 Labor hours										
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)	**19.00**	**LF**	**30,447**	**274,833**	**0**		**2,920**	**0**	**16,221.039/LF**	**308,200**
	234.133 Labor hours; 14.304 Equipment hours										

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Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 43		**PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT**										
26.29.23.005		*(10) Variable Frequency Drive, For RW Pump, 200 HP - 1 EA*										
26 29 23.200		*VARIABLE FREQ. DRIVES - 200HP*										
	1250	Variable frequency drives, custom-engineered, 460 volt, 200 HP motor size	1.00	EA	9,401	89,321	-		1,032	-	99,754.93 /EA	99,755
		26 29 23.200 VARIABLE FREQ. DRIVES - 200HP			*9,401*	*89,321*			*1,032*		*99,754.93 /EA*	*99,755*
		1.00 EA										
		68.966 Labor hours										
		13.793 Equipment hours										
		26.29.23.005 (10) Variable Frequency Drive, For RW Pump, 200 HP - 1 EA			*9,401*	*89,321*	*0*		*1,032*	*0*	*99,754.93 /EA*	*99,755*
		1.00 EA										
		68.966 Labor hours										
		13.793 Equipment hours										
43.23.31.005		*(10) Raw Water PS - (P-10-4) Raw Water Feed Pump, 200 HP, 7107 GPM @ 79'*										
43 23 31.000		*Pumping Equipment - Vertical End Suction Helical Screw Centifugal Pumps*										
n	0100	Vertical, centrifugal pump, 200 HP, 7107 GPM @ 79'	1.00	EA	4,579	448,558	-		323	-	453,460.71 /EA	453,461
		43 23 31.000 Pumping Equipment - Vertical End Suction Helical Screw Centifugal Pumps			*4,579*	*448,558*			*323*		*453,460.71 /EA*	*453,461*
		1.00 EA										
		40.00 Labor hours										
		2.00 Equipment hours										
		43.23.31.005 (10) Raw Water PS - (P-10-4) Raw Water Feed Pump, 200 HP, 7107 GPM @ 79'			*4,579*	*448,558*	*0*		*323*	*0*	*453,460.71 /EA*	*453,461*
		1.00 EA										
		40.00 Labor hours										
		2.00 Equipment hours										
		DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**13,981**	**537,879**	**0**		**1,356**	**0**	**276,607.82 /EA**	**553,216**
		2.00 EA										
		108.966 Labor hours										
		15.793 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	083 RAW WATER PUMP STATION			***50,274***	***812,841***	***0***		***16,178***	***0***	***879,292.50 /LS***	***879,293***
	1.00 LS										
	391.304 Labor hours										
	86.302 Equipment hours										

095 SPLITTER BOX

DIVISION 03 **CONCRETE**

03.11.13.005 *(11) Splitter Box - Base Slab - 575 sf - 18" Thick*

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.766	*18" Foundation Slab*										
3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	160.50	sfca	1,338	291	-		-	-	10.152 /sfca	1,629
n 2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	2.80	ton	203	-	-		87	-	103.443 /ton	290
0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	2.80	ton	5,061	6,044	-		-	-	3,966.11 /ton	11,105
2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	2.80	ton	579	-	-		248	-	295.554 /ton	828
4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	32.00	cy	1,148	-	-		127	-	39.863 /cy	1,276
4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	3.20	cy	115	-	-		13	-	39.853 /cy	128
n 0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.00	CY	-	8,813	-		-	-	275.408 /CY	8,813
n 0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.20	cy	-	881	-		-	-	275.406 /cy	881
n 0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	575.00	sf	861	-	-		46	-	1.577 /sf	907
n 0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	28.75	lf	26	1	-		3	-	1.029 /lf	30
n 0215	Control joint, clean out control joint of debris_SOG	28.75	lf	4	-	-			-	0.148 /lf	4
n 0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	28.75	lf	95	7	-		-	-	3.554 /lf	102
n 0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	5.75	csf	94	64	-		-	-	27.468 /csf	158

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.766		*18" Foundation Slab*										
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	5.75	sq	148	70	-		-	-	37.791 /sq	217
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	24.00	ecy	536	1,143	-		44	-	71.824 /ecy	1,724
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	24.00	lcy	401	-	-		443	-	35.177 /lcy	844
		03 11 13.766 18" Foundation Slab			*10,609*	*17,315*			*1,011*		*904.231/CY*	*28,935*
		32.00 CY										
		89.157 Labor hours										
		16.209 Equipment hours										
		03.11.13.005 (11) Splitter Box - Base Slab - 575 sf - 18" Thick			*10,609*	*17,315*	*0*		*1,011*	*0*	*904.231/CY*	*28,935*
		32.00 CY										
		89.157 Labor hours										
		16.209 Equipment hours										
03.11.13.010		*(11) Splitter Box - Walls - 21' High - 12" Thick - 134 LF*										
03 11 13.804		*12" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	141.00	lf	2,972	714	-		-	-	26.139 /lf	3,686
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	5,628.00	sfca	79,582	8,295	-		-	-	15.614 /sfca	87,877
	2551	BLOCKOUT-C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	22.50	sfca	318	33	-		-	-	15.614 /sfca	351
	5200	Chamfer strip, wood, 3/4" wide	282.00	lf	510	59	-		-	-	2.017 /lf	569
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	5.00	c	-	484	-		-	-	96.766 /c	484
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	132.618	lf	868	1,481	-		-	-	17.713 /lf	2,349
	0105	Splice rebar, standard, self-aligning type, taper threaded, #5 bars, includes holding rebar in place while splicing	115.50	ea	2,264	2,579	-		-	-	41.932 /ea	4,843
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	10.50	ton	760	-	-		326	-	103.442 /ton	1,086
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	10.50	ton	826	-	-		354	-	112.443 /ton	1,181
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	10.50	ton	14,550	22,665	-		-	-	3,544.355 /ton	37,216
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	105.00	cy	6,338	-	-		702	-	67.042 /cy	7,039

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	10.50	cy	634	-	-		70	-	67.041 /cy	704
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	105.00	CY	-	28,918	-		-	-	275.407 /CY	28,918
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	10.50	cy	-	2,892	-		-	-	275.408 /cy	2,892
n	0210	Control joint, clean out control joint of debris_WALLS	141.00	lf	21	-	-			-	0.149 /lf	21
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	141.00	lf	467	34	-		-	-	3.553 /lf	501
	0020	Concrete finishing, walls, includes breaking ties and patching voids	5,628.00	sf	9,328	335	-		-	-	1.717 /sf	9,663
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,814.00	sf	5,597	168	-		-	-	2.048 /sf	5,764
		03 11 13.804 12" CIP Wall			*125,036*	*68,655*			*1,452*		*1,858.507/CY*	*195,143*
		105.00 CY										
		1,074.779 Labor hours										
		26.953 Equipment hours										
		03.11.13.010 (11) Splitter Box - Walls - 21' High - 12" Thick - 134 LF			*125,036*	*68,655*	*0*		*1,452*	*0*	*1,858.507/CY*	*195,143*
		105.00 CY										
		1,074.779 Labor hours										
		26.953 Equipment hours										
		DIVISION 03 CONCRETE			**135,645**	**85,970**	**0**		**2,464**	**0**	**1,635.611/CY**	**224,079**
		137.00 CY										
		1,163.935 Labor hours										
		43.162 Equipment hours										

DIVISION 05 METALS

05.50.00.005 (11) Splitter Box - Aluminum Grating - 2" Thick - 340 SF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	340.00	SF	1,611	44,337	-		92	-	135.411 /SF	46,040
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	162.00	lf	5,408	735	-		-	-	37.921 /lf	6,143

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		05 50 00.305 Metal Grating - Aluminum			*7,019*	*45,072*			*92*		*153.479/SF*	*52,183*
		340.00 SF										
		47.909 Labor hours										
		2.72 Equipment hours										
		05.50.00.005 (11) Splitter Box - Aluminum Grating - 2" Thick - 340 SF			*7,019*	*45,072*	*0*		*92*	*0*	*153.479/SF*	*52,183*
		340.00 SF										
		47.909 Labor hours										
		2.72 Equipment hours										
05.50.00.035		*(11) Splitter Box - Metal Ladder into Splitter Box Cells, 21 LF - 5 EA*										
05 50 00.450		*Metal Ladders - Aluminum*										
	0400	Ladder, shop fabricated, aluminum, 20" W, bolted to concrete, excl cage	105.00	LF	5,852	9,767	-		336	-	151.948 /LF	15,955
		05 50 00.450 Metal Ladders - Aluminum			*5,852*	*9,767*			*336*		*151.948/LF*	*15,955*
		105.00 LF										
		39.529 Labor hours										
		9.882 Equipment hours										
		05.50.00.035 (11) Splitter Box - Metal Ladder into Splitter Box Cells, 21 LF - 5 EA			*5,852*	*9,767*	*0*		*336*	*0*	*151.948/LF*	*15,955*
		105.00 LF										
		39.529 Labor hours										
		9.882 Equipment hours										
05.50.00.040		*(11) Splitter Box - Metal Stairs, Exterior - 32 Riser*										
05 50 00.315		*Metal Stairs - Aluminum*										
	0050	Stair, shop fabricated, steel, 4'-0" W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser	32.00	RISR	5,053	28,654	-		290	-	1,062.387 /RISR	33,996
	0132	Floor grating, aluminum, 1-1/2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., up to 300 S.F., field fabricated from panels	16.00	sf	108	1,280	-		6	-	87.135 /sf	1,394
		05 50 00.315 Metal Stairs - Aluminum			*5,161*	*29,933*			*296*		*1,105.955/RISR*	*35,391*
		32.00 RISR										
		34.865 Labor hours										
		8.716 Equipment hours										
		05.50.00.040 (11) Splitter Box - Metal Stairs, Exterior - 32 Riser			*5,161*	*29,933*	*0*		*296*	*0*	*1,105.955/RISR*	*35,391*
		32.00 RISR										
		34.865 Labor hours										
		8.716 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.52.02.005		*(11) Splitter Box - Aluminum Handrail - 3-Rail - 4' High - 95 LF*										
05 52 02.002		*Aluminum Railings - 3 Rail*										
	0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	95.00	LF	3,285	15,774	-		189	-	202.606 /LF	19,248
		05 52 02.002 Aluminum Railings - 3 Rail *95.00 LF* 22.190 Labor hours 5.547 Equipment hours			*3,285*	*15,774*			*189*		*202.606/LF*	*19,248*
		05.52.02.005 (11) Splitter Box - Aluminum Handrail - 3-Rail - 4' High - 95 LF *95.00 LF* 22.190 Labor hours 5.547 Equipment hours			*3,285*	*15,774*	*0*		*189*	*0*	*202.606/LF*	*19,248*
		DIVISION 05 METALS 144.493 Labor hours 26.866 Equipment hours			**21,316**	**100,546**	**0**		**913**	**0**		**122,775**
DIVISION 31		**EARTHWORK**										
31.23.10.015		*(11) Splitter Box, Excavation, Backfill and Haul Off-Site*										
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	83.00	CY	67	-	-		126	-	2.326 /CY	193
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	12.40	CY	15	-	-		26	-	3.349 /CY	42
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	88.00	CY	2,135	-	-		2,185	-	49.089 /CY	4,320
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	12.40	CY	12	-	-		19	-	2.502 /CY	31
		31 23 10.000 Excavation, Backfill, and Haul Off-Site *195.80 CY* 18.828 Labor hours 18.477 Equipment hours			*2,229*				*2,356*		*23.419/CY*	*4,585*
		31.23.10.015 (11) Splitter Box, Excavation, Backfill and Haul Off-Site *195.80 CY* 18.828 Labor hours 18.477 Equipment hours			*2,229*	*0*	*0*		*2,356*	*0*	*23.419/CY*	*4,585*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 31 EARTHWORK			**2,229**	**0**	**0**		**2,356**	**0**	**23.419/CY**	**4,585**
		195.80 CY										
		18.828 Labor hours										
		18.477 Equipment hours										

DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)

33.05.15.010 (11) Flow Meter Vault, 10' x 5' x 6' - 1 EA

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 15.020		*Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep*										
	0100	Utility structures, utility vaults precast concrete, 5' x 10' x 6' high, I.D., 6" thick, excludes excavation and backfill	1.00	EA	3,111	28,596	-		1,657	-	33,364.57 /EA	33,365
		33 05 15.020 Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep			*3,111*	*28,596*			*1,657*		*33,364.57 /EA*	*33,365*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										
		33.05.15.010 (11) Flow Meter Vault, 10' x 5' x 6' - 1 EA			*3,111*	*28,596*	*0*		*1,657*	*0*	*33,364.57 /EA*	*33,365*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										

33.05.19.020 (11) Buried Pipe, INF - 54" Dia - 11 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	11.00	lf	58	1	-		4	-	5.704 /lf	63
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		217	-	216.75 /day	217
	1372	Excavating, trench or continuous footing, common earth, 2-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	44.00	bcy	91	-	-		125	-	4.904 /bcy	216
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	23.00	lcy	38	-	-		65	-	4.462 /lcy	103
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	20.00	ecy	45	-	-		101	-	7.318 /ecy	146
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	21.00	lcy	370	1,034	-		51	-	69.292 /lcy	1,455
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	19.00	ecy	160	-	-		15	-	9.22 /ecy	175
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.18 /clf	66
n	3286	Distribution piping,DIP,cement lined,fastite,20' lengths, 54"dia, Press Class 250, Excludes excavation, backfill, bedding	11.00	LF	1,610	14,484	-		681	-	1,525.019 /LF	16,775

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	11.00	lf		2,889	-			-	262.676 /lf	2,889
	8070	Fitting, 90 degree bend,DIP,cement lined,LKR,54"dia,C153 water piping	2.00	ea	3,440	99,687	-		2,371	-	52,748.825 /ea	105,498
n	4715	DIP,Polywrap 8 mil LDT 220ft,54"dia	1.00	roll	118	1,973	-		-	-	2,091.54 /roll	2,092
		33 05 19.054 Buried Pipe, Ductile Iron, 54" Dia			*5,936*	*120,130*			*3,629*		*11,790.417/LF*	*129,695*
		11.00 LF										
		49.249 Labor hours										
		22.168 Equipment hours										
		33.05.19.020 (11) Buried Pipe, INF - 54" Dia - 11 LF			*5,936*	*120,130*	*0*		*3,629*	*0*	*11,790.417/LF*	*129,695*
		11.00 LF										
		49.249 Labor hours										
		22.168 Equipment hours										
33.05.19.025		*(11) Buried Pipe, PSG - 30" Dia - 156 LF*										
33 05 19.030		*Buried Pipe, Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	156.00	lf	816	19	-		55	-	5.703 /lf	890
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		217	-	216.78 /day	217
	0500	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 6' to 10' deep, excludes sheeting or dewatering	395.00	bcy	3,396	-	-		2,060	-	13.813 /bcy	5,456
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	243.00	lcy	398	-	-		686	-	4.463 /lcy	1,085
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	211.00	ecy	479	-	-		1,065	-	7.316 /ecy	1,544
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	179.00	lcy	3,157	8,816	-		431	-	69.293 /lcy	12,403
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	156.00	ecy	1,312	-	-		126	-	9.220 /ecy	1,438
	00500	6" Wide Underground Utility Marking Tape	2.00	clf	12	121	-		-	-	66.195 /clf	132
n	3206	Distribution piping,DIP,cement lined,fastite,20' lengths, 30"dia, Press Class 250, Excludes excavation, backfill, bedding	156.00	LF	14,874	56,501	-		4,180	-	484.334 /LF	75,556
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	52.00	lf		13,659	-			-	262.674 /lf	13,659
	8050	Fitting, 90 degree bend,DIP,cement lined,MJ,30"dia,C110 water piping	4.00	ea	4,910	51,728	-		1,710	-	14,587.128 /ea	58,349
	8620	Fitting, dished cap,DIP,cement lined,MJ,30"dia,C110 water piping	2.00	ea	2,455	7,011	-		855	-	5,160.49 /ea	10,321
n	4711	DIP,Polywrap 8 mil LDT 440ft,30"dia	1.00	roll	118	2,459	-		-	-	2,577.240 /roll	2,577

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.030 Buried Pipe, Ductile Iron, 30" Dia			*31,927*	*140,313*			*11,387*		*1,177.094/LF*	*183,627*
		156.00 LF										
		270.685 Labor hours										
		87.873 Equipment hours										
		33.05.19.025 (11) Buried Pipe, PSG - 30" Dia - 156 LF			*31,927*	*140,313*	*0*		*11,387*	*0*	*1,177.094/LF*	*183,627*
		156.00 LF										
		270.685 Labor hours										
		87.873 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**40,974**	**289,039**	**0**		**16,673**	**0**	**2,075.963/LF**	**346,686**
		167.00 LF										
		347.933 Labor hours										
		114.041 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.010 (11) Exposed Pipe - INF - 54" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.054		*Pipe and Fittings - Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	10	0	-		1	-	5.445 /LF	11
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	23	11	-		-	-	33.92 /ea	34
	0833	Gasket and bolt set, for flanges, 150 lb., 54" pipe size	1.00	ea	1,594	3,921	-		-	-	5,514.87 /ea	5,515
n	0640	DIP,FLGxFLG,54"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	1,275	38,020	-		-	-	39,295.370 /ea	39,295
		40 05 19.054 Pipe and Fittings - Ductile Iron, 54" Dia			*2,902*	*41,952*			*1*		*22,427.525/LF*	*44,855*
		2.00 LF										
		22.601 Labor hours										
		0.032 Equipment hours										
		40.05.19.010 (11) Exposed Pipe - INF - 54" Dia - Wall Pipe			*2,902*	*41,952*	*0*		*1*	*0*	*22,427.525/LF*	*44,855*
		2.00 LF										
		22.601 Labor hours										
		0.032 Equipment hours										

40.05.19.015 (11) Exposed Pipe - PSG - 30" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	40	1	-		3	-	5.428 /LF	43

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	4.00	ea	92	43	-		-	-	33.918 /ea	136
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	4.00	ea	3,293	5,359	-		-	-	2,163.133 /ea	8,653
n	0460	DIP,FLGxFLG,30"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	2,167	49,062	-		-	-	12,807.328 /ea	51,229
		40 05 19.030 Pipe and Fittings - Ductile Iron, 30" Dia			*5,592*	*54,466*			*3*		*7,507.616/LF*	*60,061*
		8.00 LF										
		43.017 Labor hours										
		0.128 Equipment hours										
		40.05.19.015 (11) Exposed Pipe - PSG - 30" Dia - Wall Pipe			*5,592*	*54,466*	*0*		*3*	*0*	*7,507.616/LF*	*60,061*
		8.00 LF										
		43.017 Labor hours										
		0.128 Equipment hours										
40.05.59.005		*(11) Water Control Gates - 60" x 36"*										
40 05 59.160		*Fabricated Stainless Steel Slide or Weir Gate, 60" x 36"*										
	9999	Slide gates, hydraulic structures, 316 stainless steel, self contained, incl embedded frame, yoke mounted handwheel, BY SQUARE FOOT	15.00	SF	3,696	16,301	-		7,077	88	1,810.879 /SF	27,163
	9999	Slide gates, hydraulic structures, 316 stainless steel, self contained, incl embedded frame, yoke mounted handwheel, BY SQUARE FOOT	15.00	SF	3,696	16,301	-		7,077	88	1,810.879 /SF	27,163
		40 05 59.160 Fabricated Stainless Steel Slide or Weir Gate, 60" x 36"			*7,393*	*32,602*			*14,155*	*176*	*1,810.879/SF*	*54,326*
		30.00 SF										
		55.80 Labor hours										
		62.50 Equipment hours										
		40.05.59.005 (11) Water Control Gates - 60" x 36"			*7,393*	*32,602*	*0*		*14,155*	*176*	*1,810.879/SF*	*54,326*
		30.00 SF										
		55.80 Labor hours										
		62.50 Equipment hours										
40.05.64.005		*(11) Exposed Valves - PSG - Butterfly Valve - 30" Dia - 2 EA*										
40 05 64.130		*Exposed Valves - Butterfly Valve, Ductille Iron, 30" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.918 /ea	170
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	4.00	ea	3,293	5,359	-		-	-	2,163.14 /ea	8,653
	02010	30" DIP Filler Flange 3" thick	2.00	ea	326	694	-		-	-	509.72 /ea	1,019

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 64.130		*Exposed Valves - Butterfly Valve, Ductile Iron, 30" Dia*										
n	1110	Butterfly Valve Flange Res Seated: 30" / Handwheel Operator with Gearing	2.00	EA	7,628	42,112	-			-	24,870.155 /EA	49,740
		40 05 64.130 Exposed Valves - Butterfly Valve, Ductile Iron, 30" Dia			*11,363*	*48,219*					*29,790.95 /EA*	*59,582*
		2.00 EA										
		78.917 Labor hours										
		40.05.64.005 (11) Exposed Valves - PSG - Butterfly Valve - 30" Dia - 2 EA			*11,363*	*48,219*	*0*		*0*	*0*	*29,790.95 /EA*	*59,582*
		2.00 EA										
		78.917 Labor hours										
40.71.00.020		*(11) Exposed Pipe - PSG - Flow Meter - 30" Dia*										
40 71 00.130		*Flow Meter Magnetic, 30"*										
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	2.00	ea	1,647	2,680	-		-	-	2,163.13 /ea	4,326
	0180	Flow Meter Magnetic, 30"	1.00	EA	2,028	10,421					12,448.86 /EA	12,449
		40 71 00.130 Flow Meter Magnetic, 30"			*3,675*	*13,100*					*16,775.12 /EA*	*16,775*
		1.00 EA										
		26.429 Labor hours										
		40.71.00.020 (11) Exposed Pipe - PSG - Flow Meter - 30" Dia			*3,675*	*13,100*	*0*		*0*	*0*	*16,775.12 /EA*	*16,775*
		1.00 EA										
		26.429 Labor hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**30,924**	**190,340**	**0**		**14,158**	**176**	**23,559.938/LF**	**235,599**
		10.00 LF										
		226.764 Labor hours										
		62.66 Equipment hours										
		095 SPLITTER BOX			***231,089***	***665,895***	***0***		***36,564***	***176***	***933,724.69 /LS***	***933,725***
		1.00 LS										
		1,901.953 Labor hours										
		265.206 Equipment hours										

100 SUPER PULSATORS

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03			**CONCRETE**									
03.11.13.015		*(15) Super Pulsators - Base Slab - 7,255 sf - 18" Thick*										
03 11 13.766		*18" Foundation Slab*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	585.00	sfca	4,877	1,062	-		-	-	10.152 /sfca	5,939
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	35.35	ton	2,559	-	-		1,098	-	103.443 /ton	3,657
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	35.35	ton	63,896	76,306	-		-	-	3,966.108 /ton	140,202
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	35.35	ton	7,311	-	-		3,136	-	295.553 /ton	10,448
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	404.00	cy	14,500	-	-		1,605	-	39.863 /cy	16,105
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	40.40	cy	1,450	-	-		161	-	39.863 /cy	1,610
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	404.00	CY	-	111,265	-		-	-	275.407 /CY	111,265
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	40.40	cy	-	11,126	-		-	-	275.408 /cy	11,126
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	7,255.00	sf	10,860	-	-		582	-	1.577 /sf	11,442
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	362.75	lf	325	16	-		32	-	1.028 /lf	373
n	0215	Control joint, clean out control joint of debris_SOG	362.75	lf	54	-	-			-	0.149 /lf	54
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	362.75	lf	1,202	86	-		-	-	3.553 /lf	1,289
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	72.55	csf	1,188	805	-		-	-	27.468 /csf	1,993
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	72.55	sq	1,862	880	-		-	-	37.793 /sq	2,742
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	309.00	ecy	6,905	14,720	-		569	-	71.824 /ecy	22,194
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	309.00	lcy	5,160	-	-		5,709	-	35.176 /lcy	10,870

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.766 18" Foundation Slab			*122,148*	*216,267*			*12,892*		*869.573/CY*	*351,308*
		404.00 CY										
		1,021.686 Labor hours										
		206.611 Equipment hours										
		03.11.13.015 (15) Super Pulsators - Base Slab - 7,255 sf - 18" Thick			*122,148*	*216,267*	*0*		*12,892*	*0*	*869.573/CY*	*351,308*
		404.00 CY										
		1,021.686 Labor hours										
		206.611 Equipment hours										
03.11.13.020		*(15) Super Pulsators - Walls - 17'-6" High - 18" Thick - 228 LF*										
03 11 13.811		*18" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	200.00	lf	4,215	1,012	-		-	-	26.139 /lf	5,228
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	7,980.00	sfca	112,840	11,761	-		-	-	15.614 /sfca	124,601
	5200	Chamfer strip, wood, 3/4" wide	399.00	lf	722	83	-		-	-	2.017 /lf	805
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	7.00	c	-	677	-		-	-	96.763 /c	677
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	157.916	lf	1,034	1,763	-		-	-	17.713 /lf	2,797
	0100	Splice rebar, standard, self-aligning type, taper threaded, #4 bars, includes holding rebar in place while splicing	244.20	ea	4,283	4,653	-		-	-	36.594 /ea	8,936
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	22.20	ton	1,607	-	-		689	-	103.444 /ton	2,296
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	22.20	ton	1,747	-	-		749	-	112.44 /ton	2,496
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	22.20	ton	30,764	47,921	-		-	-	3,544.355 /ton	78,685
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	222.00	cy	13,400	-	-		1,483	-	67.042 /cy	14,883
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	22.20	cy	1,340	-	-		148	-	67.042 /cy	1,488
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	222.00	CY	-	61,140	-		-	-	275.407 /CY	61,140
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	22.20	cy	-	6,114	-		-	-	275.408 /cy	6,114

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0210	Control joint, clean out control joint of debris_WALLS	200.00	lf	30	-	-			-	0.149 /lf	30
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	200.00	lf	663	48	-		-	-	3.553 /lf	711
	0020	Concrete finishing, walls, includes breaking ties and patching voids	7,980.00	sf	13,226	475	-		-	-	1.717 /sf	13,702
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	3,990.00	sf	7,936	238	-		-	-	2.048 /sf	8,173
		03 11 13.811 18" CIP Wall			*193,807*	*135,886*			*3,070*		*1,498.933/CY*	*332,763*
		222.00 CY										
		1,662.041 Labor hours										
		56.987 Equipment hours										
		03.11.13.020 (15) Super Pulsators - Walls - 17'-6" High - 18" Thick - 228 LF			*193,807*	*135,886*	*0*		*3,070*	*0*	*1,498.933/CY*	*332,763*
		222.00 CY										
		1,662.041 Labor hours										
		56.987 Equipment hours										

03.11.13.025 *(15) Super Pulsators - Walls - 12'-6" High - 18" Thick - 85 LF*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	54.00	lf	1,138	273	-		-	-	26.139 /lf	1,411
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,125.00	sfca	30,048	3,132	-		-	-	15.614 /sfca	33,180
n	5200	Chamfer strip, wood, 3/4" wide	107.00	lf	193	22	-		-	-	2.017 /lf	216
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	194	-		-	-	96.765 /c	194
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	139.00	lf	910	1,511	-		-	-	17.415 /lf	2,421
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.00	ton	8,315	12,952	-		-	-	3,544.355 /ton	21,266
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	6.00	ton	434	-	-		186	-	103.447 /ton	621
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	6.00	ton	472	-	-		203	-	112.442 /ton	675
n	0210	Control joint, clean out control joint of debris_WALLS	54.00	lf	8	-	-		-	-	0.149 /lf	8
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	54.00	lf	179	13	-		-	-	3.554 /lf	192
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,125.00	sf	3,522	127	-		-	-	1.717 /sf	3,649
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,062.50	sf	2,113	63	-		-	-	2.048 /sf	2,177

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	60.00	cy	3,622	-	-		401	-	67.042 /cy	4,023
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	60.00	CY	-	16,524	-		-	-	275.407 /CY	16,524
		03 11 13.811 18" CIP Wall			*50,955*	*34,810*			*790*		*1,442.584/CY*	*86,555*
		60.00 CY										
		435.272 Labor hours 14.093 Equipment hours										
		03.11.13.025 (15) Super Pulsators - Walls - 12'-6" High - 18" Thick - 85 LF			*50,955*	*34,810*	*0*		*790*	*0*	*1,442.584/CY*	*86,555*
		60.00 CY										
		435.272 Labor hours 14.093 Equipment hours										
03.11.13.030		*(15) Super Pulsators - Walls - 21' High - 14" Thick - 69 LF*										
03 11 13.806		*14" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	73.00	lf	1,539	369	-		-	-	26.138 /lf	1,908
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,898.00	sfca	40,979	4,271	-		-	-	15.614 /sfca	45,250
n	5200	Chamfer strip, wood, 3/4" wide	145.00	lf	262	30	-		-	-	2.017 /lf	292
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	290	-		-	-	96.767 /c	290
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	142.00	lf	930	1,543	-		-	-	17.415 /lf	2,473
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.30	ton	8,730	13,599	-		-	-	3,544.356 /ton	22,329
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	6.30	ton	456	-	-		196	-	103.443 /ton	652
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	6.30	ton	496	-	-		213	-	112.441 /ton	708
n	0210	Control joint, clean out control joint of debris_WALLS	73.00	lf	11	-	-		-	-	0.149 /lf	11
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	73.00	lf	242	17	-		-	-	3.553 /lf	259
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,898.00	sf	4,803	173	-		-	-	1.717 /sf	4,976
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,449.00	sf	2,882	86	-		-	-	2.049 /sf	2,968

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
03 11 13.806		*14" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	63.00	cy	3,803	-	-		421	-	67.042 /cy	4,224
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	63.00	CY	-	17,351	-		-	-	275.407 /CY	17,351
		03 11 13.806 14" CIP Wall			*65,132*	*37,730*			*829*		*1,645.901/CY*	*103,692*
		63.00 CY										
		557.599 Labor hours										
		14.797 Equipment hours										
		03.11.13.030 (15) Super Pulsators - Walls - 21' High - 14" Thick - 69 LF			*65,132*	*37,730*	*0*		*829*	*0*	*1,645.901/CY*	*103,692*
		63.00 CY										
		557.599 Labor hours										
		14.797 Equipment hours										
03.11.13.035		*(15) Super Pulsators - Walls - 17' High - 12" Thick - 54 LF*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	46.00	lf	970	233	-		-	-	26.139 /lf	1,202
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	1,836.00	sfca	25,962	2,706	-		-	-	15.614 /sfca	28,668
n	5200	Chamfer strip, wood, 3/4" wide	92.00	lf	166	19	-		-	-	2.017 /lf	186
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	194	-		-	-	96.765 /c	194
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	100.00	lf	655	1,087	-		-	-	17.415 /lf	1,741
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.40	ton	4,712	7,339	-		-	-	3,544.35 /ton	12,051
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	3.40	ton	246	-	-		106	-	103.438 /ton	352
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	3.40	ton	268	-	-		115	-	112.447 /ton	382
n	0210	Control joint, clean out control joint of debris_WALLS	46.00	lf	7	-	-		-	-	0.149 /lf	7
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	46.00	lf	152	11	-		-	-	3.553 /lf	163
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	1,836.00	sf	3,043	109	-		-	-	1.717 /sf	3,152
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	918.00	sf	1,826	55	-		-	-	2.048 /sf	1,881

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	34.00	cy	2,052	-	-		227	-	67.042 /cy	2,279
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	34.00	CY	-	9,364	-		-	-	275.407 /CY	9,364
		03 11 13.804 12" CIP Wall			*40,058*	*21,116*			*448*		*1,812.407/CY*	*61,622*
		34.00 CY										
		343.326 Labor hours										
		7.986 Equipment hours										
		03.11.13.035 (15) Super Pulsators - Walls - 17' High - 12" Thick - 54 LF			*40,058*	*21,116*	*0*		*448*	*0*	*1,812.407/CY*	*61,622*
		34.00 CY										
		343.326 Labor hours										
		7.986 Equipment hours										

03.11.13.040 *(15) Super Pulsators - Walls - 20' High - 12" Thick - 72 LF*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	72.00	lf	1,518	364	-		-	-	26.139 /lf	1,882
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,880.00	sfca	40,724	4,245	-		-	-	15.614 /sfca	44,969
n	5200	Chamfer strip, wood, 3/4" wide	144.00	lf	260	30	-		-	-	2.017 /lf	290
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	290	-		-	-	96.76 /c	290
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	144.00	lf	943	1,565	-		-	-	17.415 /lf	2,508
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.40	ton	7,483	11,656	-		-	-	3,544.356 /ton	19,140
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.40	ton	391	-	-		168	-	103.441 /ton	559
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.40	ton	425	-	-		182	-	112.441 /ton	607
n	0210	Control joint, clean out control joint of debris_WALLS	72.00	lf	11	-	-		-	-	0.149 /lf	11
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	72.00	lf	239	17	-		-	-	3.553 /lf	256
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,880.00	sf	4,773	172	-		-	-	1.717 /sf	4,945
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,440.00	sf	2,864	86	-		-	-	2.048 /sf	2,950

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		12" CIP Wall										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	54.00	cy	3,259	-	-		361	-	67.042 /cy	3,620
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	54.00	CY	-	14,872	-		-	-	275.407 /CY	14,872
		03 11 13.804 12" CIP Wall 54.00 CY 538.980 Labor hours 12.683 Equipment hours			62,890	33,297			711		1,794.409/CY	96,898
		03.11.13.040 (15) Super Pulsators - Walls - 20' High - 12" Thick - 72 LF 54.00 CY 538.980 Labor hours 12.683 Equipment hours			62,890	33,297	0		711	0	1,794.409/CY	96,898
03.11.13.045		(15) Super Pulsators - Walls - 21' High - 12" Thick - 69 LF										
03 11 13.804		12" CIP Wall										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	73.00	lf	1,539	369	-		-	-	26.139 /lf	1,908
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,898.00	sfca	40,979	4,271	-		-	-	15.614 /sfca	45,250
n	5200	Chamfer strip, wood, 3/4" wide	145.00	lf	262	30	-		-	-	2.017 /lf	292
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	290	-		-	-	96.773 /c	290
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	142.00	lf	930	1,543	-		-	-	17.415 /lf	2,473
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.40	ton	7,483	11,656	-		-	-	3,544.357 /ton	19,140
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.40	ton	391	-	-		168	-	103.444 /ton	559
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.40	ton	425	-	-		182	-	112.441 /ton	607
n	0210	Control joint, clean out control joint of debris_WALLS	73.00	lf	11	-	-		-	-	0.149 /lf	11
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	73.00	lf	242	17	-		-	-	3.553 /lf	259
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,898.00	sf	4,803	173	-		-	-	1.717 /sf	4,976
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,449.00	sf	2,882	86	-		-	-	2.048 /sf	2,968

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	54.00	cy	3,259	-	-		361	-	67.042 /cy	3,620
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	54.00	CY	-	14,872	-		-	-	275.407 /CY	14,872
		03 11 13.804 12" CIP Wall			*63,206*	*33,309*			*711*		*1,800.473/CY*	*97,226*
		54.00 CY 541.711 Labor hours 12.683 Equipment hours										
		03.11.13.045 (15) Super Pulsators - Walls - 21' High - 12" Thick - 69 LF			*63,206*	*33,309*	*0*		*711*	*0*	*1,800.473/CY*	*97,226*
		54.00 CY 541.711 Labor hours 12.683 Equipment hours										
03.11.13.050		*(15) Super Pulsators - Walls - 4'-7" High - 8" Thick - 78 LF*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	18.00	lf	379	91	-		-	-	26.14 /lf	471
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	714.48	sfca	10,103	1,053	-		-	-	15.614 /sfca	11,156
n	5200	Chamfer strip, wood, 3/4" wide	36.00	lf	65	8	-		-	-	2.017 /lf	73
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.75 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	96.00	lf	629	1,043	-		-	-	17.415 /lf	1,672
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.90	ton	1,247	1,943	-		-	-	3,544.37 /ton	3,190
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.90	ton	65	-	-		28	-	103.411 /ton	93
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.90	ton	71	-	-		30	-	112.44 /ton	101
n	0210	Control joint, clean out control joint of debris_WALLS	18.00	lf	3	-	-		-	-	0.15 /lf	3
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	18.00	lf	60	4	-		-	-	3.552 /lf	64
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	714.48	sf	1,184	43	-		-	-	1.717 /sf	1,227
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	357.24	sf	711	21	-		-	-	2.049 /sf	732

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	9.00	cy	543	-	-		60	-	67.04 /cy	603
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	9.00	CY	-	2,479	-		-	-	275.409 /CY	2,479
		03 11 13.801 08" CIP Wall			*15,060*	*6,781*			*118*		*2,439.906/CY*	*21,959*
		9.00 CY										
		129.309 Labor hours 2.114 Equipment hours										
		03.11.13.050 (15) Super Pulsators - Walls - 4'-7" High - 8" Thick - 78 LF			*15,060*	*6,781*	*0*		*118*	*0*	*2,439.906/CY*	*21,959*
		9.00 CY										
		129.309 Labor hours 2.114 Equipment hours										
03.11.13.055		*(15) Super Pulsators - Walls - 3'-6" High - 8" Thick - 674 LF*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	118.00	lf	2,487	597	-		-	-	26.139 /lf	3,084
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	4,718.00	sfca	66,714	6,953	-		-	-	15.614 /sfca	73,668
n	5200	Chamfer strip, wood, 3/4" wide	236.00	lf	427	49	-		-	-	2.017 /lf	476
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	4.00	c	-	387	-		-	-	96.768 /c	387
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	792.00	lf	5,186	8,607	-		-	-	17.415 /lf	13,793
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.90	ton	8,176	12,736	-		-	-	3,544.361 /ton	20,912
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.90	ton	427	-	-		183	-	103.437 /ton	610
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.90	ton	464	-	-		199	-	112.446 /ton	663
n	0210	Control joint, clean out control joint of debris_WALLS	118.00	lf	18	-	-		-	-	0.149 /lf	18
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	118.00	lf	391	28	-		-	-	3.553 /lf	419
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	4,718.00	sf	7,820	281	-		-	-	1.717 /sf	8,101
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,359.00	sf	4,692	140	-		-	-	2.048 /sf	4,832

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	59.00	cy	3,561	-	-		394	-	67.042 /cy	3,955
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	59.00	CY	-	16,249	-		-	-	275.407 /CY	16,249
		03 11 13.801 08" CIP Wall			*100,363*	*46,028*			*777*		*2,494.365/CY*	*147,168*
		59.00 CY										
		861.634 Labor hours										
		13.858 Equipment hours										
		03.11.13.055 (15) Super Pulsators - Walls - 3'-6" High - 8" Thick - 674 LF			*100,363*	*46,028*	*0*		*777*	*0*	*2,494.365/CY*	*147,168*
		59.00 CY										
		861.634 Labor hours										
		13.858 Equipment hours										

03.11.13.060 *(15) Super Pulsators - Column Footings - 16"x16"x 16" Thick - 4 EA*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.250		*Column Footings*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	32.00	sfca	332	33	-		-	-	11.403 /sfca	365
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.563	ton	41	-	-		17	-	103.41 /ton	58
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.563	ton	44	-	-		19	-	112.45 /ton	63
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.563	ton	1,018	779	-		-	-	3,192.00 /ton	1,797
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.00	cy	179	-	-		20	-	39.862 /cy	199
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.50	cy	18	-	-		2	-	39.82 /cy	20
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.00	CY	-	1,340	-		-	-	267.966 /CY	1,340
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.50	cy	-	134	-		-	-	267.960 /cy	134
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	16.00	sf	10	-	-		-	-	0.643 /sf	10
		03 11 13.250 Column Footings			*1,642*	*2,287*			*58*		*797.366/CY*	*3,987*
		5.00 CY										
		13.416 Labor hours										
		0.808 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.060 (15) Super Pulsators - Colunm Footings - 16"x16"x 16" Thick - 4 EA			*1,642*	*2,287*	*0*		*58*	*0*	*797.366/CY*	*3,987*
		5.00 CY										
		13.416 Labor hours										
		0.808 Equipment hours										
03.11.13.065		*(15) Super Pulsators - Colunms for Effluent Trough - 12"x12"x 6'-4" High - 4 EA*										
03 11 13.709		*CIP Sqr Col 12"*										
	6650	C.I.P. concrete forms, column, square, plywood, 24" x 24", 4 use, includes erecting, bracing, stripping and cleaning	58.64	sfca	893	125	-		-	-	17.365 /sfca	1,018
n	0202	Ties, for coil tie system, for CIP column forms, 1/2", 6000#, 36", includes material only	4.00	c	-	2,828	-		-	-	707.123 /c	2,828
n	2030	Reinforcing steel, unload and sort, add to base_COLUMNS	0.234	ton	17	-	-		7	-	103.419 /ton	24
n	2216	Reinforcing steel, crane cost for handling, average, add_COLUMNS	0.234	ton	18	-	-		8	-	112.48 /ton	26
	0250	Reinforcing steel, in place, columns, #8 to #18, A615, grade 60, incl labor for accessories, excl material for accessories	0.234	ton	423	505	-		-	-	3,966.111 /ton	928
	0400	Structural concrete, placing, column, square or round, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	0.938	cy	104	-	-		11	-	122.93 /cy	115
	0400	Structural concrete, placing, column, square or round, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	0.094	cy	10	-	-		1	-	122.553 /cy	12
n	0625	Struct COLUMNS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.938	CY	-	258	-		-	-	275.405 /CY	258
n	0625	Struct COLUMNS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.094	cy	-	26	-		-	-	275.532 /cy	26
n	0022	Concrete finishing, columns, includes breaking ties and patching voids	58.64	sf	97	3	-		-	-	1.702 /sf	100
		03 11 13.709 CIP Sqr Col 12"			*1,563*	*3,745*			*28*		*5,688.93 /CY*	*5,336*
		0.938 CY										
		13.383 Labor hours										
		0.452 Equipment hours										
		03.11.13.065 (15) Super Pulsators - Colunms for Effluent Trough - 12"x12"x 6'-4" High - 4 EA			*1,563*	*3,745*	*0*		*28*	*0*	*5,688.93 /CY*	*5,336*
		0.938 CY										
		13.383 Labor hours										
		0.452 Equipment hours										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.070		*(15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick*										
03 11 13.303		*12" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	16.00	csf	6,076	-	-		-	-	379.768 /csf	6,076
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	48.00	csf	-	4,609	-		-	-	96.020 /csf	4,609
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,599.00	sf	16,418	5,237	-		-	-	13.542 /sf	21,654
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1.00	lf	7	0	-		-	-	7.69 /lf	8
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	6.638	ton	481	-	-		206	-	103.448 /ton	687
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	6.638	ton	522	-	-		224	-	112.439 /ton	746
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.638	ton	9,516	14,329	-		-	-	3,592.141 /ton	23,845
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	59.00	cy	2,448	-	-		271	-	46.092 /cy	2,719
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	5.90	cy	245	-	-		27	-	46.085 /cy	272
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	59.00	CY	-	16,249	-		-	-	275.407 /CY	16,249
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.90	cy	-	1,625	-		-	-	275.408 /cy	1,625
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,599.00	sf	2,394	-	-		128	-	1.577 /sf	2,522
n	9000	Concrete finishing, elev slabs, includes patching voids	1,599.00	sf	2,649	71	-		-	-	1.702 /sf	2,721
		03 11 13.303 12" Elevated Slab			*40,756*	*42,120*			*857*		*1,419.205/CY*	*83,733*
		59.00 CY										
		345.368 Labor hours										
		18.295 Equipment hours										
		03.11.13.070 (15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick			*40,756*	*42,120*	*0*		*857*	*0*	*1,419.205/CY*	*83,733*
		59.00 CY										
		345.368 Labor hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.070 (15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick			*40,756*	*42,120*	*0*		*857*	*0*	*1,419.205/CY*	*83,733*
		59.00 CY										
		345.368 Labor hours										
		18.295 Equipment hours										
03.11.13.075		*(15) Super Pulsators - Elevated Slab - 1,341 SF - 8" Thick*										
03 11 13.301		*08" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	14.00	csf	5,317	-	-		-	-	379.765 /csf	5,317
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	41.00	csf	-	3,937	-		-	-	96.021 /csf	3,937
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,341.00	sf	13,769	4,392	-		-	-	13.542 /sf	18,160
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	314.00	lf	2,277	145	-		-	-	7.714 /lf	2,422
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	3.713	ton	269	-	-		115	-	103.442 /ton	384
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	3.713	ton	292	-	-		125	-	112.432 /ton	417
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.713	ton	5,323	8,015	-		-	-	3,592.141 /ton	13,338
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	33.00	cy	1,369	-	-		152	-	46.092 /cy	1,521
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	3.30	cy	137	-	-		15	-	46.09 /cy	152
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	33.00	CY	-	9,088	-		-	-	275.407 /CY	9,088
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.30	cy	-	909	-		-	-	275.412 /cy	909
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,341.00	sf	2,007	-	-		108	-	1.577 /sf	2,115
n	9000	Concrete finishing, elev slabs, includes patching voids	1,341.00	sf	2,222	60	-		-	-	1.702 /sf	2,282

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.301 08" Elevated Slab			*32,982*	*26,546*			*515*		*1,819.470/CY*	*60,043*
		33.00 CY										
		281.671 Labor hours										
		12.314 Equipment hours										
		03.11.13.075 (15) Super Pulsators - Elevated Slab - 1,341 SF - 8" Thick			*32,982*	*26,546*	*0*		*515*	*0*	*1,819.470/CY*	*60,043*
		33.00 CY										
		281.671 Labor hours										
		12.314 Equipment hours										
03.11.13.080		*(15) Super Pulsators - Elevated Slab - 1,493 SF - 6" Thick*										
03 11 13.300		*06" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	15.00	csf	5,697	-	-		-	-	379.767 /csf	5,697
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	45.00	csf	-	4,321	-		-	-	96.021 /csf	4,321
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,493.00	sf	15,329	4,890	-		-	-	13.542 /sf	20,219
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	584.00	lf	4,235	269	-		-	-	7.714 /lf	4,505
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	3.15	ton	228	-	-		98	-	103.448 /ton	326
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	3.15	ton	248	-	-		106	-	112.438 /ton	354
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.15	ton	4,516	6,800	-		-	-	3,592.15 /ton	11,315
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	28.00	cy	1,162	-	-		129	-	46.090 /cy	1,291
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	2.80	cy	116	-	-		13	-	46.096 /cy	129
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	28.00	CY	-	7,711	-		-	-	275.407 /CY	7,711
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.80	cy	-	771	-		-	-	275.410 /cy	771
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,493.00	sf	2,235	-	-		120	-	1.577 /sf	2,355

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.300		*06" Elevated Slab*										
n	9000	Concrete finishing, elev slabs, includes patching voids	1,493.00	sf	2,474	67	-		-	-	1.702 /sf	2,540
		03 11 13.300 06" Elevated Slab			*36,240*	*24,829*			*465*		*2,197.639/CY*	*61,534*
		28.00 CY										
		310.870 Labor hours										
		12.103 Equipment hours										
		03.11.13.080 (15) Super Pulsators - Elevated Slab - 1,493 SF - 6" Thick			*36,240*	*24,829*	*0*		*465*	*0*	*2,197.639/CY*	*61,534*
		28.00 CY										
		310.870 Labor hours										
		12.103 Equipment hours										
03.11.13.085		*(15) Super Pulsators - Grout Topping - 6" Thick - 2,521 SF*										
03 11 13.406		*Grout Fill*										
	4350	Structural concrete, placing, slab on grade, pumped, up to 6" thick, includes leveling (strike off) & consolidation, excludes material	47.00	cy	2,401	-	-		266	-	56.728 /cy	2,666
n	4350	Strt concret,ready mix,flowabl fill,strt,1000 psi,includs ash,portlnd cement type i,aggregt,sand and water,delivrd,excluds all additvs and treatments (Flow Fill)	47.00	CY	-	6,997	-		-	-	148.869 /CY	6,997
		03 11 13.406 Grout Fill			*2,401*	*6,997*			*266*		*205.597/CY*	*9,663*
		47.00 CY										
		23.138 Labor hours										
		8.677 Equipment hours										
		03.11.13.085 (15) Super Pulsators - Grout Topping - 6" Thick - 2,521 SF			*2,401*	*6,997*	*0*		*266*	*0*	*205.597/CY*	*9,663*
		47.00 CY										
		23.138 Labor hours										
		8.677 Equipment hours										
		DIVISION 03 CONCRETE			**829,202**	**671,749**	**0**		**22,534**	**0**	**1,345.909/CY**	**1,523,485**
		1,131.938 CY										
		7,079.405 Labor hours										
		394.460 Equipment hours										

DIVISION 05 METALS

Item	Description
05.12.00.005	*(15) Super Pulsators - Structural Beams - W4x13 - 10 LF*
05 12 00.000	*Structural Steel*

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 12 00.000		*Structural Steel*										
n	0115	Structural steel member, 100-ton project, 1 to 2 story building, W4x13, A992 steel, shop fabricated, incl shop primer, bolted connections	10.00	LF	136	374	-		52	-	56.16 /LF	562
		05 12 00.000 Structural Steel			*136*	*374*			*52*		*8,022.90 /TON*	*562*
		0.07 TON										
		0.933 Labor hours										
		0.133 Equipment hours										
		05.12.00.005 (15) Super Pulsators - Structural Beams - W4x13 - 10 LF			*136*	*374*	*0*		*52*	*0*	*56.16 /LF*	*562*
		10.00 LF										
		0.933 Labor hours										
		0.133 Equipment hours										
05.50.00.010		*(15) Super Pulsators - Aluminum Grating - 2" Thick - 184 SF*										
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	184.00	SF	872	23,994	-		50	-	135.411 /SF	24,916
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	106.00	lf	3,539	481	-		-	-	37.921 /lf	4,020
		05 50 00.305 Metal Grating - Aluminum			*4,410*	*24,475*			*50*		*157.256/SF*	*28,935*
		184.00 SF										
		30.117 Labor hours										
		1.472 Equipment hours										
		05.50.00.010 (15) Super Pulsators - Aluminum Grating - 2" Thick - 184 SF			*4,410*	*24,475*	*0*		*50*	*0*	*157.256/SF*	*28,935*
		184.00 SF										
		30.117 Labor hours										
		1.472 Equipment hours										
05.50.00.015		*(15) Super Pulsators - Metal Access Hatch - 3'-6" Long x 3'-6" Wide - 2 EA*										
05 50 00.335		*Metal Hatches*										
n	0050	Doors, specialty, access, floor, commercial, aluminum tile, steel frame, one leaf, 3'-6" x 3'-6" opening	2.00	EA	1,335	12,171	-		-	-	6,753.08 /EA	13,506
		05 50 00.335 Metal Hatches			*1,335*	*12,171*					*6,753.08 /EA*	*13,506*
		2.00 EA										
		9.143 Labor hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		05.50.00.015 (15) Super Pulsators - Metal Access Hatch - 3'-6" Long x 3'-6" Wide - 2 EA			*1,335*	*12,171*	*0*		*0*	*0*	*6,753.08 /EA*	*13,506*
		2.00 EA										
		9.143 Labor hours										
		DIVISION 05 METALS			**5,881**	**37,020**	**0**		**102**	**0**	**43,002.95 /LS**	**43,003**
		1.00 LS										
		40.193 Labor hours										
		1.605 Equipment hours										

DIVISION 31 EARTHWORK

31.23.10.010 (15) Super Pulsators, Excavation, Backfill and Haul Off-Site

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	982.00	CY	792	-	-		1,492	-	2.326 /CY	2,284
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	148.00	CY	182	-	-		314	-	3.348 /CY	495
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1,045.00	CY	25,353	-	-		25,945	-	49.089 /CY	51,298
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	148.00	CY	146	-	-		225	-	2.502 /CY	370
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*26,472*				*27,976*		*23.439/CY*	*54,448*
		2,323.00 CY										
		223.572 Labor hours										
		219.410 Equipment hours										
		31.23.10.010 (15) Super Pulsators, Excavation, Backfill and Haul Off-Site			*26,472*	*0*	*0*		*27,976*	*0*	*23.439/CY*	*54,448*
		2,323.00 CY										
		223.572 Labor hours										
		219.410 Equipment hours										
		DIVISION 31 EARTHWORK			**26,472**	**0**	**0**		**27,976**	**0**	**23.439/CY**	**54,448**
		2,323.00 CY										
		223.572 Labor hours										
		219.410 Equipment hours										

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 33		**UTILITIES (BURIED PIPE AND VALVES)**										
33.05.19.030		*(15) Buried Pipe, IN - 30" Dia - 4 LF*										
33 05 19.030		*Buried Pipe, Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	lf	21	0	-		1	-	5.705 /lf	23
	7050	Rent trench box, 8000 lb., 8' x 16'	0.50	day	-	-	-		108	-	216.74 /day	108
	0500	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 6' to 10' deep, excludes sheeting or dewatering	11.00	bcy	95	-	-		57	-	13.813 /bcy	152
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	7.00	lcy	11	-	-		20	-	4.467 /lcy	31
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	6.00	ecy	14	-	-		30	-	7.312 /ecy	44
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	5.00	lcy	88	246	-		12	-	69.292 /lcy	346
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	5.00	ecy	42	-	-		4	-	9.218 /ecy	46
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.21 /clf	66
n	3206	Distribution piping,DIP,cement lined,fastite,20' lengths, 30"dia, Press Class 250, Excludes excavation, backfill, bedding	4.00	LF	381	1,449	-		107	-	484.338 /LF	1,937
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	4.00	lf		1,051	-			-	262.67 /lf	1,051
	8050	Fitting, 90 degree bend,DIP,cement lined,MJ,30"dia,C110 water piping	1.00	ea	1,228	12,932	-		428	-	14,587.11 /ea	14,587
n	4711	DIP,Polywrap 8 mil LDT 440ft,30"dia	1.00	roll	118	2,459	-		-	-	2,577.31 /roll	2,577
		33 05 19.030 Buried Pipe, Ductile Iron, 30" Dia			*2,004*	*18,197*			*768*		*5,242.37 /LF*	*20,969*
		4.00 LF										
		16.916 Labor hours										
		8.005 Equipment hours										
		33.05.19.030 (15) Buried Pipe, IN - 30" Dia - 4 LF			*2,004*	*18,197*	*0*		*768*	*0*	*5,242.37 /LF*	*20,969*
		4.00 LF										
		16.916 Labor hours										
		8.005 Equipment hours										
33.05.19.035		*(15) Buried Pipe, RW - 24" Dia - 70 LF*										
33 05 19.024		*Buried Pipe, Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	70.00	lf	366	8	-		25	-	5.703 /lf	399
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		217	-	216.76 /day	217
	0300	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, truck mounted, 4' to 6' deep, excludes sheeting or dewatering	156.00	bcy	1,509	-	-		1,116	-	16.826 /bcy	2,625

John F. Kime Water Treatment Plant Expansion

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	33 05 19.024	*Buried Pipe, Ductile Iron, 24" Dia*										
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	103.00	lcy	169	-	-		291	-	4.464 /lcy	460
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	89.00	ecy	202	-	-		449	-	7.316 /ecy	651
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	68.00	lcy	1,199	3,349	-		164	-	69.293 /lcy	4,712
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	60.00	ecy	505	-	-		49	-	9.22 /ecy	553
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.18 /clf	66
n	2180	Distribution piping,DIP,cement lined,fastite,20' lengths, 24"dia, Press Class 250, Excludes excavation, backfill, bedding	70.00	LF	4,832	14,459	-		1,017	-	290.118 /LF	20,308
n	4203	Distribution Piping,DIP,Field Flex-Ring Joint,24"dia,additional per linear foot of restrained pipe	24.00	lf		3,171	-			-	132.115 /lf	3,171
n	8045	Fitting, 90 degree bend,DIP,cement lined,MJ,24"dia,C110 water piping	4.00	ea	4,303	29,359	-		989	-	8,662.713 /ea	34,651
n	4710	DIP,Polywrap 8 mil LDT 500ft,24"dia	1.00	roll	118	2,252	-		-	-	2,370.450 /roll	2,370
		33 05 19.024 Buried Pipe, Ductile Iron, 24" Dia			*13,209*	*52,659*			*4,316*		*1,002.618/LF*	*70,183*
		70.00 LF										
		114.582 Labor hours										
		40.850 Equipment hours										
		33.05.19.035 (15) Buried Pipe, RW - 24" Dia - 70 LF			*13,209*	*52,659*	*0*		*4,316*	*0*	*1,002.618/LF*	*70,183*
		70.00 LF										
		114.582 Labor hours										
		40.850 Equipment hours										
	33.05.19.040	*(15) Buried Pipe, DR - 12" Dia - 18 LF*										
	33 05 19.012	*Buried Pipe, Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	18.00	lf	94	2	-		6	-	5.702 /lf	103
	7050	Rent trench box, 8000 lb., 8' x 16'	0.50	day	-	-	-		108	-	216.76 /day	108
	0090	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	30.00	bcy	282	-	-		59	-	11.379 /bcy	341
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	22.00	lcy	36	-	-		62	-	4.463 /lcy	98
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	20.00	ecy	45	-	-		101	-	7.316 /ecy	146
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	12.00	lcy	212	591	-		29	-	69.293 /lcy	832
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	11.00	ecy	93	-	-		9	-	9.222 /ecy	101
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.21 /clf	66

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	2100	Distribution piping,DIP,cement lined,fastite,20' lengths, 12"dia, Press Class 350, Excludes excavation, backfill, bedding	18.00	LF	317	1,416	-		151	-	104.627 /LF	1,883
n	4104	Distribution Piping,DIP,Flex-Ring Joint,12"dia,additional per linear foot of restrained pipe	18.00	lf		468	-			-	25.992 /lf	468
n	8020	Fitting, 90 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	2.00	ea	1,079	3,221	-		255	-	2,277.260 /ea	4,555
n	4705	DIP,Polywrap 8 mil LDT 500ft,12"dia	1.00	roll	118	1,126	-		-	-	1,244.48 /roll	1,244
		33 05 19.012 Buried Pipe, Ductile Iron, 12" Dia			*2,282*	*6,884*			*781*		*552.564/LF*	*9,946*
		18.00 LF										
		19.567 Labor hours										
		10.143 Equipment hours										
		33.05.19.040 (15) Buried Pipe, DR - 12" Dia - 18 LF			*2,282*	*6,884*	*0*		*781*	*0*	*552.564/LF*	*9,946*
		18.00 LF										
		19.567 Labor hours										
		10.143 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**17,494**	**77,740**	**0**		**5,865**	**0**	**1,098.901/LF**	**101,099**
		92.00 LF										
		151.065 Labor hours										
		58.998 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.020 (15) Exposed Pipe - SW - 42" Dia

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.042		*Pipe and Fittings - Ductile Iron, 42" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	20.00	LF	100	2	-		7	-	5.425 /LF	109
	7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	242.00	sf	1,970	270	-		-	-	9.258 /sf	2,241
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.912 /ea	170
	0831	Gasket and bolt set, for flanges, 150 lb., 42" pipe size	4.00	ea	4,191	9,492	-		-	-	3,420.825 /ea	13,683
n	0575	DIP,FLGxFLG,42"dia,15'-0" long,class 53,excl excav, backfill	1.00	ea	1,445	60,684	-		-	-	62,128.33 /ea	62,128
n	1028	Fitting,DIP,FLG,90 degree bend,42"dia,c 110 water piping	2.00	ea	1,736	61,948	-		-	-	31,842.375 /ea	63,685

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 19.042 Pipe and Fittings - Ductile Iron, 42" Dia			*9,558*	*132,451*			*7*		*7,100.750/LF*	*142,015*
		20.00 LF										
		78.236 Labor hours										
		0.32 Equipment hours										
		40.05.19.020 (15) Exposed Pipe - SW - 42" Dia			*9,558*	*132,451*	*0*		*7*	*0*	*7,100.750/LF*	*142,015*
		20.00 LF										
		78.236 Labor hours										
		0.32 Equipment hours										
40.05.19.025		*(15) Exposed Pipe - IN - 30" Dia - Wall Pipe*										
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	10	0	-		1	-	5.425 /LF	11
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	23	11	-		-	-	33.94 /ea	34
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	1.00	ea	823	1,340	-		-	-	2,163.12 /ea	2,163
n	0460	DIP,FLGxFLG,30"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	542	12,266	-		-	-	12,807.33 /ea	12,807
		40 05 19.030 Pipe and Fittings - Ductile Iron, 30" Dia			*1,398*	*13,616*			*1*		*7,507.62 /LF*	*15,015*
		2.00 LF										
		10.754 Labor hours										
		0.032 Equipment hours										
		40.05.19.025 (15) Exposed Pipe - IN - 30" Dia - Wall Pipe			*1,398*	*13,616*	*0*		*1*	*0*	*7,507.62 /LF*	*15,015*
		2.00 LF										
		10.754 Labor hours										
		0.032 Equipment hours										
40.05.19.030		*(15) Exposed Pipe - RW - 24" Dia - Wall Pipe*										
40 05 19.024		*Pipe and Fittings - Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	40	1	-		3	-	5.428 /LF	43
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	4.00	ea	92	43	-		-	-	33.918 /ea	136
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	2,427	2,025	-		-	-	1,112.803 /ea	4,451
n	0415	DIP,FLGxFLG,24"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	1,828	31,455	-		-	-	8,320.93 /ea	33,284
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia			*4,387*	*33,524*			*3*		*4,739.253/LF*	*37,914*
		8.00 LF										
		34.002 Labor hours										
		0.128 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40.05.19.030 (15) Exposed Pipe - RW - 24" Dia - Wall Pipe	*8.00*	*LF*	*4,387*	*33,524*	*0*		*3*	*0*	*4,739.253/LF*	*37,914*
		34.002 Labor hours										
		0.128 Equipment hours										
40.05.19.035		*(15) Exposed Pipe - RW - 24" Dia*										
40 05 19.024		*Pipe and Fittings - Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	30.00	LF	149	3	-		10	-	5.426 /LF	163
	7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	206.80	sf	1,684	231	-		-	-	9.258 /sf	1,915
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.92 /ea	170
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	2,427	2,025	-		-	-	1,112.805 /ea	4,451
n	0440	DIP,FLGxFLG,24"dia,15'-0" long,class 53,excl excav, backfill	2.00	ea	1,546	40,083	-		-	-	20,814.395 /ea	41,629
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia	*30.00*	*LF*	*5,921*	*42,396*			*10*		*1,610.901/LF*	*48,327*
		49.086 Labor hours										
		0.48 Equipment hours										
		40.05.19.035 (15) Exposed Pipe - RW - 24" Dia	*30.00*	*LF*	*5,921*	*42,396*	*0*		*10*	*0*	*1,610.901/LF*	*48,327*
		49.086 Labor hours										
		0.48 Equipment hours										
40.05.19.040		*(15) Exposed Pipe - DR - 12" Dia - Wall Pipe*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	20	0	-		1	-	5.428 /LF	22
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	2.00	ea	46	22	-		-	-	33.92 /ea	68
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	2.00	ea	549	435	-		-	-	491.795 /ea	984
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	474	5,455	-		-	-	2,964.28 /ea	5,929
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia	*4.00*	*LF*	*1,089*	*5,911*			*1*		*1,750.425/LF*	*7,002*
		8.490 Labor hours										
		0.064 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40.05.19.040 (15) Exposed Pipe - DR - 12" Dia - Wall Pipe			*1,089*	*5,911*	*0*		*1*	*0*	*1,750.425/LF*	*7,002*
		4.00 LF										
		8.490 Labor hours										
		0.064 Equipment hours										
40.05.19.045		*(15) Exposed Pipe - GTD - 12" Dia*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	30.00	LF	149	3	-		10	-	5.426 /LF	163
	7800	Paints & coatings, pipes, primer + 1 coat, brushwork, 10" to 12" diameter	33.00	lf	212	29	-		-	-	7.290 /lf	241
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.922 /ea	170
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	2.00	ea	549	435	-		-	-	491.785 /ea	984
n	0215	DIP,FLGxFLG,12"dia,15'-0" long,class 53,excl excav, backfill	2.00	ea	813	15,459	-		-	-	8,135.56 /ea	16,271
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*1,838*	*15,980*			*10*		*594.255/LF*	*17,828*
		30.00 LF										
		15.088 Labor hours										
		0.48 Equipment hours										
		40.05.19.045 (15) Exposed Pipe - GTD - 12" Dia			*1,838*	*15,980*	*0*		*10*	*0*	*594.255/LF*	*17,828*
		30.00 LF										
		15.088 Labor hours										
		0.48 Equipment hours										
40.05.19.105		*(15) Exposed Pipe - PLI - 3" Dia - 34 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	34.00	LF	169	4	-		11	-	5.426 /LF	184
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	37.40	lf	80	6	-		-	-	2.291 /lf	86
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	82	27	-		-	-	21.872 /ea	109
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	18.00	ea	1,886	421	-		-	-	128.158 /ea	2,307
n	0001	DIP,FLGxFLG,3"dia,1'-0" long,class 53,excl excav, backfill	4.00	ea	497	2,692	-		-	-	797.033 /ea	3,188
n	0010	DIP,FLGxFLG,3"dia,5'-0" long,class 53,excl excav, backfill	6.00	ea	745	7,582	-		-	-	1,387.743 /ea	8,326

John F. Kime Water Treatment Plant Expansion

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Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*3,459*	*10,730*			*11*		*417.675/LF*	*14,201*
		34.00 LF										
		26.810 Labor hours										
		0.544 Equipment hours										
		40.05.19.105 (15) Exposed Pipe - PLI - 3" Dia - 34 LF			*3,459*	*10,730*	*0*		*11*	*0*	*417.675/LF*	*14,201*
		34.00 LF										
		26.810 Labor hours										
		0.544 Equipment hours										
40.05.19.110		*(15) Exposed Pipe - SHC - 3" Dia - 16 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	16.00	LF	80	2	-		5	-	5.426 /LF	87
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	17.60	lf	38	3	-		-	-	2.293 /lf	40
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	82	27	-		-	-	21.866 /ea	109
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	8.00	ea	838	187	-		-	-	128.16 /ea	1,025
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	1.00	ea	124	673	-		-	-	797.02 /ea	797
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	3.00	ea	372	3,791	-		-	-	1,387.747 /ea	4,163
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*1,535*	*4,682*			*5*		*388.878/LF*	*6,222*
		16.00 LF										
		11.800 Labor hours										
		0.256 Equipment hours										
		40.05.19.110 (15) Exposed Pipe - SHC - 3" Dia - 16 LF			*1,535*	*4,682*	*0*		*5*	*0*	*388.878/LF*	*6,222*
		16.00 LF										
		11.800 Labor hours										
		0.256 Equipment hours										
40.05.19.115		*(15) Exposed Pipe - FS - 3" Dia - 57 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	57.00	LF	284	6	-		19	-	5.427 /LF	309
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	62.70	lf	134	9	-		-	-	2.291 /lf	144
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	82	27	-		-	-	21.872 /ea	109
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	16.00	ea	1,677	374	-		-	-	128.158 /ea	2,051

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	2.00	ea	248	1,346	-		-	-	797.02 /ea	1,594
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	1.00	ea	124	1,264	-		-	-	1,387.74 /ea	1,388
n	0025	DIP,FLGxFLG,4"dia,10'-0" long,class 53,excl excav, backfill	5.00	ea	1,016	10,010	-		-	-	2,205.14 /ea	11,026
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*3,565*	*13,036*			*19*		*291.585/LF*	*16,620*
		57.00 LF										
		28.108 Labor hours										
		0.912 Equipment hours										
		40.05.19.115 (15) Exposed Pipe - FS - 3" Dia - 57 LF			*3,565*	*13,036*	*0*		*19*	*0*	*291.585/LF*	*16,620*
		57.00 LF										
		28.108 Labor hours										
		0.912 Equipment hours										
40.05.19.120		*(15) Exposed Pipe - LM - 3" Dia - 14 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	14.00	LF	70	2	-		5	-	5.426 /LF	76
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	15.40	lf	33	2	-		-	-	2.292 /lf	35
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	82	27	-		-	-	21.868 /ea	109
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	12.00	ea	1,257	280	-		-	-	128.158 /ea	1,538
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	4.00	ea	497	2,692	-		-	-	797.033 /ea	3,188
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	2.00	ea	248	2,527	-		-	-	1,387.75 /ea	2,776
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*2,187*	*5,530*			*5*		*551.579/LF*	*7,722*
		14.00 LF										
		16.783 Labor hours										
		0.224 Equipment hours										
		40.05.19.120 (15) Exposed Pipe - LM - 3" Dia - 14 LF			*2,187*	*5,530*	*0*		*5*	*0*	*551.579/LF*	*7,722*
		14.00 LF										
		16.783 Labor hours										
		0.224 Equipment hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**34,937**	**277,857**	**0**		**72**	**0**	**1,455.191/LF**	**312,866**
		215.00 LF										

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**34,937**	**277,857**	**0**		**72**	**0**	**1,455.191/LF**	**312,866**
	215.00 LF										
	279.156 Labor hours										
	3.44 Equipment hours										

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

43.21.02.010 (15) Sample Pump - (SP-12B, SP-15B) 0.17HP, 40GPM @ 40'

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
43 23 57.000	*Pumping Equipment - Progressive Cavity Pump*										
0100	Sample Pump, 0.17HP, 40 GPM @ 40'	3.00	EA	8,243	22,330	-		1,940	-	10,837.63 /EA	32,513
	43 23 57.000 Pumping Equipment - Progressive Cavity Pump			*8,243*	*22,330*			*1,940*		*10,837.63 /EA*	*32,513*
	3.00 EA										
	72.00 Labor hours										
	12.00 Equipment hours										
	43.21.02.010 (15) Sample Pump - (SP-12B, SP-15B) 0.17HP, 40GPM @ 40'			*8,243*	*22,330*	*0*		*1,940*	*0*	*10,837.63 /EA*	*32,513*
	3.00 EA										
	72.00 Labor hours										
	12.00 Equipment hours										
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**8,243**	**22,330**	**0**		**1,940**	**0**	**10,837.63 /EA**	**32,513**
	3.00 EA										
	72.00 Labor hours										
	12.00 Equipment hours										

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

46.01.70.005 (15) Superpulsators - (SP-15C, SP-15D)

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 43 22.005	*Suction Header Retangular Clarifier Equipment*										
0001	Superpulsators	2.00	EA	9,159		3,930,136		3,233	-	1,971,263.905 /EA	3,942,528
	46 43 22.005 Suction Header Retangular Clarifier Equipment			*9,159*		*3,930,136*		*3,233*		*1,971,263.905/EA*	*3,942,528*
	2.00 EA										
	80.00 Labor hours										
	20.00 Equipment hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46.01.70.005 (15) Superpulsators - (SP-15C, SP-15D)			*9,159*	*0*	*3,930,136*		*3,233*	*0*	*1,971,263.905/EA*	*3,942,528*
	2.00 EA										
	80.00 Labor hours										
	20.00 Equipment hours										

46.01.70.010 *(72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)*

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 36 09.000	*Chemical Feed Equipment - Dry Systems (Polymer)*										
1200	Polymer Equipment	1.00	LS	11,448	519,552	-		6,466	-	537,466.200 /LS	537,466
	46 36 09.000 Chemical Feed Equipment - Dry Systems (Polymer)			*11,448*	*519,552*			*6,466*		*537,466.200/EA*	*537,466*
	1.00 EA										
	100.00 Labor hours										
	40.00 Equipment hours										
	46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)			*11,448*	*519,552*	*0*		*6,466*	*0*	*537,466.200/LS*	*537,466*
	1.00 LS										
	100.00 Labor hours										
	40.00 Equipment hours										
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**20,607**	**519,552**	**3,930,136**		**9,699**	**0**	**2,239,997.005/EA**	**4,479,994**
	2.00 EA										
	180.00 Labor hours										
	60.00 Equipment hours										
	100 SUPER PULSATORS			***942,837***	***1,606,248***	***3,930,136***		***68,187***	***0***	***6,547,407.84 /LS***	***6,547,408***
	1.00 LS										
	8,025.390 Labor hours										
	749.913 Equipment hours										

165 FERRIC SULFATE STORAGE

DIVISION 03 CONCRETE

03.11.13.090 *(52) Ferric Sulfate Storage - Slab on Grade - 5,442 SF - 12" Thick*

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504	*12" Slab on Grade*										
3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	316.00	sfca	2,634	574	-		-	-	10.152 /sfca	3,208

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Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	270.00	sfca	1,341	181	-		-	-	5.636 /sfca	1,522
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	17.50	ton	1,267	-	-		543	-	103.444 /ton	1,810
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	17.50	ton	31,631	37,775	-		-	-	3,966.107 /ton	69,407
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	17.50	ton	3,619	-	-		1,553	-	295.553 /ton	5,172
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	200.00	cy	7,178	-	-		795	-	39.863 /cy	7,973
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	20.00	cy	718	-	-		79	-	39.863 /cy	797
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	200.00	CY	-	55,081	-		-	-	275.407 /CY	55,081
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	20.00	cy	-	5,508	-		-	-	275.408 /cy	5,508
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	5,400.00	sf	8,083	-	-		433	-	1.577 /sf	8,517
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	270.00	lf	242	12	-		24	-	1.028 /lf	278
n	0215	Control joint, clean out control joint of debris_SOG	270.00	lf	40	-	-			-	0.149 /lf	40
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	540.00	lf	1,790	129	-		-	-	3.553 /lf	1,919
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	54.00	csf	884	599	-		-	-	27.468 /csf	1,483
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	54.00	sq	1,386	655	-		-	-	37.792 /sq	2,041
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	230.00	ecy	5,140	10,957	-		423	-	71.824 /ecy	16,520
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	230.00	lcy	3,841	-	-		4,249	-	35.176 /lcy	8,091
		03 11 13.504 12" Slab on Grade			*69,794*	*111,471*			*8,100*		*946.829/CY*	*189,366*

200.00 CY

591.555 Labor hours
136.696 Equipment hours

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.090 (52) Ferric Sulfate Storage - Slab on Grade - 5,442 SF - 12" Thick			*69,794*	*111,471*	*0*		*8,100*	*0*	*946.829/CY*	*189,366*
		200.00 CY										
		591.555 Labor hours										
		136.696 Equipment hours										
03.11.13.095		*(52) Ferric Sulfate Storage - Thickened Edge Footing - 1'-9" Thick x 1'-6" Wide - 311 LF*										
03 11 13.151		*Thickened Edge Footing, 1'-9" Thick*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	1,093.75	sfca	9,118	1,986	-		-	-	10.152 /sfca	11,104
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	40.819	sfca	203	27	-		-	-	5.636 /sfca	230
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	2.713	ton	196	-	-		84	-	103.446 /ton	281
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	2.713	ton	4,904	5,856	-		-	-	3,966.104 /ton	10,760
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	2.713	ton	561	-	-		241	-	295.547 /ton	802
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	31.00	cy	1,113	-	-		123	-	39.862 /cy	1,236
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	3.10	cy	111	-	-		12	-	39.868 /cy	124
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	31.00	CY	-	8,538	-		-	-	275.407 /CY	8,538
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.10	cy	-	854	-		-	-	275.406 /cy	854
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	466.50	sf	698	-	-		37	-	1.577 /sf	736
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	23.325	lf	21	1	-		2	-	1.028 /lf	24
n	0215	Control joint, clean out control joint of debris_SOG	23.325	lf	4	-	-			-	0.15 /lf	4
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	46.65	lf	155	11	-		-	-	3.552 /lf	166
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	4.665	csf	76	52	-		-	-	27.468 /csf	128
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	4.665	sq	120	57	-		-	-	37.794 /sq	176
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	20.00	ecy	447	953	-		37	-	71.826 /ecy	1,437

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.151		*Thickened Edge Footing, 1'-9" Thick*										
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	20.00	lcy	334	-	-		370	-	35.176 /lcy	704
		03 11 13.151 Thickened Edge Footing, 1'-9" Thick			*18,060*	*18,335*			*906*		*1,203.251/CY*	*37,301*

31.00 CY

154.898 Labor hours
14.181 Equipment hours

	Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.095 (52) Ferric Sulfate Storage - Thickened Edge Footing - 1'-9" Thick x 1'-6" Wide - 311 LF	*18,060*	*18,335*	*0*		*906*	*0*	*1,203.251/CY*	*37,301*

31.00 CY

154.898 Labor hours
14.181 Equipment hours

03.11.13.100 (52) Ferric Sulfate Storage - Tank Pads - 2,091 SF - 12" Thick

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 15.012		*12" CIP Equipment Pad*										
	3060	C.I.P. concrete forms, slab on grade, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	519.00	sfca	5,377	1,120	-		-	-	12.519 /sfca	6,497
	5200	Chamfer strip, wood, 3/4" wide	519.00	lf	939	108	-		-	-	2.017 /lf	1,047
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	6.825	ton	494	-	-		212	-	103.446 /ton	706
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.825	ton	12,336	14,732	-		-	-	3,966.105 /ton	27,069
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	6.825	ton	1,412	-	-		606	-	295.556 /ton	2,017
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	78.00	cy	2,799	-	-		310	-	39.863 /cy	3,109
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	7.80	cy	280	-	-		31	-	39.862 /cy	311
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	78.00	CY	-	21,482	-		-	-	275.407 /CY	21,482
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	7.80	cy	-	2,148	-		-	-	275.409 /cy	2,148
n	0200	Concrt fnshng,fresh concrt fltwrk,floors,basic fnshng for unspcf flatwrk,bull float,manual float&manual steel trowel,excl placing,strikng off&cnsldtng	2,091.00	sf	4,245	-	-		-	-	2.030 /sf	4,245
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	20.91	csf	342	232	-		-	-	27.468 /csf	574

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 15.012 12" CIP Equipment Pad			*28,224*	*39,823*			*1,158*		*887.248/CY*	*69,205*
		78.00 CY										
		237.933 Labor hours 13.237 Equipment hours										
		03.11.13.100 (52) Ferric Sulfate Storage - Tank Pads - 2,091 SF - 12" Thick			*28,224*	*39,823*	*0*		*1,158*	*0*	*887.248/CY*	*69,205*
		78.00 CY										
		237.933 Labor hours 13.237 Equipment hours										
03.11.13.105		*(52) Ferric Sulfate Storage - Wall - 8 LF - 1'-6" High - 18" Thick*										
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	1.00	lf	21	5	-		-	-	26.12 /lf	26
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	24.00	sfca	339	35	-		-	-	15.614 /sfca	375
n	5200	Chamfer strip, wood, 3/4" wide	2.00	lf	4	0	-		-	-	2.015 /lf	4
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.77 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	9.00	lf	59	98	-		-	-	17.417 /lf	157
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.10	ton	139	216	-		-	-	3,544.30 /ton	354
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.10	ton	7	-	-		3	-	103.60 /ton	10
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.10	ton	8	-	-		3	-	112.30 /ton	11
n	0210	Control joint, clean out control joint of debris_WALLS	1.00	lf	0	-	-		-	-	0.15 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	1.00	lf	3	0	-		-	-	3.55 /lf	4
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	24.00	sf	40	1	-		-	-	1.719 /sf	41
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	12.00	sf	24	1	-		-	-	2.046 /sf	25
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	1.00	cy	60	-	-		7	-	67.03 /cy	67
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	1.00	CY	-	275	-		-	-	275.410 /CY	275

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					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
		03 11 13.811 18" CIP Wall			*704*	*729*			*13*		*1,446.37 /CY*	*1,446*
		1.00 CY										
		5.990 Labor hours										
		0.235 Equipment hours										
		03.11.13.105 (52) Ferric Sulfate Storage - Wall - 8 LF - 1'-6" High - 18" Thick			*704*	*729*	*0*		*13*	*0*	*1,446.37 /CY*	*1,446*
		1.00 CY										
		5.990 Labor hours										
		0.235 Equipment hours										
03.11.13.110		*(52) Ferric Sulfate Storage - Wall - 106 LF - 3'-6" High - 12" Thick*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	19.00	lf	400	96	-		-	-	26.14 /lf	497
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	742.00	sfca	10,492	1,094	-		-	-	15.614 /sfca	11,586
n	5200	Chamfer strip, wood, 3/4" wide	38.00	lf	69	8	-		-	-	2.016 /lf	77
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.79 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	125.00	lf	818	1,358	-		-	-	17.415 /lf	2,177
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	1.40	ton	1,940	3,022	-		-	-	3,544.34 /ton	4,962
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	1.40	ton	101	-	-		43	-	103.457 /ton	145
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	1.40	ton	110	-	-		47	-	112.43 /ton	157
n	0210	Control joint, clean out control joint of debris_WALLS	19.00	lf	3	-	-		-	-	0.150 /lf	3
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	19.00	lf	63	5	-		-	-	3.552 /lf	67
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	742.00	sf	1,230	44	-		-	-	1.717 /sf	1,274
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	371.00	sf	738	22	-		-	-	2.048 /sf	760
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	14.00	cy	845	-	-		94	-	67.043 /cy	939
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	14.00	CY	-	3,856	-		-	-	275.407 /CY	3,856

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.804 12" CIP Wall			*16,810*	*9,601*			*184*		*1,899.685/CY*	*26,596*
		14.00 CY										
		143.975 Labor hours										
		3.288 Equipment hours										
		03.11.13.110 (52) Ferric Sulfate Storage - Wall - 106 LF - 3'-6" High - 12" Thick			*16,810*	*9,601*	*0*		*184*	*0*	*1,899.685/CY*	*26,596*
		14.00 CY										
		143.975 Labor hours										
		3.288 Equipment hours										
03.11.13.110a		*(52) Ferric Sulfate Storage - Wall - 208 LF x 28'-4" High - 18" Thick*										
03 11 13.811		*18" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	295.00	lf	6,218	1,493	-		-	-	26.139 /lf	7,711
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	11,785.28	sfca	166,648	17,369	-		-	-	15.614 /sfca	184,017
	5200	Chamfer strip, wood, 3/4" wide	590.00	lf	1,067	123	-		-	-	2.017 /lf	1,190
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	10.00	c	-	968	-		-	-	96.763 /c	968
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	191.909	lf	1,257	2,143	-		-	-	17.713 /lf	3,399
	0100	Splice rebar, standard, self-aligning type, taper threaded, #4 bars, includes holding rebar in place while splicing	360.80	ea	6,328	6,875	-		-	-	36.594 /ea	13,203
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	32.80	ton	2,374	-	-		1,019	-	103.443 /ton	3,393
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	32.80	ton	2,581	-	-		1,107	-	112.441 /ton	3,688
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	32.80	ton	45,453	70,802	-		-	-	3,544.356 /ton	116,255
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	328.00	cy	19,798	-	-		2,191	-	67.042 /cy	21,990
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	32.80	cy	1,980	-	-		219	-	67.042 /cy	2,199
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	328.00	CY	-	79,176	-		-	-	241.391 /CY	79,176
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.80	cy	-	7,918	-		-	-	241.391 /cy	7,918

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0210	Control joint, clean out control joint of debris_WALLS	295.00	lf	44	-	-			-	0.149 /lf	44
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	295.00	lf	978	70	-		-	-	3.553 /lf	1,048
	0020	Concrete finishing, walls, includes breaking ties and patching voids	11,785.28	sf	19,533	702	-		-	-	1.717 /sf	20,235
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	5,892.64	sf	11,720	351	-		-	-	2.048 /sf	12,071
		03 11 13.811 18" CIP Wall			*285,979*	*187,989*			*4,536*		*1,458.856/CY*	*478,505*
		328.00 CY										
		2,452.522 Labor hours										
		84.196 Equipment hours										
		03.11.13.110a (52) Ferric Sulfate Storage - Wall - 208 LF x 28'-4" High - 18" Thick			*285,979*	*187,989*	*0*		*4,536*	*0*	*1,458.856/CY*	*478,505*
		328.00 CY										
		2,452.522 Labor hours										
		84.196 Equipment hours										

03.11.13.115 *(52) Ferric Sulfate Storage - Wall - 10 LF - 5'-6" High - 12" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	63	15	-		-	-	26.14 /lf	78
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	110.00	sfca	1,555	162	-		-	-	15.614 /sfca	1,718
n	5200	Chamfer strip, wood, 3/4" wide	6.00	lf	11	1	-		-	-	2.022 /lf	12
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.76 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	13.00	lf	85	141	-		-	-	17.416 /lf	226
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.30	ton	416	648	-		-	-	3,544.33 /ton	1,063
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.30	ton	22	-	-		9	-	103.40 /ton	31
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.30	ton	24	-	-		10	-	112.50 /ton	34
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.147 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	10	1	-		-	-	3.55 /lf	11
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	110.00	sf	182	7	-		-	-	1.717 /sf	189
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	55.00	sf	109	3	-		-	-	2.049 /sf	113

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	3.00	cy	181	-	-		20	-	67.04 /cy	201
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.00	CY	-	826	-		-	-	275.403 /CY	826
		03 11 13.804 12" CIP Wall *3.00 CY* 22.715 Labor hours 0.705 Equipment hours			*2,659*	*1,901*			*39*		*1,533.10 /CY*	*4,599*
		03.11.13.115 (52) Ferric Sulfate Storage - Wall - 10 LF - 5'-6" High - 12" Thick *3.00 CY* 22.715 Labor hours 0.705 Equipment hours			*2,659*	*1,901*	*0*		*39*	*0*	*1,533.10 /CY*	*4,599*
03.11.13.120		*(52) Ferric Sulfate Storage - Wall - 17 LF - 3'-6" High - 8" Thick*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	63	15	-		-	-	26.14 /lf	78
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	119.00	sfca	1,683	175	-		-	-	15.614 /sfca	1,858
n	5200	Chamfer strip, wood, 3/4" wide	6.00	lf	11	1	-		-	-	2.015 /lf	12
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.79 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	20.00	lf	131	217	-		-	-	17.414 /lf	348
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.20	ton	277	432	-		-	-	3,544.55 /ton	709
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.20	ton	14	-	-		6	-	103.25 /ton	21
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.20	ton	16	-	-		7	-	112.50 /ton	23
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.15 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	10	1	-		-	-	3.557 /lf	11
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	119.00	sf	197	7	-		-	-	1.717 /sf	204
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	59.50	sf	118	4	-		-	-	2.049 /sf	122

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	2.00	cy	121	-	-		13	-	67.045 /cy	134
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.00	CY	-	551	-		-	-	275.400 /CY	551
		03 11 13.801 08" CIP Wall			*2,642*	*1,500*			*26*		*2,083.975/CY*	*4,168*
		2.00 CY										
		22.643 Labor hours										
		0.470 Equipment hours										
		03.11.13.120 (52) Ferric Sulfate Storage - Wall - 17 LF - 3'-6" High - 8" Thick			*2,642*	*1,500*	*0*		*26*	*0*	*2,083.975/CY*	*4,168*
		2.00 CY										
		22.643 Labor hours										
		0.470 Equipment hours										
		DIVISION 03 CONCRETE			**424,872**	**371,349**	**0**		**14,964**	**0**	**1,234.682/CY**	**811,186**
		657.00 CY										
		3,632.233 Labor hours										
		253.008 Equipment hours										

DIVISION 04 MASONRY

04.22.00.005 (52) CMU Block 8" Wall - 10' High x 48 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.208		*Concrete Masonry Unit (08" CMU) - Exterior*										
n	0440	Wall Insulation, Rigid, fiberglass, unfaced, 3" thick, R13, 3#/CF	480.00	sf	640	1,736	-		-	-	4.950 /sf	2,376
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	5.00	csf	2,000	-	-		-	-	399.984 /csf	2,000
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	5.00	csf	-	722	-		-	-	144.314 /csf	722
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.473 /ea	262
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	48.00	lf	132	103	-		12	-	5.143 /lf	247
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	480.00	sf	2,723	1,143	-		246	-	8.568 /sf	4,112
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	158.611	lb	208	201	-		-	-	2.579 /lb	409
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	594.792	lb	959	755	-		-	-	2.881 /lb	1,714

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.208		*Concrete Masonry Unit (08" CMU) - Exterior*										
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	48.00	lf	414	394	-		-	-	16.822 /lf	807
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	480.00	SF	6,490	3,822	-		-	-	21.485 /SF	10,313
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	48.00	sf	649	382	-		-	-	21.485 /sf	1,031
		04 22 00.208 Concrete Masonry Unit (08" CMU) - Exterior			*14,214*	*9,520*			*258*		*49.985/SF*	*23,993*
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										
		04.22.00.005 (52) CMU Block 8" Wall - 10' High x 48 LF			*14,214*	*9,520*	*0*		*258*	*0*	*49.985/SF*	*23,993*
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										
		DIVISION 04 MASONRY			**14,214**	**9,520**	**0**		**258**	**0**	**49.985/SF**	**23,993**
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										

DIVISION 05 METALS

05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	16.00	SF	76	2,086	-		4	-	135.411 /SF	2,167
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	16.00	lf	534	73	-		-	-	37.921 /lf	607
		05 50 00.305 Metal Grating - Aluminum			*610*	*2,159*			*4*		*173.332/SF*	*2,773*
		16.00 SF										
		4.169 Labor hours										
		0.128 Equipment hours										
		05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF			*610*	*2,159*	*0*		*4*	*0*	*173.332/SF*	*2,773*
		16.00 SF										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF			*610*	*2,159*	*0*		*4*	*0*	*173.332/SF*	*2,773*
		16.00 SF										
		4.169 Labor hours 0.128 Equipment hours										
05.50.00.025		*(52) Ferric Sulfate Storage - Aluminum Stairs - 20 Risers*										
05 50 00.315		*Metal Stairs - Aluminum*										
n	0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	12.00	lf	415	1,993	-		24	-	202.604 /lf	2,431
	0020	Stair, shop fabricated, steel, 3'-6" W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser	20.00	RISR	2,707	12,866	-		155	-	786.426 /RISR	15,729
	0134	Floor grating, aluminum, 1-1/2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., over 300 S.F., field fabricated from panels	90.00	sf	426	6,572	-		24	-	78.034 /sf	7,023
		05 50 00.315 Metal Stairs - Aluminum			*3,548*	*21,431*			*204*		*1,259.141/RISR*	*25,183*
		20.00 RISR										
		23.969 Labor hours 5.992 Equipment hours										
		05.50.00.025 (52) Ferric Sulfate Storage - Aluminum Stairs - 20 Risers			*3,548*	*21,431*	*0*		*204*	*0*	*1,259.141/RISR*	*25,183*
		20.00 RISR										
		23.969 Labor hours 5.992 Equipment hours										
		DIVISION 05 METALS			**4,158**	**23,590**	**0**		**208**	**0**	**27,956.13 /LS**	**27,956**
		1.00 LS										
		28.138 Labor hours 6.120 Equipment hours										
DIVISION 08		**OPENINGS**										
08.11.19.015		*(52) Ferric Sulfate Storage - Doors - Steel 6'x7'*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	1.00	EA	178	409	-		-	-	586.35 /EA	586
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	2.00	ea	251	2,312	-		-	-	1,281.71 /ea	2,563
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	2.00	ea	533	2,086	-		-	-	1,309.865 /ea	2,620

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
08 11 00.061		*Metal Doors & Frames (6070)*										
	0011	Thresholds, aluminum, 3' long door saddles	6.00	lf	133	126	-		-	-	43.173 /lf	259
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	3.00	pr	-	316	-		-	-	105.187 /pr	316
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	2.00	ea	107	8	-		-	-	57.725 /ea	115
		08 11 00.061 Metal Doors & Frames (6070)			*1,203*	*5,257*					*6,459.55 /EA*	*6,460*
		1.00 EA										
		9.157 Labor hours										
		08.11.19.015 (52) Ferric Sulfate Storage - Doors - Steel 6'x7'			*1,203*	*5,257*	*0*		*0*	*0*	*6,459.55 /EA*	*6,460*
		1.00 EA										
		9.157 Labor hours										
		DIVISION 08 OPENINGS			**1,203**	**5,257**	**0**		**0**	**0**	**6,459.55 /EA**	**6,460**
		1.00 EA										
		9.157 Labor hours										

DIVISION 13 SPECIAL CONSTRUCTION

13.34.19.010 (52) Pre-Engineered Metal Building, Ferric Sulfate Storage

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
13 34 19.000		*Metal Building Systems*										
	5450	(73) Pre-Engineered Metal Building, Sludge Storage	180.00	SF	7,319	21,907	-		2,823	-	178.057 /SF	32,050
		13 34 19.000 Metal Building Systems			*7,319*	*21,907*			*2,823*		*178.057/SF*	*32,050*
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										
		13.34.19.010 (52) Pre-Engineered Metal Building, Ferric Sulfate Storage			*7,319*	*21,907*	*0*		*2,823*	*0*	*178.057/SF*	*32,050*
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										
		DIVISION 13 SPECIAL CONSTRUCTION			**7,319**	**21,907**	**0**		**2,823**	**0**	**178.057/SF**	**32,050**
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 31		**EARTHWORK**										
31.23.10.020		*(52) Ferric Sulfate Storage, Excavation, Backfill and Haul Off-Site*										
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	485.00	CY	391	-	-		737	-	2.326 /CY	1,128
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	73.00	CY	90	-	-		155	-	3.347 /CY	244
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	515.00	CY	12,495	-	-		12,786	-	49.089 /CY	25,281
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	73.00	CY	72	-	-		111	-	2.503 /CY	183
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*13,047*				*13,789*		*23.417/CY*	*26,836*
		1,146.00 CY										
		110.189 Labor hours										
		108.135 Equipment hours										
		31.23.10.020 (52) Ferric Sulfate Storage, Excavation, Backfill and Haul Off-Site			*13,047*	*0*	*0*		*13,789*	*0*	*23.417/CY*	*26,836*
		1,146.00 CY										
		110.189 Labor hours										
		108.135 Equipment hours										
		DIVISION 31 EARTHWORK			**13,047**	**0**	**0**		**13,789**	**0**	**23.417/CY**	**26,836**
		1,146.00 CY										
		110.189 Labor hours										
		108.135 Equipment hours										
DIVISION 40		**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
40.05.23.005		*(52) Exposed Pipe - PSG - 2" Dia - 44 LF*										
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	44.00	LF	219	5	-		15	-	5.426 /LF	239
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	48.40	lf	104	7	-		-	-	2.291 /lf	111
	01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	10.00	ea	5,300	8,202	-		-	-	1,350.22 /ea	13,502
	1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	5.00	ea	77	16	-		-	-	18.618 /ea	93

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
	0590	Pipe, stainless steel, butt weld, 2" diameter, schedule 5, type 304, includes weld joint and clevis type hangers 10' OC	48.40	lf	1,487	2,810	-		118	-	91.228 /lf	4,415
		40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*7,187*	*11,040*			*133*		*417.281/LF*	*18,360*
		44.00 LF										
		54.535 Labor hours										
		6.316 Equipment hours										
		40.05.23.005 (52) Exposed Pipe - PSG - 2" Dia - 44 LF			*7,187*	*11,040*	*0*		*133*	*0*	*417.281/LF*	*18,360*
		44.00 LF										
		54.535 Labor hours										
		6.316 Equipment hours										
40.05.23.010		*(52) Exposed Pipe - PSG - 1.5" Dia - 124 LF*										
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	124.00	LF	618	14	-		41	-	5.426 /LF	673
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	136.40	lf	292	20	-		-	-	2.292 /lf	313
	01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	25.00	ea	13,251	20,504	-		-	-	1,350.219 /ea	33,755
	1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	10.00	ea	154	32	-		-	-	18.613 /ea	186
	4480	Pipe, stainless steel, threaded, 1-1/2" diameter, schedule 40, type 316	124.00	lf	3,810	7,476	-		-	-	91.019 /lf	11,286
	9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	12.00	ea	247	-	-		-	-	20.622 /ea	247
		40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*18,372*	*28,047*			*41*		*374.684/LF*	*46,461*
		124.00 LF										
		139.369 Labor hours										
		1.984 Equipment hours										
		40.05.23.010 (52) Exposed Pipe - PSG - 1.5" Dia - 124 LF			*18,372*	*28,047*	*0*		*41*	*0*	*374.684/LF*	*46,461*
		124.00 LF										
		139.369 Labor hours										
		1.984 Equipment hours										
40.05.23.015		*(52) Exposed Pipe - PSG - 1.25" Dia - 48 LF*										
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	48.00	LF	239	5	-		16	-	5.426 /LF	260
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	52.80	lf	113	8	-		-	-	2.292 /lf	121

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	9.00	ea	4,770	7,382	-		-	-	1,350.218 /ea	12,152
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	5.00	ea	77	16	-		-	-	18.616 /ea	93
4475	Pipe, stainless steel, threaded, 1-1/4" diameter, schedule 40, type 316	48.00	lf	1,339	2,537	-		-	-	80.745 /lf	3,876
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	5.00	ea	103	-	-		-	-	20.618 /ea	103
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*6,642*	*9,948*			*16*		*345.945/LF*	*16,605*
	48.00 LF										
	50.386 Labor hours										
	0.768 Equipment hours										
	40.05.23.015 (52) Exposed Pipe - PSG - 1.25" Dia - 48 LF			*6,642*	*9,948*	*0*		*16*	*0*	*345.945/LF*	*16,605*
	48.00 LF										
	50.386 Labor hours										
	0.768 Equipment hours										
40.05.23.020	*(52) Exposed Pipe - FS - 2" Dia - 85 LF*										
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	85.00	LF	423	10	-		28	-	5.427 /LF	461
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	52.80	lf	113	8	-		-	-	2.291 /lf	121
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	17.00	ea	9,011	13,943	-		-	-	1,350.219 /ea	22,954
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	10.00	ea	154	32	-		-	-	18.615 /ea	186
4485	Pipe, stainless steel, threaded, 2" diameter, schedule 40, type 316	85.00	lf	3,162	6,960	-		-	-	119.074 /lf	10,121
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	9.00	ea	186	-	-		-	-	20.619 /ea	186
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*13,048*	*20,952*			*28*		*400.341/LF*	*34,029*
	85.00 LF										
	98.726 Labor hours										
	1.36 Equipment hours										
	40.05.23.020 (52) Exposed Pipe - FS - 2" Dia - 85 LF			*13,048*	*20,952*	*0*		*28*	*0*	*400.341/LF*	*34,029*
	85.00 LF										
	98.726 Labor hours										
	1.36 Equipment hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40.05.23.025	*(52) Exposed Pipe - - 1.5" Dia - 212 LF*										
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	212.00	LF	1,056	24	-		71	-	5.426 /LF	1,150
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	23.10	lf	50	3	-		-	-	2.292 /lf	53
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	45.00	ea	23,852	36,908	-		-	-	1,350.218 /ea	60,760
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	15.00	ea	231	49	-		-	-	18.614 /ea	279
4480	Pipe, stainless steel, threaded, 1-1/2" diameter, schedule 40, type 316	212.00	lf	6,514	12,782	-		-	-	91.019 /lf	19,296
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	21.00	ea	433	-	-		-	-	20.619 /ea	433
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*32,135*	*49,765*			*71*		*386.658/LF*	*81,971*
	212.00 LF										
	242.731 Labor hours										
	3.392 Equipment hours										
	40.05.23.025 (52) Exposed Pipe - - 1.5" Dia - 212 LF			*32,135*	*49,765*	*0*		*71*	*0*	*386.658/LF*	*81,971*
	212.00 LF										
	242.731 Labor hours										
	3.392 Equipment hours										
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**77,385**	**119,753**	**0**		**289**	**0**	**384.848/LF**	**197,427**
	513.00 LF										
	585.747 Labor hours										
	13.820 Equipment hours										

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
43.21.02.015	*(52) Magnetic Drive Transfer Pump - (TP-52A, TP-52B) 150 GPM, 10 HP*										
43 25 53.005	*Pumping Equipment - Chemical Transfer Pump*										
0010	Magnetic Drive Transfer Pump, 150 GPM, 10 HP	2.00	EA	3,503	59,548	-			744	31,897.56 /EA	63,795
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			*3,503*	*59,548*				*744*	*31,897.56 /EA*	*63,795*
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	43.21.02.015 (52) Magnetic Drive Transfer Pump - (TP-52A, TP-52B) 150 GPM, 10 HP			3,503	59,548	0		0	744	31,897.56 /EA	63,795
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
43.21.02.020	(52) Diaphragm Ferric Sulfate Pump - (P-52A, P-52B, P-52C) 100 GPH, 3 HP										
43 25 53.005	Pumping Equipment - Chemical Transfer Pump										
0010	Diaphragm Ferric Sulfate Pump, 100 GPH, 3 HP	3.00	EA	5,255	66,991	-			1,117	24,454.11 /EA	73,362
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			5,255	66,991				1,117	24,454.11 /EA	73,362
	3.00 EA										
	36.00 Labor hours										
	3.00 Equipment hours										
	43.21.02.020 (52) Diaphragm Ferric Sulfate Pump - (P-52A, P-52B, P-52C) 100 GPH, 3 HP			5,255	66,991	0		0	1,117	24,454.11 /EA	73,362
	3.00 EA										
	36.00 Labor hours										
	3.00 Equipment hours										
43.21.02.025	(52) Diaphragm Ferric Sulfate Pump, for Existng Chemical Tank Rehab - 100 GPH, 3 HP - 2 EA										
43 25 53.005	Pumping Equipment - Chemical Transfer Pump										
0010	Diaphragm Ferric Sulfate Pump, 100 GPH, 3 HP	2.00	EA	3,503	44,661	-			744	24,454.12 /EA	48,908
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			3,503	44,661				744	24,454.12 /EA	48,908
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
	43.21.02.025 (52) Diaphragm Ferric Sulfate Pump, for Existng Chemical Tank Rehab - 100 GPH, 3 HP - 2 EA			3,503	44,661	0		0	744	24,454.12 /EA	48,908
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**12,261**	**171,199**	**0**		**0**	**2,605**	**26,580.813/EA**	**186,066**
	7.00 EA										
	84.00 Labor hours										
	7.00 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 54		**STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED**										
54.16.23.005		*(52) Ferric Sulfate Bulk Tank (BTK-52A, BTK-52B, BTK-52C, BTK-52D), 12,000 Gal - 4 EA*										
54 16 24.010		*Steel Tank - Fiberglass Reinforced Plastic Coated*										
	0910	Steel water storage tanks, ground level, ht./diam. less than 1, 100,000 gallons, excl. foundation	4.00	EA	4,115	-	-		3,021	545,211	138,086.485 /EA	552,346
		54 16 24.010 Steel Tank - Fiberglass Reinforced Plastic Coated			*4,115*				*3,021*	*545,211*	*9.206/GAL*	*552,346*
		60,000.00 GAL										
		32.00 Labor hours										
		16.00 Equipment hours										
		54.16.23.005 (52) Ferric Sulfate Bulk Tank (BTK-52A, BTK-52B, BTK-52C, BTK-52D), 12,000 Gal - 4 EA			*4,115*	*0*	*0*		*3,021*	*545,211*	*138,086.485/EA*	*552,346*
		4.00 EA										
		32.00 Labor hours										
		16.00 Equipment hours										
54.16.23.010		*(52) Ferric Sulfate Day Tank (TK-52A), 5,000 Gal - 1 EA*										
54 16 23.005		*Steel Tank - Glass Coated*										
	0900	Steel water storage tanks, ground level, ht./diam. less than 1, 100,000 gallons, excl. foundation, pumps or piping	1.00	EA	1,029	17,387	-		1,510	-	19,925.810 /EA	19,926
		54 16 23.005 Steel Tank - Glass Coated			*1,029*	*17,387*			*1,510*		*19,925.810/EA*	*19,926*
		1.00 EA										
		8.00 Labor hours										
		8.00 Equipment hours										
		54.16.23.010 (52) Ferric Sulfate Day Tank (TK-52A), 5,000 Gal - 1 EA			*1,029*	*17,387*	*0*		*1,510*	*0*	*19,925.810/EA*	*19,926*
		1.00 EA										
		8.00 Labor hours										
		8.00 Equipment hours										
54.16.24.010		*(52) Ferric Sulfate Storage - Rehab of Existing Chemical Tank - 2 EA*										
54 16 24.010		*Steel Tank - Fiberglass Reinforced Plastic Coated*										
n	0900	Project Allowance_Rehab of Existing Chemical Tank	2.00	EA			121,708				60,854.08 /EA	121,708
		54 16 24.010 Steel Tank - Fiberglass Reinforced Plastic Coated					*121,708*				*10.142/GAL*	*121,708*
		12,000.00 GAL										

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Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		54.16.24.010 (52) Ferric Sulfate Storage - Rehab of Existing Chemical Tank - 2 EA			*0*	*0*	*121,708*		*0*	*0*	*60,854.08 /EA*	*121,708*
		2.00 EA										
		DIVISION 54 STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED			**5,143**	**17,387**	**121,708**		**4,531**	**545,211**	**99,139.987/EA**	**693,980**
		7.00 EA										
		40.00 Labor hours										
		24.00 Equipment hours										
		165 FERRIC SULFATE STORAGE			***559,604***	***739,963***	***121,708***		***36,863***	***547,816***	***2,005,953.34 /LS***	***2,005,953***
		1.00 LS										
		4,654.321 Labor hours										
		425.204 Equipment hours										

400 SLUDGE HOLDING TANK

DIVISION 02 EXISTING CONDITIONS

02.41.00.030 (71) Sludge Holding Tank - Demo and Rehab

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
02 41 00.190		*Process Equipment Demolition*										
n	0900	Project Allowance_Sludge Holding Tank, Demo and Rehab	1.00	LS	59,883	156,482			34,774		251,138.95 /LS	251,139
		02 41 00.190 Process Equipment Demolition			*59,883*	*156,482*			*34,774*		*251,138.95 /EA*	*251,139*
		1.00 EA										
		02.41.00.030 (71) Sludge Holding Tank - Demo and Rehab			*59,883*	*156,482*	*0*		*34,774*	*0*	*251,138.95 /LS*	*251,139*
		1.00 LS										
		DIVISION 02 EXISTING CONDITIONS			**59,883**	**156,482**	**0**		**34,774**	**0**	**251,138.95 /LS**	**251,139**
		1.00 LS										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.050 (71) Exposed Pipe - PSG - 6" Dia - 7 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	7.00	LF	35	1	-		2	-	5.427 /LF	38

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	7.70	lf	33	2	-		-	-	4.569 /lf	35
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	5.00	ea	96	27	-		-	-	24.612 /ea	123
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	16.00	ea	3,074	1,393	-		-	-	279.196 /ea	4,467
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	813	5,073	-		-	-	981.007 /ea	5,886
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	4.00	ea	542	1,791	-		-	-	583.23 /ea	2,333
n	2514	Fitting,DIP,FLG,Conc. Reducer,6"x5",c 110 water piping	2.00	ea	271	617	-		-	-	443.885 /ea	888
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*4,863*	*8,905*			*2*		*1,967.156/LF*	*13,770*
		7.00 LF										
		37.004 Labor hours										
		0.112 Equipment hours										
		40.05.19.050 (71) Exposed Pipe - PSG - 6" Dia - 7 LF			*4,863*	*8,905*	*0*		*2*	*0*	*1,967.156/LF*	*13,770*
		7.00 LF										
		37.004 Labor hours										
		0.112 Equipment hours										
40.05.62.005		*(71) Exposed Pipe - PSG - Plug Valve - 06" Dia*										
40 05 62.006		*Exposed Valves - Plug, Eccentric, Cast Iron, 06" Dia*										
n	0502	Plug Valve Flange: 6" / Handwheel or Lever Operator / Includes Gear Operator	2.00	EA	1,192	2,755	-		630	-	2,288.48 /EA	4,577
		40 05 62.006 Exposed Valves - Plug, Eccentric, Cast Iron, 06" Dia			*1,192*	*2,755*			*630*		*2,288.48 /EA*	*4,577*
		2.00 EA										
		10.667 Labor hours										
		4.00 Equipment hours										
		40.05.62.005 (71) Exposed Pipe - PSG - Plug Valve - 06" Dia			*1,192*	*2,755*	*0*		*630*	*0*	*2,288.48 /EA*	*4,577*
		2.00 EA										
		10.667 Labor hours										
		4.00 Equipment hours										
40.05.66.010		*(71) Exposed Pipe - PSG - Check Valve - 06" Dia*										
40 05 66.106		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia*										
n	0015	Check Valve, 250 lb, Swing: 6" / Flange End	2.00	EA	1,947		-			-	973.625 /EA	1,947

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Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	40 05 66.106 Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia		*1,947*						*973.625/EA*	*1,947*
	2.00 EA									
	13.34 Labor hours									
	40.05.66.010 (71) Exposed Pipe - PSG - Check Valve - 06" Dia		*1,947*	*0*	*0*		*0*	*0*	*973.625/EA*	*1,947*
	2.00 EA									
	13.34 Labor hours									
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)		**8,002**	**11,660**	**0**		**632**	**0**	**2,899.186/LF**	**20,294**
	7.00 LF									
	61.011 Labor hours 4.112 Equipment hours									

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

43.25.13.005 (71) Dry Pit Submersible Pump, Sludge Transfer Pump (P-71-1, P-71-2), 400 GPM - 2 EA

43 25 13.000 Pumping Equipment - Submersible End-Suction Sewage Pumps

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
9000	Submersible Pump_400 GPM	2.00 EA	4,579	184,597	-		323	592	95,046.215 /EA	190,092
	43 25 13.000 Pumping Equipment - Submersible End-Suction Sewage Pumps		*4,579*	*184,597*			*323*	*592*	*95,046.215/EA*	*190,092*
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									
	43.25.13.005 (71) Dry Pit Submersible Pump, Sludge Transfer Pump (P-71-1, P-71-2), 400 GPM - 2 EA		*4,579*	*184,597*	*0*		*323*	*592*	*95,046.215/EA*	*190,092*
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT		**4,579**	**184,597**	**0**		**323**	**592**	**95,046.215/EA**	**190,092**
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 46	**WATER AND WASTEWATER EQUIPMENT**										
46.41.00.005	*(71) Sludge Holding Tank - Mixing System*										
46 41 00.005	*Paddle Mixers*										
1100	Mixing System	1.00	EA	16,706	227,025	-		6,379	-	250,110.56 /EA	250,111
	46 41 00.005 Paddle Mixers			*16,706*	*227,025*			*6,379*		*250,110.56 /EA*	*250,111*
	1.00 EA										
	135.00 Labor hours										
	19.00 Equipment hours										
	46.41.00.005 (71) Sludge Holding Tank - Mixing System			*16,706*	*227,025*	*0*		*6,379*	*0*	*250,110.56 /EA*	*250,111*
	1.00 EA										
	135.00 Labor hours										
	19.00 Equipment hours										
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**16,706**	**227,025**	**0**		**6,379**	**0**	**250,110.56 /EA**	**250,111**
	1.00 EA										
	135.00 Labor hours										
	19.00 Equipment hours										
	400 SLUDGE HOLDING TANK			***89,171***	***579,764***	***0***		***42,109***	***592***	***711,636.24 /LS***	***711,636***
	1.00 LS										
	236.011 Labor hours										
	25.112 Equipment hours										
	412 THICKENED SLUDGE PUMP STATION										
DIVISION 03	**CONCRETE**										
03.11.13.210	*(75) Thickened Sludge Pump Station - Buried Slab, 1,050 SF - 12" Thick*										
03 11 13.763	*12" Foundation Slab*										
3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	136.00	sfca	1,134	247	-		-	-	10.152 /sfca	1,381
n 9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	52.80	sfca	262	35	-		-	-	5.636 /sfca	298
n 2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	3.50	ton	253	-	-		109	-	103.446 /ton	362

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.50	ton	6,326	7,555	-		-	-	3,966.106 /ton	13,881
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	3.50	ton	724	-	-		311	-	295.557 /ton	1,034
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	40.00	cy	1,436	-	-		159	-	39.863 /cy	1,595
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	4.00	cy	144	-	-		16	-	39.863 /cy	159
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	40.00	CY	-	11,016	-		-	-	275.407 /CY	11,016
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	4.00	cy	-	1,102	-		-	-	275.410 /cy	1,102
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	1,056.00	sf	1,581	-	-		85	-	1.577 /sf	1,666
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	52.80	lf	47	2	-		5	-	1.028 /lf	54
n	0215	Control joint, clean out control joint of debris_SOG	52.80	lf	8	-	-			-	0.148 /lf	8
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	105.60	lf	350	25	-		-	-	3.553 /lf	375
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	10.56	csf	173	117	-		-	-	27.468 /csf	290
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	10.56	sq	271	128	-		-	-	37.792 /sq	399
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	45.00	ecy	1,006	2,144	-		83	-	71.824 /ecy	3,232
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	45.00	lcy	752	-	-		831	-	35.176 /lcy	1,583
		03 11 13.763 12" Foundation Slab			*14,466*	*22,372*			*1,598*		*960.876/CY*	*38,435*
		40.00 CY										
		122.737 Labor hours										
		26.890 Equipment hours										
		03.11.13.210 (75) Thickened Sludge Pump Station - Buried Slab, 1,050 SF - 12" Thick			*14,466*	*22,372*	*0*		*1,598*	*0*	*960.876/CY*	*38,435*
		40.00 CY										
		122.737 Labor hours										
		26.890 Equipment hours										

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.215		*(75) Thickened Sludge Pump Station - Walls, 22' High, 124 LF - 12" Thick*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	137.00	lf	2,888	693	-		-	-	26.139 /lf	3,581
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	5,456.00	sfca	77,150	8,041	-		-	-	15.614 /sfca	85,191
n	5200	Chamfer strip, wood, 3/4" wide	273.00	lf	494	57	-		-	-	2.017 /lf	551
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	5.00	c	-	484	-		-	-	96.762 /c	484
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	261.00	lf	1,709	2,836	-		-	-	17.415 /lf	4,545
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	10.20	ton	14,135	22,018	-		-	-	3,544.353 /ton	36,152
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	10.20	ton	738	-	-		317	-	103.445 /ton	1,055
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	10.20	ton	803	-	-		344	-	112.44 /ton	1,147
n	0210	Control joint, clean out control joint of debris_WALLS	137.00	lf	20	-	-		-	-	0.149 /lf	20
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	137.00	lf	454	33	-		-	-	3.553 /lf	487
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	5,456.00	sf	9,043	325	-		-	-	1.717 /sf	9,368
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,728.00	sf	5,426	162	-		-	-	2.048 /sf	5,588
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	102.00	cy	6,157	-	-		682	-	67.042 /cy	6,838
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	102.00	CY	-	28,092	-		-	-	275.407 /CY	28,092
		03 11 13.804 12" CIP Wall			*119,016*	*62,741*			*1,343*		*1,795.091/CY*	*183,099*

102.00 CY

1,020.017 Labor hours
23.958 Equipment hours

	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.215 (75) Thickened Sludge Pump Station - Walls, 22' High, 124 LF - 12" Thick	*119,016*	*62,741*	*0*	*1,343*	*0*	*1,795.091/CY*	*183,099*

102.00 CY

1,020.017 Labor hours
23.958 Equipment hours

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 03 CONCRETE			**133,482**	**85,113**	**0**		**2,940**	**0**	**1,560.101/CY**	**221,534**
		142.00 CY										
		1,142.754 Labor hours										
		50.848 Equipment hours										

DIVISION 05 METALS

05.12.00.010 (75) Thickened Sludge Pump Station - Structural Columns - HSS8x8x3/8 - 10' High - 6 EA

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 12 00.000		*Structural Steel*										
n	0125	Structural steel member, 100-ton project, 1 to 2 story building, HSS8x8x3/8, A992 steel, shop fabricated, incl shop primer, bolted connections	60.00	LF	555	2,295	-		214	-	51.058 /LF	3,063
	4300	Column base plates, structural, light, 100-ton project, up to 150 lb each, A992 steel, shop fabricated, incl shop primer	900.00	lb	1,052	2,817	-		-	-	4.298 /lb	3,868
		05 12 00.000 Structural Steel			*1,606*	*5,112*			*214*		*6,134.265/TON*	*6,932*
		1.13 TON										
		11.018 Labor hours										
		0.545 Equipment hours										
		05.12.00.010 (75) Thickened Sludge Pump Station - Structural Columns - HSS8x8x3/8 - 10' High - 6 EA			*1,606*	*5,112*	*0*		*214*	*0*	*115.529/LF*	*6,932*
		60.00 LF										
		11.018 Labor hours										
		0.545 Equipment hours										

05.12.00.015 (75) Thickened Sludge Pump Station - Roof Joists - W10x19 - 145 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 12 00.000		*Structural Steel*										
n	0640	Structural steel member, 100-ton project, 1 to 2 story building, W10x20, A992 steel, shop fabricated, incl shop primer, bolted connections	145.00	LF	1,965	9,076	-		758	-	81.374 /LF	11,799
		05 12 00.000 Structural Steel			*1,965*	*9,076*			*758*		*8,550.152/TON*	*11,799*
		1.38 TON										
		13.533 Labor hours										
		1.933 Equipment hours										
		05.12.00.015 (75) Thickened Sludge Pump Station - Roof Joists - W10x19 - 145 LF			*1,965*	*9,076*	*0*		*758*	*0*	*81.374/LF*	*11,799*
		145.00 LF										
		13.533 Labor hours										
		1.933 Equipment hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.50.00.030	*(75) Canopy over Thickened Sludge Pump Station*										
05 50 00.500	*Fabricated, Metal Canopy*										
1160	(75) Canopy over Thickened Sludge Pump Station	861.00	SF	-	0	74,851		-	-	86.934 /SF	74,851
	05 50 00.500 Fabricated, Metal Canopy					*74,851*				*86.934/SF*	*74,851*
	861.00 SF										
	05.50.00.030 (75) Canopy over Thickened Sludge Pump Station			*0*	*0*	*74,851*		*0*	*0*	*86.934/SF*	*74,851*
	861.00 SF										
05.52.02.010	*(75) Thickened Sludge Pump Station - Aluminum Handrail - 3-Rail - 4' High - 116 LF*										
05 52 02.002	*Aluminum Railings - 3 Rail*										
0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	116.00	LF	4,011	19,261	-		230	-	202.606 /LF	23,502
	05 52 02.002 Aluminum Railings - 3 Rail			*4,011*	*19,261*			*230*		*202.606/LF*	*23,502*
	116.00 LF										
	27.095 Labor hours										
	6.774 Equipment hours										
	05.52.02.010 (75) Thickened Sludge Pump Station - Aluminum Handrail - 3-Rail - 4' High - 116 LF			*4,011*	*19,261*	*0*		*230*	*0*	*202.606/LF*	*23,502*
	116.00 LF										
	27.095 Labor hours										
	6.774 Equipment hours										
	DIVISION 05 METALS			**7,582**	**33,449**	**74,851**		**1,202**	**0**	**117,083.75 /LS**	**117,084**
	1.00 LS										
	51.646 Labor hours										
	9.252 Equipment hours										
DIVISION 31	**EARTHWORK**										
31.23.10.025	*(75) Thickened Sludge Pump Station, Excavation, Backfill and Haul Off-Site*										
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	1,058.00	CY	853	-	-		1,608	-	2.326 /CY	2,461
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	159.00	CY	195	-	-		337	-	3.347 /CY	532

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1,125.00	CY	27,294	-	-		27,931	-	49.089 /CY	55,225
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	159.00	CY	156	-	-		242	-	2.502 /CY	398
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*28,499*				*30,117*		*23.437/CY*	*58,616*
		2,501.00 CY										
		240.687 Labor hours										
		236.206 Equipment hours										
		31.23.10.025 (75) Thickened Sludge Pump Station, Excavation, Backfill and Haul Off-Site			*28,499*	*0*	*0*		*30,117*	*0*	*23.437/CY*	*58,616*
		2,501.00 CY										
		240.687 Labor hours										
		236.206 Equipment hours										
31.23.19.005		*(75) Thickened Sludge Pump Station, Wellpoint Dewatering - 160 LF - 4 Months*										
31 23 19.020		*Dewatering - Wellpoint*										
n	0700	Wellpoints,complete installation,2"wellpoints,5'oc, 100'long header,6"diameter,includes one month operation,equipment rental,fuel and removal system	160.00	HDR	200,876	39,145	-		-	-	1,500.135 /HDR	240,022
	0800	Wellpoints, each additional month, 2" wellpoints, 5' O.C., 100' long header, 6" diameter, includes equipment rental, fuel and removal of system	480.00	hdr	471,305	93,796	-		-	-	1,177.295 /hdr	565,101
		31 23 19.020 Dewatering - Wellpoint			*672,182*	*132,941*					*201,280.742/MO*	*805,123*
		4.00 MO										
		5,304.268 Labor hours										
		31.23.19.005 (75) Thickened Sludge Pump Station, Wellpoint Dewatering - 160 LF - 4 Months			*672,182*	*132,941*	*0*		*0*	*0*	*5,032.019/HDR*	*805,123*
		160.00 HDR										
		5,304.268 Labor hours										
31.62.17.005		*(75) Thickened Sludge Pump Station, Sheeting and Shoring - 148 LF x 32' Deep - 4,736 SF*										
31 62 17.040		*Driven Steel Sheet Piling, 40' Deep*										
	1000	Sheet piling, steel, 38 psf, 40' excavation, per ton, drive, extract and salvage, excludes wales	90.00	TON	61,679	72,921	-		43,175	-	1,975.279 /TON	177,775
	2500	Sheet piling, wales, connections and struts, 2/3 salvage	90.00	ton	-	72,921	-		-	-	810.231 /ton	72,921
		31 62 17.040 Driven Steel Sheet Piling, 40' Deep			*61,679*	*145,842*			*43,175*		*2,785.510/TON*	*250,696*
		90.00 TON										
		470.204 Labor hours										
		117.551 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		31.62.17.005 (75) Thickened Sludge Pump Station, Sheeting and Shoring - 148 LF x 32' Deep - 4,736 SF			*61,679*	*145,842*	*0*		*43,175*	*0*	*2,785.510/TON*	*250,696*
		90.00 TON										
		470.204 Labor hours										
		117.551 Equipment hours										
		DIVISION 31 EARTHWORK			**762,359**	**278,783**	**0**		**73,293**	**0**	**445.596/CY**	**1,114,435**
		2,501.00 CY										
		6,015.158 Labor hours										
		353.757 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.085 (75) Exposed Pipe - TS - 8" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	20	0	-		1	-	5.43 /LF	22
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	2.00	ea	41	17	-		-	-	29.145 /ea	58
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	2.00	ea	461	155	-		-	-	307.935 /ea	616
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	327	3,239	-		-	-	1,783.35 /ea	3,567
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			*849*	*3,412*			*1*		*1,065.645/LF*	*4,263*
		4.00 LF										
		6.546 Labor hours										
		0.064 Equipment hours										
		40.05.19.085 (75) Exposed Pipe - TS - 8" Dia - Wall Pipe			*849*	*3,412*	*0*		*1*	*0*	*1,065.645/LF*	*4,263*
		4.00 LF										
		6.546 Labor hours										
		0.064 Equipment hours										

40.05.19.090 (75) Exposed Pipe - TS - 8" Dia - 12 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	12.00	LF	60	1	-		4	-	5.427 /LF	65
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	13.20	lf	57	4	-		-	-	4.566 /lf	60
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	5.00	ea	103	43	-		-	-	29.142 /ea	146
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	24.00	ea	5,533	1,858	-		-	-	307.941 /ea	7,391

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	0095	DIP,FLGxFLG,8"dia,1'-0" long,class 53,excl excav, backfill	2.00	ea	327	2,496	-		-	-	1,411.76 /ea	2,824
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	655	6,479	-		-	-	1,783.34 /ea	7,133
n	1408	Fitting,DIP,FLG,Tee,8"dia,c 110 water piping	3.00	ea	491	3,273	-		-	-	1,254.557 /ea	3,764
n	2524	Fitting,DIP,FLG,Conc. Reducer,8"x6",c 110 water piping	3.00	ea	491	1,504	-		-	-	665.037 /ea	1,995
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			*7,716*	*15,658*			*4*		*1,948.112/LF*	*23,377*
		12.00 LF										
		57.550 Labor hours										
		0.192 Equipment hours										
		40.05.19.090 (75) Exposed Pipe - TS - 8" Dia - 12 LF			*7,716*	*15,658*	*0*		*4*	*0*	*1,948.112/LF*	*23,377*
		12.00 LF										
		57.550 Labor hours										
		0.192 Equipment hours										
40.05.19.095		*(75) Exposed Pipe - TS - 6" Dia - Wall Pipe*										
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	20	0	-		1	-	5.425 /LF	22
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	2.00	ea	38	11	-		-	-	24.62 /ea	49
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	2.00	ea	384	174	-		-	-	279.185 /ea	558
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	271	2,220	-		-	-	1,245.400 /ea	2,491
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*713*	*2,405*			*1*		*780.028/LF*	*3,120*
		4.00 LF										
		5.493 Labor hours										
		0.064 Equipment hours										
		40.05.19.095 (75) Exposed Pipe - TS - 6" Dia - Wall Pipe			*713*	*2,405*	*0*		*1*	*0*	*780.028/LF*	*3,120*
		4.00 LF										
		5.493 Labor hours										
		0.064 Equipment hours										
40.05.19.100		*(75) Exposed Pipe - TS - 6" Dia - 60 LF*										
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	60.00	LF	299	7	-		20	-	5.426 /LF	326
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	66.00	lf	283	19	-		-	-	4.568 /lf	301
	01066	Pipe Support, 6", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	14.00	ea	7,421	11,716	-		-	-	1,366.89 /ea	19,136

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	5.00	ea	96	27	-		-	-	24.618 /ea	123
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	46.00	ea	8,837	4,006	-		-	-	279.195 /ea	12,843
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	813	5,073	-		-	-	981.007 /ea	5,886
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	22.00	ea	2,980	24,419	-		-	-	1,245.398 /ea	27,399
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	20.00	ea	2,709	8,956	-		-	-	583.229 /ea	11,665
n	1406	Fitting,DIP,FLG,Tee,6"dia,c 110 water piping	9.00	ea	1,219	5,895	-		-	-	790.457 /ea	7,114
n	2514	Fitting,DIP,FLG,Conc. Reducer,6"x4",c 110 water piping	3.00	ea	406	925	-		-	-	443.883 /ea	1,332
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*25,061*	*61,043*			*20*		*1,435.412/LF*	*86,125*
		60.00 LF										
		195.179 Labor hours										
		0.96 Equipment hours										
		40.05.19.100 (75) Exposed Pipe - TS - 6" Dia - 60 LF			*25,061*	*61,043*	*0*		*20*	*0*	*1,435.412/LF*	*86,125*
		60.00 LF										
		195.179 Labor hours										
		0.96 Equipment hours										
40.05.62.010		*(75) Exposed Pipe - TS - Plug Valve - 08" Dia*										
40 05 62.108		*Exposed Valves - Plug, Eccentric, Ductile Iron, 08" Dia*										
n	0503	Plug Valve Flange: 8" / Handwheel or Lever Operator / Includes Gear Operator	3.00	EA	1,788	6,066	-		945	-	2,932.95 /EA	8,799
		40 05 62.108 Exposed Valves - Plug, Eccentric, Ductile Iron, 08" Dia			*1,788*	*6,066*			*945*		*2,932.95 /EA*	*8,799*
		3.00 EA										
		16.000 Labor hours										
		6.00 Equipment hours										
		40.05.62.010 (75) Exposed Pipe - TS - Plug Valve - 08" Dia			*1,788*	*6,066*	*0*		*945*	*0*	*2,932.95 /EA*	*8,799*
		3.00 EA										
		16.000 Labor hours										
		6.00 Equipment hours										
40.05.62.015		*(75) Exposed Pipe - TS - Plug Valve - 06" Dia*										
40 05 62.106		*Exposed Valves - Plug, Eccentric, Ductile Iron, 06" Dia*										
n	0502	Plug Valve Flange: 6" / Handwheel or Lever Operator / Includes Gear Operator	19.00	EA	11,324	26,174	-		5,983	-	2,288.482 /EA	43,481

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 62.106 Exposed Valves - Plug, Eccentric, Ductile Iron, 06" Dia			*11,324*	*26,174*			*5,983*		*2,288.482/EA*	*43,481*
		19.00 EA										
		101.333 Labor hours										
		38.00 Equipment hours										
		40.05.62.015 (75) Exposed Pipe - TS - Plug Valve - 06" Dia			*11,324*	*26,174*	*0*		*5,983*	*0*	*2,288.482/EA*	*43,481*
		19.00 EA										
		101.333 Labor hours										
		38.00 Equipment hours										
40.05.66.015		*(75) Exposed Pipe - TS - Check Valve - 06" Dia*										
40 05 66.106		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia*										
n	102	Check Valve Flange, Swing: 6" / Lever and Weight	3.00	EA	1,341	5,282	-		630	-	2,417.707 /EA	7,253
		40 05 66.106 Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia			*1,341*	*5,282*			*630*		*2,417.707/EA*	*7,253*
		3.00 EA										
		12.00 Labor hours										
		4.000 Equipment hours										
		40.05.66.015 (75) Exposed Pipe - TS - Check Valve - 06" Dia			*1,341*	*5,282*	*0*		*630*	*0*	*2,417.707/EA*	*7,253*
		3.00 EA										
		12.00 Labor hours										
		4.000 Equipment hours										
40.71.00.005		*(75) Exposed Pipe - TS - Flow Meter - 06" Dia*										
40 71 00.106		*Flow Meter Magnetic, 06"*										
	0135	Flow Meter Magnetic, 6"	2.00	EA	946	9,825					5,385.89 /EA	10,772
		40 71 00.106 Flow Meter Magnetic, 06"			*946*	*9,825*					*5,385.89 /EA*	*10,772*
		2.00 EA										
		7.00 Labor hours										
		40.71.00.005 (75) Exposed Pipe - TS - Flow Meter - 06" Dia			*946*	*9,825*	*0*		*0*	*0*	*5,385.89 /EA*	*10,772*
		2.00 EA										
		7.00 Labor hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**49,739**	**129,866**	**0**		**7,584**	**0**	**2,339.871/LF**	**187,190**
		80.00 LF										
		401.101 Labor hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**49,739**	**129,866**	**0**		**7,584**	**0**	**2,339.871/LF**	**187,190**
	80.00 LF										
	401.101 Labor hours										
	49.280 Equipment hours										
DIVISION 43	**PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT**										
43.23.57.005	*(75) Progressive Cavity Pump - (P-75-1, P-75-2, P-75-3), 200 GPM, 50 PSI*										
43 23 57.000	*Pumping Equipment - Progressive Cavity Pump*										
n 9990	Progressive Cavity Pump,200 GPM, 50 PSI	3.00	EA	13,738	164,195	-		485	1,603	60,007.06 /EA	180,021
	43 23 57.000 Pumping Equipment - Progressive Cavity Pump			*13,738*	*164,195*			*485*	*1,603*	*60,007.06 /EA*	*180,021*
	3.00 EA										
	120.00 Labor hours										
	3.00 Equipment hours										
	43.23.57.005 (75) Progressive Cavity Pump - (P-75-1, P-75-2, P-75-3), 200 GPM, 50 PSI			*13,738*	*164,195*	*0*		*485*	*1,603*	*60,007.06 /EA*	*180,021*
	3.00 EA										
	120.00 Labor hours										
	3.00 Equipment hours										
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**13,738**	**164,195**	**0**		**485**	**1,603**	**60,007.06 /EA**	**180,021**
	3.00 EA										
	120.00 Labor hours										
	3.00 Equipment hours										
DIVISION 46	**WATER AND WASTEWATER EQUIPMENT**										
46.24.23.005	*(75) Sludge Grinder - (SG-75-1, SG-75-2, SG-75-3), 3 HP*										
46 24 23.000	*Sludge Grinders*										
9998	Sludge Grinders_3 HP	3.00	EA	2,748	82,385	-		3,879	-	29,670.837 /EA	89,013
	46 24 23.000 Sludge Grinders			*2,748*	*82,385*			*3,879*		*29,670.837/EA*	*89,013*
	3.00 EA										
	24.00 Labor hours										
	24.00 Equipment hours										

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Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46.24.23.005 (75) Sludge Grinder - (SG-75-1, SG-75-2, SG-75-3), 3 HP *3.00 EA* 24.00 Labor hours 24.00 Equipment hours		*2,748*	*82,385*	*0*		*3,879*	*0*	*29,670.837/EA*	*89,013*
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT **3.00 EA** 24.00 Labor hours 24.00 Equipment hours		**2,748**	**82,385**	**0**		**3,879**	**0**	**29,670.837/EA**	**89,013**
	412 THICKENED SLUDGE PUMP STATION ***1.00 LS*** 7,754.660 Labor hours 490.136 Equipment hours		***969,648***	***773,791***	***74,851***		***89,383***	***1,603***	***1,909,276.18 /LS***	***1,909,276***

500 SLUDGE THICKENER

DIVISION 03 CONCRETE

03.11.13.180 (74) Sludge Thickener - Center Slab, 9' Dia, 77 SF - 27" Thick

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.775	*27" Foundation Slab*									
3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	64.00 sfca	663	67	-		-	-	11.403 /sfca	730
n 9011	C.I.P. concrete forms, bulkhead for foundation w/ keyway, 12" and greater, exp metal, includes erecting, bracing, stripping and cleaning	41.00 sfca	177	15	-		-	-	4.690 /sfca	192
n 3005	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_FOUNDATIONS	18.00 lf	118	201	-		-	-	17.713 /lf	319
n 2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.563 ton	41	-	-		17	-	103.41 /ton	58
n 2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.563 ton	44	-	-		19	-	112.451 /ton	63
n 0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.563 ton	1,018	779	-		-	-	3,191.95 /ton	1,797
n 4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.00 cy	179	-	-		20	-	39.866 /cy	199
n 4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.50 cy	18	-	-		2	-	39.86 /cy	20

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.775		*27" Foundation Slab*										
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.00	CY	-	1,340	-		-	-	267.962 /CY	1,340
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.50	cy	-	134	-		-	-	267.960 /cy	134
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	64.00	sf	41	-	-		-	-	0.642 /sf	41
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	18.00	lf	3	-	-			-	0.15 /lf	3
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	18.00	lf	60	4	-		-	-	3.553 /lf	64
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	0.64	csf	10	7	-		-	-	27.48 /csf	18
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	2.00	ecy	82	95	-		7	-	91.97 /ecy	184
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	2.00	lcy	33	-	-		37	-	35.17 /lcy	70
		03 11 13.775 27" Foundation Slab			*2,487*	*2,643*			*102*		*1,046.426/CY*	*5,232*
		5.00 CY										
		20.946 Labor hours										
		1.533 Equipment hours										
		03.11.13.180 (74) Sludge Thickener - Center Slab, 9' Dia, 77 SF - 27" Thick			*2,487*	*2,643*	*0*		*102*	*0*	*1,046.426/CY*	*5,232*
		5.00 CY										
		20.946 Labor hours										
		1.533 Equipment hours										
03.11.13.185		*(74) Sludge Thickener - Bottom Slab, 105' Dia, 8630 SF - 12" Thick*										
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	330.00	sfca	3,419	344	-		-	-	11.403 /sfca	3,763
n	9011	C.I.P. concrete forms, bulkhead for foundation w/ keyway, 12" and greater, exp metal, includes erecting, bracing, stripping and cleaning	210.00	sfca	907	78	-		-	-	4.690 /sfca	985
n	3005	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_FOUNDATIONS	210.00	lf	1,375	2,345	-		-	-	17.713 /lf	3,720
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	36.113	ton	2,614	-	-		1,121	-	103.443 /ton	3,736
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	36.113	ton	2,842	-	-		1,219	-	112.442 /ton	4,061
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	36.113	ton	65,275	49,998	-		-	-	3,191.990 /ton	115,272

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	321.00	cy	11,521	-	-		1,275	-	39.863 /cy	12,796
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	32.10	cy	1,152	-	-		128	-	39.863 /cy	1,280
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	321.00	CY	-	86,016	-		-	-	267.964 /CY	86,016
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.10	cy	-	8,602	-		-	-	267.964 /cy	8,602
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	8,660.00	sf	5,560	-	-		-	-	0.642 /sf	5,560
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	210.00	lf	31	-	-			-	0.149 /lf	31
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	210.00	lf	696	50	-		-	-	3.553 /lf	746
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	86.60	csf	1,418	960	-		-	-	27.468 /csf	2,379
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	321.00	ecy	13,151	15,292	-		1,083	-	91.98 /ecy	29,526
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	369.00	lcy	6,163	-	-		6,818	-	35.176 /lcy	12,980
		03 11 13.763 12" Foundation Slab			*116,123*	*163,685*			*11,644*		*907.948/CY*	*291,451*
		321.00 CY 972.675 Labor hours 182.573 Equipment hours										
		03.11.13.185 (74) Sludge Thickener - Bottom Slab, 105' Dia, 8630 SF - 12" Thick			*116,123*	*163,685*	*0*		*11,644*	*0*	*907.948/CY*	*291,451*
		321.00 CY 972.675 Labor hours 182.573 Equipment hours										
03.11.13.190		*(74) Sludge Thickener - Thickened Edge Footing, 330' x 5'-3" Wide, 642 SF - 12" Thick*										
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	670.50	sfca	6,947	699	-		-	-	11.403 /sfca	7,646
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	7.219	ton	523	-	-		224	-	103.444 /ton	747
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	7.219	ton	568	-	-		244	-	112.441 /ton	812
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	7.219	ton	13,048	9,995	-		-	-	3,191.992 /ton	23,043
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	64.167	cy	2,303	-	-		255	-	39.863 /cy	2,558

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	6.417	cy	230	-	-		26	-	39.866 /cy	256
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	64.167	CY	-	17,194	-		-	-	267.964 /CY	17,194
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	6.417	cy	-	1,720	-		-	-	267.965 /cy	1,720
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	1,732.50	sf	1,112	-	-		-	-	0.642 /sf	1,112
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	86.625	lf	13	-	-			-	0.149 /lf	13
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	86.625	lf	287	21	-		-	-	3.553 /lf	308
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	17.325	csf	284	192	-		-	-	27.468 /csf	476
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	64.00	ecy	2,622	3,049	-		216	-	91.980 /ecy	5,887
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	74.00	lcy	1,236	-	-		1,367	-	35.176 /lcy	2,603
		03 11 13.763 12" Foundation Slab			*29,173*	*32,869*			*2,331*		*1,003.215/CY*	*64,373*
		64.167 CY										
		247.155 Labor hours										
		36.555 Equipment hours										
		03.11.13.190 (74) Sludge Thickener - Thickened Edge Footing, 330' x 5'-3" Wide, 642 SF - 12" Thick			*29,173*	*32,869*	*0*		*2,331*	*0*	*1,003.215/CY*	*64,373*
		64.167 CY										
		247.155 Labor hours										
		36.555 Equipment hours										
03.11.13.195		*(74) Sludge Thickener - Walls, 15' High, 319 LF - 18" Thick*										
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	240.00	lf	5,059	1,215	-		-	-	26.139 /lf	6,273
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	9,570.00	sfca	135,323	14,104	-		-	-	15.614 /sfca	149,428
n	5200	Chamfer strip, wood, 3/4" wide	479.00	lf	866	100	-		-	-	2.017 /lf	966
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	8.00	c	-	774	-		-	-	96.761 /c	774
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	559.00	lf	3,660	6,075	-		-	-	17.415 /lf	9,735

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	26.60	ton	36,861	57,419	-		-	-	3,544.356 /ton	94,280
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	26.60	ton	1,926	-	-		826	-	103.444 /ton	2,752
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	26.60	ton	2,093	-	-		898	-	112.440 /ton	2,991
n	0210	Control joint, clean out control joint of debris_WALLS	240.00	lf	36	-	-		-	-	0.149 /lf	36
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	240.00	lf	796	57	-		-	-	3.553 /lf	853
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	9,570.00	sf	15,862	570	-		-	-	1.717 /sf	16,432
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	4,785.00	sf	9,517	285	-		-	-	2.048 /sf	9,802
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	266.00	cy	16,056	-	-		1,777	-	67.042 /cy	17,833
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	266.00	CY	-	73,258	-		-	-	275.407 /CY	73,258
		03 11 13.811 18" CIP Wall			*228,054*	*153,857*			*3,501*		*1,448.918/CY*	*385,412*
		266.00 CY										
		1,948.407 Labor hours										
		62.477 Equipment hours										
		03.11.13.195 (74) Sludge Thickener - Walls, 15' High, 319 LF - 18" Thick			*228,054*	*153,857*	*0*		*3,501*	*0*	*1,448.918/CY*	*385,412*
		266.00 CY										
		1,948.407 Labor hours										
		62.477 Equipment hours										
03.11.13.200		*(74) Sludge Thickener - Elevated Trough Wall, 2'-6" High, 295 LF - 8" Thick*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	37.00	lf	780	187	-		-	-	26.138 /lf	967
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	1,475.00	sfca	20,857	2,174	-		-	-	15.614 /sfca	23,031
n	5200	Chamfer strip, wood, 3/4" wide	74.00	lf	134	15	-		-	-	2.017 /lf	149
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	194	-		-	-	96.76 /c	194
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	332.00	lf	2,174	3,608	-		-	-	17.415 /lf	5,782

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	1.90	ton	2,633	4,101	-		-	-	3,544.36 /ton	6,734
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	1.90	ton	138	-	-		59	-	103.442 /ton	197
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	1.90	ton	150	-	-		64	-	112.44 /ton	214
n	0210	Control joint, clean out control joint of debris_WALLS	37.00	lf	6	-	-		-	-	0.149 /lf	6
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	37.00	lf	123	9	-		-	-	3.553 /lf	131
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	1,475.00	sf	2,445	88	-		-	-	1.717 /sf	2,533
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	737.50	sf	1,467	44	-		-	-	2.049 /sf	1,511
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	19.00	cy	1,147	-	-		127	-	67.041 /cy	1,274
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	19.00	CY	-	5,233	-		-	-	275.407 /CY	5,233
		03 11 13.801 08" CIP Wall			*32,051*	*15,653*			*250*		*2,523.886/CY*	*47,954*
		19.00 CY 275.037 Labor hours 4.463 Equipment hours										
		03.11.13.200 (74) Sludge Thickener - Elevated Trough Wall, 2'-6" High, 295 LF - 8" Thick			*32,051*	*15,653*	*0*		*250*	*0*	*2,523.886/CY*	*47,954*
		19.00 CY 275.037 Labor hours 4.463 Equipment hours										
03.11.13.205		*(74) Sludge Thickener - Elevated Trough Slab, 3'-4" Wide, 1,040 SF - 12" Thick*										
03 11 13.303		*12" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	11.00	csf	4,177	-	-		-	-	379.766 /csf	4,177
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	32.00	csf	-	3,073	-		-	-	96.02 /csf	3,073
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,040.00	sf	10,678	3,406	-		-	-	13.542 /sf	14,084
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1.00	lf	7	0	-		-	-	7.70 /lf	8
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	4.388	ton	318	-	-		136	-	103.44 /ton	454

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.303		*12" Elevated Slab*										
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	4.388	ton	345	-	-		148	-	112.445 /ton	493
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	4.388	ton	6,290	9,472	-		-	-	3,592.144 /ton	15,762
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	39.00	cy	1,618	-	-		179	-	46.091 /cy	1,798
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	3.90	cy	162	-	-		18	-	46.09 /cy	180
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	39.00	CY	-	10,741	-		-	-	275.407 /CY	10,741
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.90	cy	-	1,074	-		-	-	275.410 /cy	1,074
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,040.00	sf	1,557	-	-		83	-	1.577 /sf	1,640
n	9000	Concrete finishing, elev slabs, includes patching voids	1,040.00	sf	1,723	46	-		-	-	1.702 /sf	1,770
		03 11 13.303 12" Elevated Slab			*26,876*	*27,813*			*565*		*1,416.764/CY*	*55,254*
		39.00 CY										
		227.688 Labor hours										
		12.014 Equipment hours										
		03.11.13.205 (74) Sludge Thickener - Elevated Trough Slab, 3'-4" Wide, 1,040 SF - 12" Thick			*26,876*	*27,813*	*0*		*565*	*0*	*1,416.764/CY*	*55,254*
		39.00 CY										
		227.688 Labor hours										
		12.014 Equipment hours										
		DIVISION 03 CONCRETE			**434,764**	**396,519**	**0**		**18,393**	**0**	**1,189.745/CY**	**849,676**
		714.167 CY										
		3,691.907 Labor hours										
		299.616 Equipment hours										

DIVISION 31 EARTHWORK

31.23.10.030 (74) Sludge Thickener, Excavation, Backfill and Haul Off-Site

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	3,180.00	CY	2,563	-	-		4,833	-	2.326 /CY	7,396

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	477.00	CY	586	-	-		1,010	-	3.347 /CY	1,597
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	3,379.00	CY	81,979	-	-		83,893	-	49.089 /CY	165,872
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	477.00	CY	469	-	-		725	-	2.502 /CY	1,194
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*85,597*				*90,461*		*23.434/CY*	*176,058*
		7,513.00 CY										
		722.920 Labor hours										
		709.458 Equipment hours										
		31.23.10.030 (74) Sludge Thickener, Excavation, Backfill and Haul Off-Site			*85,597*	*0*	*0*		*90,461*	*0*	*23.434/CY*	*176,058*
		7,513.00 CY										
		722.920 Labor hours										
		709.458 Equipment hours										
		DIVISION 31 EARTHWORK			**85,597**	**0**	**0**		**90,461**	**0**	**23.434/CY**	**176,058**
		7,513.00 CY										
		722.920 Labor hours										
		709.458 Equipment hours										

DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)

33.05.19.045 (74) Buried Pipe, SLG - 12" Dia - 64 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	64.00	lf	335	8	-		23	-	5.702 /lf	365
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		217	-	216.79 /day	217
	0090	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	107.00	bcy	1,007	-	-		210	-	11.378 /bcy	1,217
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	79.00	lcy	129	-	-		223	-	4.463 /lcy	353
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	69.00	ecy	157	-	-		348	-	7.316 /ecy	505
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	42.00	lcy	741	2,068	-		101	-	69.293 /lcy	2,910
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	37.00	ecy	311	-	-		30	-	9.22 /ecy	341
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.20 /clf	66

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	2100	Distribution piping,DIP,cement lined,fastite,20' lengths, 12"dia, Press Class 350, Excludes excavation, backfill, bedding	64.00	LF	1,126	5,033	-		538	-	104.628 /LF	6,696
n	4104	Distribution Piping,DIP,Flex-Ring Joint,12"dia,additional per linear foot of restrained pipe	64.00	lf		1,663	-			-	25.991 /lf	1,663
n	8020	Fitting, 90 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	1.00	ea	539	1,610	-		128	-	2,277.27 /ea	2,277
n	4705	DIP,Polywrap 8 mil LDT 500ft,12"dia	1.00	roll	118	1,126	-		-	-	1,244.48 /roll	1,244
	8420	Fitting,11.25 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	2.00	ea	1,114	1,699	-			-	1,406.165 /ea	2,812
		33 05 19.012 Buried Pipe, Ductile Iron, 12" Dia			*5,583*	*13,268*			*1,817*		*322.935/LF*	*20,668*
		64.00 LF										
		47.676 Labor hours										
		26.475 Equipment hours										
		33.05.19.045 (74) Buried Pipe, SLG - 12" Dia - 64 LF			*5,583*	*13,268*	*0*		*1,817*	*0*	*322.935/LF*	*20,668*
		64.00 LF										
		47.676 Labor hours										
		26.475 Equipment hours										
33.05.19.050		*(74) Buried Pipe, TS - 8" Dia - 55 LF*										
33 05 19.008		*Buried Pipe, Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	55.00	lf	288	7	-		20	-	5.703 /lf	314
	0062	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	83.00	bcy	595	-	-		361	-	11.511 /bcy	955
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	65.00	lcy	107	-	-		184	-	4.463 /lcy	290
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	57.00	ecy	129	-	-		288	-	7.316 /ecy	417
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	30.00	lcy	529	1,477	-		72	-	69.293 /lcy	2,079
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	27.00	ecy	227	-	-		22	-	9.22 /ecy	249
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	6	60	-		-	-	66.19 /clf	66
n	2060	Distribution piping,DIP,cement lined,fastite,20' lengths, 08"dia, Press Class 350, Excludes excavation, backfill, bedding	55.00	LF	860	2,627	-		411	-	70.856 /LF	3,897
n	4102	Distribution Piping,DIP,Flex-Ring Joint, 08"dia,additional per linear foot of restrained pipe	55.00	lf		931	-			-	16.935 /lf	931
n	4703	DIP,Polywrap 8 mil LDT 500ft,8"dia	1.00	roll	118	830	-		-	-	948.86 /roll	949

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
		33 05 19.008 Buried Pipe, Ductile Iron, 08" Dia			*2,858*	*5,933*			*1,356*		*184.500/LF*	*10,148*
		55.00 LF										
		24.454 Labor hours										
		11.591 Equipment hours										
		33.05.19.050 (74) Buried Pipe, TS - 8" Dia - 55 LF			*2,858*	*5,933*	*0*		*1,356*	*0*	*184.500/LF*	*10,148*
		55.00 LF										
		24.454 Labor hours										
		11.591 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**8,441**	**19,201**	**0**		**3,174**	**0**	**258.953/LF**	**30,815**
		119.00 LF										
		72.130 Labor hours										
		38.067 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.065 (74) Exposed Pipe - GTD - 12" Dia - Wall Pipe

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	10	0	-		1	-	5.43 /LF	11
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	23	11	-		-	-	33.94 /ea	34
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	1.00	ea	274	217	-		-	-	491.78 /ea	492
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	237	2,727	-		-	-	2,964.28 /ea	2,964
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*544*	*2,956*			*1*		*1,750.43 /LF*	*3,501*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
		40.05.19.065 (74) Exposed Pipe - GTD - 12" Dia - Wall Pipe			*544*	*2,956*	*0*		*1*	*0*	*1,750.43 /LF*	*3,501*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										

40.05.19.070 (74) Exposed Pipe - SLG - 12" Dia - Wall Pipe

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	10	0	-		1	-	5.425 /LF	11

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	23	11	-		-	-	33.94 /ea	34
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	1.00	ea	274	217	-		-	-	491.77 /ea	492
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	237	2,727	-		-	-	2,964.30 /ea	2,964
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*544*	*2,956*			*1*		*1,750.43 /LF*	*3,501*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
		40.05.19.070 (74) Exposed Pipe - SLG - 12" Dia - Wall Pipe			*544*	*2,956*	*0*		*1*	*0*	*1,750.43 /LF*	*3,501*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
40.05.19.075		*(74) Exposed Pipe - TS - 8" Dia - Wall Pipe*										
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	10	0	-		1	-	5.43 /LF	11
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	1.00	ea	21	9	-		-	-	29.14 /ea	29
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	1.00	ea	231	77	-		-	-	307.93 /ea	308
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	164	1,620	-		-	-	1,783.34 /ea	1,783
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			*425*	*1,706*			*1*		*1,065.635/LF*	*2,131*
		2.00 LF										
		3.273 Labor hours										
		0.032 Equipment hours										
		40.05.19.075 (74) Exposed Pipe - TS - 8" Dia - Wall Pipe			*425*	*1,706*	*0*		*1*	*0*	*1,065.635/LF*	*2,131*
		2.00 LF										
		3.273 Labor hours										
		0.032 Equipment hours										
40.05.19.080		*(74) Exposed Pipe - GTD - 12" Dia - 21 LF*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	21.00	LF	105	2	-		7	-	5.426 /LF	114
	7800	Paints & coatings, pipes, primer + 1 coat, brushwork, 10" to 12" diameter	23.10	lf	148	20	-		-	-	7.289 /lf	168

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	115	54	-		-	-	33.924 /ea	170
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	8.00	ea	2,196	1,739	-		-	-	491.785 /ea	3,934
n	0185	DIP,FLGxFLG,12"dia,1'-0" long,class 53,excl excav, backfill	1.00	ea	237	2,127	-		-	-	2,364.050 /ea	2,364
n	0205	DIP,FLGxFLG,12"dia,10'-0" long,class 53,excl excav, backfill	2.00	ea	813	11,457	-		-	-	6,134.765 /ea	12,270
n	1012	Fitting,DIP,FLG,90 degree bend,12"dia,c 110 water piping	2.00	ea	474	3,018	-		-	-	1,745.935 /ea	3,492
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*4,087*	*18,418*			*7*		*1,071.984/LF*	*22,512*
		21.00 LF										
		31.833 Labor hours 0.336 Equipment hours										
		40.05.19.080 (74) Exposed Pipe - GTD - 12" Dia - 21 LF			*4,087*	*18,418*	*0*		*7*	*0*	*1,071.984/LF*	*22,512*
		21.00 LF										
		31.833 Labor hours 0.336 Equipment hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**5,601**	**26,035**	**0**		**9**	**0**	**1,172.024/LF**	**31,645**
		27.00 LF										
		43.596 Labor hours 0.432 Equipment hours										

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 71 33.000		*Rotary Drum Sludge Thickening System*										
	9201	Spiral Scraper Style, Center Drive, Hybrid (SS/CS), for 100' diameter mechanism	1.00	EA	800	841,853	-			-	842,653.04 /EA	842,653
		46 71 33.000 Rotary Drum Sludge Thickening System			*800*	*841,853*					*842,653.04 /EA*	*842,653*
		1.00 EA										
		100.00 Labor hours 20.00 Equipment hours										
		46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA			*800*	*841,853*	*0*		*0*	*0*	*842,653.04 /EA*	*842,653*
		1.00 EA										
		100.00 Labor hours										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA			*800*	*841,853*	*0*		*0*	*0*	*842,653.04 /EA*	*842,653*
		1.00 EA										
		100.00 Labor hours										
		20.00 Equipment hours										
		DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**800**	**841,853**	**0**		**0**	**0**	**842,653.04 /EA**	**842,653**
		1.00 EA										
		100.00 Labor hours										
		20.00 Equipment hours										
		500 SLUDGE THICKENER			***535,203***	***1,283,607***	***0***		***112,037***	***0***	***1,930,847.44 /LS***	***1,930,847***
		1.00 LS										
		4,630.554 Labor hours										
		1,067.573 Equipment hours										

547 SLUDGE STORAGE

DIVISION 03 CONCRETE

03.11.13.145 (73) Sludge Storage - Buried Slab, Drainage Structure Base, 71 SF - 12" Thick

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	36.00	sfca	373	38	-		-	-	11.403 /sfca	411
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.30	ton	22	-	-		9	-	103.43 /ton	31
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.30	ton	24	-	-		10	-	112.50 /ton	34
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.30	ton	542	415	-		-	-	3,192.00 /ton	958
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	2.667	cy	96	-	-		11	-	39.865 /cy	106
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.267	cy	10	-	-		1	-	39.78 /cy	11
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.667	CY	-	715	-		-	-	267.968 /CY	715
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.267	cy	-	72	-		-	-	267.978 /cy	72

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	72.00	sf	46	-	-		-	-	0.642 /sf	46
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	3.55	lf	1	-	-			-	0.146 /lf	1
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	3.60	lf	12	1	-		-	-	3.553 /lf	13
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	0.72	csf	12	8	-		-	-	27.50 /csf	20
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	3.00	ecy	123	143	-		10	-	91.977 /ecy	276
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	3.00	lcy	50	-	-		55	-	35.173 /lcy	106
		03 11 13.763 12" Foundation Slab			*1,309*	*1,391*			*97*		*1,048.673/CY*	*2,797*
		2.667 CY										
		11.140 Labor hours										
		1.520 Equipment hours										
		03.11.13.145 (73) Sludge Storage - Buried Slab, Drainage Structure Base, 71 SF - 12" Thick			*1,309*	*1,391*	*0*		*97*	*0*	*1,048.673/CY*	*2,797*
		2.667 CY										
		11.140 Labor hours										
		1.520 Equipment hours										
03.11.13.150		*(73) Sludge Storage - Wall, Drainage Structure, 2' High - 24 LF - 24" Thick*										
03 11 13.815		*24" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	63	15	-		-	-	26.14 /lf	78
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	96.00	sfca	1,357	142	-		-	-	15.614 /sfca	1,499
n	5200	Chamfer strip, wood, 3/4" wide	5.00	lf	9	1	-		-	-	2.018 /lf	10
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	97	-		-	-	96.75 /c	97
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	27.00	lf	177	293	-		-	-	17.415 /lf	470
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.40	ton	554	863	-		-	-	3,544.33 /ton	1,418
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.40	ton	29	-	-		12	-	103.45 /ton	41
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.40	ton	31	-	-		14	-	112.43 /ton	45
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.147 /lf	0

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.815		*24" CIP Wall*										
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	10	1	-		-	-	3.553 /lf	11
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	96.00	sf	159	6	-		-	-	1.717 /sf	165
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	48.00	sf	95	3	-		-	-	2.049 /sf	98
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	4.00	cy	241	-	-		27	-	67.04 /cy	268
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	4.00	CY	-	1,102	-		-	-	275.408 /CY	1,102
		03 11 13.815 24" CIP Wall *4.00 CY* 23.205 Labor hours 0.940 Equipment hours			*2,728*	*2,522*			*53*		*1,325.638/CY*	*5,303*
		03.11.13.150 (73) Sludge Storage - Wall, Drainage Structure, 2' High - 24 LF - 24" Thick *4.00 CY* 23.205 Labor hours 0.940 Equipment hours			*2,728*	*2,522*	*0*		*53*	*0*	*1,325.638/CY*	*5,303*
03.11.13.155		*(73) Sludge Storage - Slab on Grade - 6,750 SF - 12" Thick*										
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	340.00	sfca	2,834	618	-		-	-	10.152 /sfca	3,452
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	350.00	sfca	1,738	234	-		-	-	5.636 /sfca	1,972
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	22.75	ton	1,647	-	-		706	-	103.444 /ton	2,353
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	22.75	ton	41,121	49,108	-		-	-	3,966.109 /ton	90,229
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	22.75	ton	4,705	-	-		2,019	-	295.552 /ton	6,724
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	260.00	cy	9,331	-	-		1,033	-	39.863 /cy	10,364
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	26.00	cy	933	-	-		103	-	39.862 /cy	1,036
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	260.00	CY	-	71,606	-		-	-	275.407 /CY	71,606

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	26.00	cy	-	7,161	-		-	-	275.408 /cy	7,161
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	7,000.00	sf	10,478	-	-		562	-	1.577 /sf	11,040
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	350.00	lf	313	16	-		31	-	1.028 /lf	360
n	0215	Control joint, clean out control joint of debris_SOG	350.00	lf	52	-	-			-	0.149 /lf	52
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	700.00	lf	2,320	167	-		-	-	3.553 /lf	2,487
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	70.00	csf	1,146	776	-		-	-	27.468 /csf	1,923
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	70.00	sq	1,796	849	-		-	-	37.793 /sq	2,645
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	298.00	ecy	6,659	14,196	-		548	-	71.824 /ecy	21,404
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	298.00	lcy	4,977	-	-		5,506	-	35.176 /lcy	10,483
		03 11 13.504 12" Slab on Grade			*90,053*	*144,731*			*10,508*		*943.428/CY*	*245,291*
		260.00 CY										
		762.978 Labor hours 177.275 Equipment hours										
		03.11.13.155 (73) Sludge Storage - Slab on Grade - 6,750 SF - 12" Thick			*90,053*	*144,731*	*0*		*10,508*	*0*	*943.428/CY*	*245,291*
		260.00 CY										
		762.978 Labor hours 177.275 Equipment hours										
03.11.13.160		*(73) Sludge Storage - Thickened Edge Footing, 1'6" Wide - 99 LF - 12" Thick*										
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	201.00	sfca	1,676	365	-		-	-	10.152 /sfca	2,041
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	7.425	sfca	37	5	-		-	-	5.638 /sfca	42
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.525	ton	38	-	-		16	-	103.429 /ton	54
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.525	ton	949	1,133	-		-	-	3,966.11 /ton	2,082
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	0.525	ton	109	-	-		47	-	295.540 /ton	155

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	6.00	cy	215	-	-		24	-	39.867 /cy	239
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	0.60	cy	22	-	-		2	-	39.833 /cy	24
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	6.00	CY	-	1,652	-		-	-	275.405 /CY	1,652
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.60	cy	-	165	-		-	-	275.43 /cy	165
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	148.50	sf	222	-	-		12	-	1.577 /sf	234
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	7.425	lf	7	0	-		1	-	1.026 /lf	8
n	0215	Control joint, clean out control joint of debris_SOG	7.425	lf	1	-	-			-	0.15 /lf	1
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	14.85	lf	49	4	-		-	-	3.552 /lf	53
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	1.485	csf	24	16	-		-	-	27.468 /csf	41
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	1.485	sq	38	18	-		-	-	37.811 /sq	56
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	6.00	ecy	134	286	-		11	-	71.827 /ecy	431
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	6.00	lcy	100	-	-		111	-	35.17 /lcy	211
		03 11 13.504 12" Slab on Grade			*3,621*	*3,645*			*224*		*1,248.255/CY*	*7,490*
		6.00 CY										
		31.189 Labor hours										
		3.736 Equipment hours										
		03.11.13.160 (73) Sludge Storage - Thickened Edge Footing, 1'6" Wide - 99 LF - 12" Thick			*3,621*	*3,645*	*0*		*224*	*0*	*1,248.255/CY*	*7,490*
		6.00 CY										
		31.189 Labor hours										
		3.736 Equipment hours										
03.11.13.165		*(73) Sludge Storage - Cont. Footing, 48" Wide - 242 LF - 12" Thick*										
03 11 13.153		*Cont. Footing 48" x 24"*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	492.00	sfca	5,098	513	-		-	-	11.403 /sfca	5,610

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.153		*Cont. Footing 48" x 24"*										
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	4.033	ton	292	-	-		125	-	103.444 /ton	417
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	4.033	ton	317	-	-		136	-	112.442 /ton	453
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	4.033	ton	7,290	5,584	-		-	-	3,191.989 /ton	12,873
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	35.852	cy	1,287	-	-		142	-	39.864 /cy	1,429
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	3.585	cy	129	-	-		14	-	39.863 /cy	143
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	35.852	CY	-	9,607	-		-	-	267.964 /CY	9,607
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.585	cy	-	961	-		-	-	267.964 /cy	961
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	968.00	sf	621	-	-		-	-	0.642 /sf	621
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	48.40	lf	7	-	-			-	0.149 /lf	7
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	48.40	lf	160	12	-		-	-	3.553 /lf	172
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	9.68	csf	159	107	-		-	-	27.468 /csf	266
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	36.00	ecy	1,475	1,715	-		121	-	91.98 /ecy	3,311
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	41.00	lcy	685	-	-		758	-	35.176 /lcy	1,442
		03 11 13.153 Cont. Footing 48" x 24"			*17,519*	*18,498*			*1,297*		*1,040.778/CY*	*37,314*

35.852 CY

148.862 Labor hours
20.338 Equipment hours

	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.165 (73) Sludge Storage - Cont. Footing, 48" Wide - 242 LF - 12" Thick	*17,519*	*18,498*	*0*	*1,297*	*0*	*1,040.778/CY*	*37,314*

35.852 CY

148.862 Labor hours
20.338 Equipment hours

03.11.13.170 (73) Sludge Storage - Wall, 10' High, 238 LF - 12" Thick

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	119.00	lf	2,508	602	-		-	-	26.139 /lf	3,111

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	4,760.00	sfca	67,308	7,015	-		-	-	15.614 /sfca	74,323
n	5200	Chamfer strip, wood, 3/4" wide	238.00	lf	430	50	-		-	-	2.017 /lf	480
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	4.00	c	-	387	-		-	-	96.765 /c	387
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	357.00	lf	2,337	3,880	-		-	-	17.415 /lf	6,217
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	8.90	ton	12,333	19,212	-		-	-	3,544.355 /ton	31,545
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	8.90	ton	644	-	-		276	-	103.445 /ton	921
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	8.90	ton	700	-	-		300	-	112.439 /ton	1,001
n	0210	Control joint, clean out control joint of debris_WALLS	119.00	lf	18	-	-		-	-	0.149 /lf	18
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	119.00	lf	395	28	-		-	-	3.553 /lf	423
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	4,760.00	sf	7,889	283	-		-	-	1.717 /sf	8,173
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,380.00	sf	4,734	142	-		-	-	2.048 /sf	4,875
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	89.00	cy	5,372	-	-		595	-	67.042 /cy	5,967
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	89.00	CY	-	24,511	-		-	-	275.407 /CY	24,511
		03 11 13.804 12" CIP Wall			*104,669*	*56,110*			*1,171*		*1,819.675/CY*	*161,951*
		89.00 CY										
		896.938 Labor hours										
		20.904 Equipment hours										
		03.11.13.170 (73) Sludge Storage - Wall, 10' High, 238 LF - 12" Thick			*104,669*	*56,110*	*0*		*1,171*	*0*	*1,819.675/CY*	*161,951*
		89.00 CY										
		896.938 Labor hours										
		20.904 Equipment hours										

03.11.13.175 *(73) Sludge Storage - Entrance Curb, 6" High, 98 LF - 6" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.006		*06" High CIP Curb*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	98.00	sfca	817	178	-		-	-	10.152 /sfca	995
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.088	ton	6	-	-		3	-	103.409 /ton	9

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.006		*06" High CIP Curb*										
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.088	ton	159	190	-		-	-	3,966.10 /ton	349
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	0.088	ton	18	-	-		8	-	295.50 /ton	26
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	1.00	cy	36	-	-		4	-	39.87 /cy	40
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	0.10	cy	4	-	-		0	-	39.80 /cy	4
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	1.00	CY	-	275	-		-	-	275.410 /CY	275
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.10	cy	-	28	-		-	-	275.30 /cy	28
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	49.00	sf	73	-	-		4	-	1.577 /sf	77
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	2.45	lf	2	0	-		0	-	1.033 /lf	3
n	0215	Control joint, clean out control joint of debris_SOG	2.45	lf	0	-	-			-	0.143 /lf	0
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	2.45	lf	8	1	-		-	-	3.551 /lf	9
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	0.49	csf	8	5	-		-	-	27.510 /csf	13
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	0.49	sq	13	6	-		-	-	37.76 /sq	19
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	2.00	ecy	45	95	-		4	-	71.815 /ecy	144
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	2.00	lcy	33	-	-		37	-	35.18 /lcy	70
		03 11 16.006 06" High CIP Curb			*1,223*	*778*			*60*		*2,060.69 /CY*	*2,061*
		1.00 CY										
		10.706 Labor hours										
		1.073 Equipment hours										
		03.11.13.175 (73) Sludge Storage - Entrance Curb, 6" High, 98 LF - 6" Thick			*1,223*	*778*	*0*		*60*	*0*	*2,060.69 /CY*	*2,061*
		1.00 CY										
		10.706 Labor hours										
		1.073 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 03 CONCRETE			**221,122**	**227,675**	**0**		**13,409**	**0**	**1,159.809/CY**	**462,206**
		398.519 CY										
		1,885.019 Labor hours 225.786 Equipment hours										
DIVISION 13		**SPECIAL CONSTRUCTION**										
13.34.19.005		*(73) Pre-Engineered Metal Building, Sludge Storage*										
13 34 19.000		*Metal Building Systems*										
	5450	(73) Pre-Engineered Metal Building, Sludge Storage	7,000.00	SF	284,644	851,957	-		109,799	-	178.057 /SF	1,246,401
		13 34 19.000 Metal Building Systems			*284,644*	*851,957*			*109,799*		*178.057/SF*	*1,246,401*
		7,000.00 SF										
		1,960.000 Labor hours 280.00 Equipment hours										
		13.34.19.005 (73) Pre-Engineered Metal Building, Sludge Storage			*284,644*	*851,957*	*0*		*109,799*	*0*	*178.057/SF*	*1,246,401*
		7,000.00 SF										
		1,960.000 Labor hours 280.00 Equipment hours										
		DIVISION 13 SPECIAL CONSTRUCTION			**284,644**	**851,957**	**0**		**109,799**	**0**	**178.057/SF**	**1,246,401**
		7,000.00 SF										
		1,960.000 Labor hours 280.00 Equipment hours										
DIVISION 31		**EARTHWORK**										
31.23.10.035		*(73) Sludge Storage, Excavation, Backfill and Haul Off-Site*										
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	668.00	CY	538	-	-		1,015	-	2.326 /CY	1,554
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	100.00	CY	123	-	-		212	-	3.348 /CY	335
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	708.00	CY	17,177	-	-		17,578	-	49.089 /CY	34,755

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	100.00	CY	98	-	-		152	-	2.502 /CY	250
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*17,937*				*18,957*		*23.410/CY*	*36,894*
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		31.23.10.035 (73) Sludge Storage, Excavation, Backfill and Haul Off-Site			*17,937*	*0*	*0*		*18,957*	*0*	*23.410/CY*	*36,894*
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		DIVISION 31 EARTHWORK			**17,937**	**0**	**0**		**18,957**	**0**	**23.410/CY**	**36,894**
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		547 SLUDGE STORAGE			***523,703***	***1,079,632***	***0***		***142,165***	***0***	***1,745,500.37 /LS***	***1,745,500***
		1.00 LS										
		3,996.504 Labor hours										
		654.444 Equipment hours										

700 DEWATERING BUILDING

DIVISION 03 CONCRETE

03.11.13.125 (72) Dewatering Building - Slab on Grade - 5,198 SF -12" Thick

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	304.00	sfca	2,534	552	-		-	-	10.152 /sfca	3,086
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	16.538	ton	1,197	-	-		514	-	103.443 /ton	1,711
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	16.538	ton	29,893	35,699	-		-	-	3,966.108 /ton	65,591
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	16.538	ton	3,421	-	-		1,467	-	295.552 /ton	4,888
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	189.00	cy	6,783	-	-		751	-	39.863 /cy	7,534

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	18.90	cy	678	-	-		75	-	39.863 /cy	753
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	189.00	CY	-	52,052	-		-	-	275.407 /CY	52,052
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	18.90	cy	-	5,205	-		-	-	275.408 /cy	5,205
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	5,198.00	sf	7,781	-	-		417	-	1.577 /sf	8,198
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	259.900	lf	233	12	-		23	-	1.028 /lf	267
n	0215	Control joint, clean out control joint of debris_SOG	259.900	lf	39	-	-			-	0.149 /lf	39
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	259.900	lf	862	62	-		-	-	3.553 /lf	923
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	51.98	csf	851	577	-		-	-	27.468 /csf	1,428
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	51.98	sq	1,334	631	-		-	-	37.793 /sq	1,964
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	217.00	ecy	4,849	10,337	-		399	-	71.824 /ecy	15,586
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	221.00	lcy	3,691	-	-		4,083	-	35.177 /lcy	7,774
		03 11 13.504 12" Slab on Grade			*64,145*	*105,126*			*7,729*		*936.511/CY*	*177,001*
		189.00 CY 543.027 Labor hours 130.709 Equipment hours										
		03.11.13.125 (72) Dewatering Building - Slab on Grade - 5,198 SF -12" Thick			*64,145*	*105,126*	*0*		*7,729*	*0*	*936.511/CY*	*177,001*
		189.00 CY 543.027 Labor hours 130.709 Equipment hours										
03.11.13.130		*(72) Dewatering Building - Cont. Footing - 300 LF - 3'-0' Wide x 12" Thick*										
03 11 13.152		*Cont. Footing 36" x 12"*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	606.00	sfca	6,279	632	-		-	-	11.403 /sfca	6,910
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	3.75	ton	271	-	-		116	-	103.443 /ton	388
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	3.75	ton	295	-	-		127	-	112.443 /ton	422

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.152		*Cont. Footing 36" x 12"*										
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.75	ton	6,778	5,192	-		-	-	3,191.992 /ton	11,970
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	33.333	cy	1,196	-	-		132	-	39.863 /cy	1,329
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	3.333	cy	120	-	-		13	-	39.862 /cy	133
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	33.333	CY	-	8,932	-		-	-	267.963 /CY	8,932
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.333	cy	-	893	-		-	-	267.963 /cy	893
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	900.00	sf	578	-	-		-	-	0.642 /sf	578
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	45.00	lf	7	-	-			-	0.149 /lf	7
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	45.00	lf	149	11	-		-	-	3.553 /lf	160
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	9.00	csf	147	100	-		-	-	27.468 /csf	247
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	33.00	ecy	1,352	1,572	-		111	-	91.980 /ecy	3,035
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	38.00	lcy	635	-	-		702	-	35.177 /lcy	1,337
		03 11 13.152 Cont. Footing 36" x 12"			*17,807*	*17,331*			*1,202*		*1,090.212/CY*	*36,340*
		33.333 CY										
		151.786 Labor hours										
		18.842 Equipment hours										
		03.11.13.130 (72) Dewatering Building - Cont. Footing - 300 LF - 3'-0' Wide x 12" Thick			*17,807*	*17,331*	*0*		*1,202*	*0*	*1,090.212/CY*	*36,340*
		33.333 CY										
		151.786 Labor hours										
		18.842 Equipment hours										
03.11.13.135		*(72) Dewatering Building - Cont. Footing - 137 LF - 1'-8" Wide x 8" Thick*										
03 11 13.15		*Cont. Footing 20" x 8"*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	185.818	sfca	1,925	194	-		-	-	11.403 /sfca	2,119
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.639	ton	46	-	-		20	-	103.44 /ton	66
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.639	ton	50	-	-		22	-	112.43 /ton	72

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.15		*Cont. Footing 20" x 8"*										
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.639	ton	1,155	885	-		-	-	3,192.003 /ton	2,040
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.677	cy	204	-	-		23	-	39.864 /cy	226
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.568	cy	20	-	-		2	-	39.86 /cy	23
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.677	CY	-	1,521	-		-	-	267.962 /CY	1,521
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.568	cy	-	152	-		-	-	267.993 /cy	152
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	228.79	sf	147	-	-		-	-	0.642 /sf	147
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	11.44	lf	2	-	-			-	0.151 /lf	2
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	11.44	lf	38	3	-		-	-	3.551 /lf	41
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	2.288	csf	37	25	-		-	-	27.474 /csf	63
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	8.00	ecy	328	381	-		27	-	91.978 /ecy	736
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	9.00	lcy	150	-	-		166	-	35.177 /lcy	317
		03 11 13.15 Cont. Footing 20" x 8"			*4,103*	*3,161*			*260*		*1,325.237/CY*	*7,523*
		5.677 CY										
		35.433 Labor hours										
		4.117 Equipment hours										
		03.11.13.135 (72) Dewatering Building - Cont. Footing - 137 LF - 1'-8" Wide x 8" Thick			*4,103*	*3,161*	*0*		*260*	*0*	*1,325.237/CY*	*7,523*
		5.677 CY										
		35.433 Labor hours										
		4.117 Equipment hours										
03.11.13.140		*(72) Dewatering Building - CIP Curb, 1'-6" High - 169 LF - 8" Wide*										
03 11 16.100		*CIP Curb, Other*										
n	3060	C.I.P. concrete forms, slab on grade, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	509.01	sfca	5,274	1,099	-		-	-	12.519 /sfca	6,372
n	5200	Chamfer strip, wood, 3/4" wide	339.34	lf	614	71	-		-	-	2.017 /lf	684
n	0600	Reinforcing Steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.613	ton	1,108	1,323	-		-	-	3,966.12 /ton	2,431
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.613	ton	44	-	-		19	-	103.458 /ton	63

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.100		*CIP Curb, Other*										
n	2220	Reinforcing steel, crane cost for handling, average, add_SLAB ON GRADE	0.613	ton	48	-	-		21	-	112.41 /ton	69
n	0200	Concrete finishng,floors,basic finishng for unspecfd flatwork,bull float,manual float&manual steel trowel,excludes placing,striking off&consolidating	113.23	sf	230	-	-		-	-	2.03 /sf	230
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	1.132	csf	19	23	-		-	-	36.57 /csf	41
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	7.00	cy	251	-	-		28	-	39.861 /cy	279
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	7.00	CY	-	1,928	-		-	-	275.406 /CY	1,928
		03 11 16.100 CIP Curb, Other			*7,588*	*4,443*			*68*		*1,728.35 /CY*	*12,098*
		7.00 CY 65.715 Labor hours 1.010 Equipment hours										
		03.11.13.140 (72) Dewatering Building - CIP Curb, 1'-6" High - 169 LF - 8" Wide			*7,588*	*4,443*	*0*		*68*	*0*	*1,728.35 /CY*	*12,098*
		7.00 CY 65.715 Labor hours 1.010 Equipment hours										
03.41.33.005		*(72) Dewatering Building - Precast Double Tee Roof, 10DT32, 5,200 SF*										
03 41 33.060		*Precast Concrete - Tees - 10' Wide x 32" Deep*										
	0200	Precast tees, double, floor, 52' span, prestressed	5,200.00	SF	5,765	89,798	-		2,225	-	18.805 /SF	97,787
		03 41 33.060 Precast Concrete - Tees - 10' Wide x 32" Deep			*5,765*	*89,798*			*2,225*		*18.805/SF*	*97,787*
		5,200.00 SF 44.571 Labor hours 4.952 Equipment hours										
		03.41.33.005 (72) Dewatering Building - Precast Double Tee Roof, 10DT32, 5,200 SF			*5,765*	*89,798*	*0*		*2,225*	*0*	*18.805/SF*	*97,787*
		5,200.00 SF 44.571 Labor hours 4.952 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 03 CONCRETE			**99,407**	**219,859**	**0**		**11,483**	**0**	**1,407.387/CY**	**330,750**
		235.01 CY										
		840.532 Labor hours										
		159.631 Equipment hours										

DIVISION 04 MASONRY

04.22.00.010 (72) CMU Block 12" Wall - 24' High x 178 LF

04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	43.00	csf	17,199	-	-		-	-	399.981 /csf	17,199
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	43.00	csf	-	6,205	-		-	-	144.311 /csf	6,205
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.474 /ea	262
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	178.00	lf	660	492	-		60	-	6.809 /lf	1,212
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	4,272.00	sf	25,749	16,638	-		2,327	-	10.467 /sf	44,714
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	588.183	lb	770	747	-		-	-	2.579 /lb	1,517
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	5,293.649	lb	8,533	6,719	-		-	-	2.881 /lb	15,252
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	178.00	lf	2,000	1,888	-		-	-	21.841 /lf	3,888
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	4,272.00	SF	90,659	47,909	-		-	-	32.436 /SF	138,568
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	4,272.00	sf	-	6,462	-		-	-	1.513 /sf	6,462
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	4,272.00	sf	5,696	17,529	-		-	-	5.437 /sf	23,225
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*151,267*	*104,851*			*2,386*		*60.511/SF*	*258,504*
		4,272.00 SF										
		1,238.051 Labor hours										
		54.769 Equipment hours										

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		04.22.00.010 (72) CMU Block 12" Wall - 24' High x 178 LF			*151,267*	*104,851*	*0*		*2,386*	*0*	*60.511/SF*	*258,504*
		4,272.00 SF										
		1,238.051 Labor hours										
		54.769 Equipment hours										
04.22.00.015		*(72) CMU Block 12" Wall - 12' High x 96 LF*										
04 22 00.212		*Concrete Masonry Unit (12" CMU) - Exterior*										
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	12.00	csf	4,800	-	-		-	-	399.983 /csf	4,800
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	12.00	csf	-	1,732	-		-	-	144.309 /csf	1,732
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.475 /ea	262
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	96.00	lf	356	265	-		32	-	6.809 /lf	654
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	1,152.00	sf	6,944	4,487	-		627	-	10.467 /sf	12,058
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	317.222	lb	416	403	-		-	-	2.579 /lb	818
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	1,427.501	lb	2,301	1,812	-		-	-	2.881 /lb	4,113
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	96.00	lf	1,079	1,018	-		-	-	21.841 /lf	2,097
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	1,152.00	SF	24,447	12,919	-		-	-	32.436 /SF	37,367
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	1,152.00	sf	-	1,743	-		-	-	1.513 /sf	1,743
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	1,152.00	sf	1,536	4,727	-		-	-	5.437 /sf	6,263
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*41,878*	*29,367*			*660*		*62.417/SF*	*71,905*
		1,152.00 SF										
		342.651 Labor hours										
		15.138 Equipment hours										
		04.22.00.015 (72) CMU Block 12" Wall - 12' High x 96 LF			*41,878*	*29,367*	*0*		*660*	*0*	*62.417/SF*	*71,905*
		1,152.00 SF										
		342.651 Labor hours										
		15.138 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04.22.00.020		*(72) CMU Block 12" Wall - 18' High x 24 LF*										
04 22 00.212		*Concrete Masonry Unit (12" CMU) - Exterior*										
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	4.00	csf	1,600	-	-		-	-	399.988 /csf	1,600
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	4.00	csf	-	577	-		-	-	144.308 /csf	577
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.473 /ea	262
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	24.00	lf	89	66	-		8	-	6.809 /lf	163
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	432.00	sf	2,604	1,683	-		235	-	10.467 /sf	4,522
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	79.306	lb	104	101	-		-	-	2.579 /lb	205
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	535.313	lb	863	679	-		-	-	2.881 /lb	1,542
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	24.00	lf	270	255	-		-	-	21.841 /lf	524
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	432.00	SF	9,168	4,845	-		-	-	32.436 /SF	14,012
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	432.00	sf	-	653	-		-	-	1.513 /sf	653
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	432.00	sf	576	1,773	-		-	-	5.437 /sf	2,349
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*15,273*	*10,894*			*243*		*61.134/SF*	*26,410*
		432.00 SF 125.099 Labor hours 5.585 Equipment hours										
		04.22.00.020 (72) CMU Block 12" Wall - 18' High x 24 LF			*15,273*	*10,894*	*0*		*243*	*0*	*61.134/SF*	*26,410*
		432.00 SF 125.099 Labor hours 5.585 Equipment hours										
04.22.00.025		*(72) CMU Block 8" Wall - 20' High x 124 LF*										
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	25.00	csf	10,000	-	-		-	-	399.981 /csf	10,000

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	04 22 00.080	*Concrete Masonry Unit (08" CMU) - Interior*										
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	25.00	csf	-	3,608	-		-	-	144.311 /csf	3,608
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.472 /ea	262
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	124.00	lf	342	265	-		31	-	5.143 /lf	638
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	2,480.00	sf	14,069	5,907	-		1,271	-	8.567 /sf	21,247
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	409.746	lb	537	520	-		-	-	2.579 /lb	1,057
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	3,073.092	lb	4,954	3,901	-		-	-	2.881 /lb	8,854
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	124.00	lf	1,068	1,018	-		-	-	16.822 /lf	2,086
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	2,480.00	SF	33,533	19,749	-		-	-	21.485 /SF	53,282
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	248.00	sf	3,353	1,975	-		-	-	21.485 /sf	5,328
		04 22 00.080 Concrete Masonry Unit (08" CMU) - Interior			*67,855*	*37,204*			*1,302*		*42.888/SF*	*106,361*
		2,480.00 SF										
		548.350 Labor hours										
		29.885 Equipment hours										
		04.22.00.025 (72) CMU Block 8" Wall - 20' High x 124 LF			*67,855*	*37,204*	*0*		*1,302*	*0*	*42.888/SF*	*106,361*
		2,480.00 SF										
		548.350 Labor hours										
		29.885 Equipment hours										
	04.22.00.030	*(72) CMU Block 8" Wall - 13' High x 22 LF*										
	04 22 00.080	*Concrete Masonry Unit (08" CMU) - Interior*										
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	3.00	csf	1,200	-	-		-	-	399.98 /csf	1,200
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	3.00	csf	-	433	-		-	-	144.31 /csf	433
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	262	-		-	-	17.474 /ea	262
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	22.00	lf	61	47	-		5	-	5.143 /lf	113
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	286.00	sf	1,622	681	-		147	-	8.567 /sf	2,450

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	72.697	lb	95	92	-		-	-	2.579 /lb	187
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	354.397	lb	571	450	-		-	-	2.881 /lb	1,021
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	22.00	lf	190	181	-		-	-	16.824 /lf	370
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	286.00	SF	3,867	2,277	-		-	-	21.485 /SF	6,145
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	29.00	sf	392	231	-		-	-	21.484 /sf	623
		04 22 00.080 Concrete Masonry Unit (08" CMU) - Interior			*7,998*	*4,654*			*152*		*44.772/SF*	*12,805*
		286.00 SF										
		64.608 Labor hours										
		3.490 Equipment hours										
		04.22.00.030 (72) CMU Block 8" Wall - 13' High x 22 LF			*7,998*	*4,654*	*0*		*152*	*0*	*44.772/SF*	*12,805*
		286.00 SF										
		64.608 Labor hours										
		3.490 Equipment hours										
		DIVISION 04 MASONRY			**284,271**	**186,970**	**0**		**4,743**	**0**	**55.206/SF**	**475,985**
		8,622.00 SF										
		2,318.759 Labor hours										
		108.868 Equipment hours										
DIVISION 07		**THERMAL, MOISTURE PROTECTION**										
07.53.25.005		*(72) Dewatering Building - Membrane Roofing System - EPDM - 4,994 SF*										
07 53 25.000		*Adhered Elastomeric (EPDM) Sheet Roofing*										
n	0100	Elastomeric sheet waterproofing, EPDM, plain, 60 mils thick	5,200.00	SF	17,338	8,227	-		-	-	4.917 /SF	25,566
	0800	Aluminum coping, stock units, for 12" wall, excludes scaffolding	350.00	lf	8,356	1,406	-		-	-	27.891 /lf	9,762
	2780	2" x 8" miscellaneous wood blocking, to steel construction, per M.B.F.	3.146	mbf	15,979	5,880	-		-	-	6,948.22 /mbf	21,859
	2780	2" x 8" miscellaneous wood blocking, to steel construction, per M.B.F.	3.15	mbf	15,999	5,888	-		-	-	6,948.22 /mbf	21,887
	0200	Underlayment, plywood, underlayment grade, 5/8" thick	5,200.00	SF	7,923	25,406	-		-	-	6.409 /SF	33,329

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
07 53 25.000		*Adhered Elastomeric (EPDM) Sheet Roofing*										
	1725	Polyisocyanurate insulation, for roof decks, 2" thick, 2#/CF density, fastening excluded	5,200.00	sf	3,456	6,781	-		-	-	1.969 /sf	10,236
	1745	Polyisocyanurate insulation, for roof decks, 3" thick, 2#/CF density, fastening excluded	5,200.00	sf	3,801	10,126	-		-	-	2.678 /sf	13,927
	0825	Asphalt shingles, #30 felt underlayment	52.00	sq	852	787	-		-	-	31.511 /sq	1,639
	0800	Aluminum roof panels, corrugated, on steel frame, painted, .024" thick	5,200.00	sf	18,518	20,433	-		-	-	7.491 /sf	38,951
	0100	Sheet metal flashing, aluminum, flexible, mill finish, .032" thick, including up to 4 bends	1,340.00	sf	8,782	9,879	-		-	-	13.926 /sf	18,660
		07 53 25.000 Adhered Elastomeric (EPDM) Sheet Roofing			*101,004*	*94,812*					*18.828/SF*	*195,816*
		10,400.00 SF										
		796.102 Labor hours										
		07.53.25.005 (72) Dewatering Building - Membrane Roofing System - EPDM - 4,994 SF			*101,004*	*94,812*	*0*		*0*	*0*	*18.828/SF*	*195,816*
		10,400.00 SF										
		796.102 Labor hours										
		DIVISION 07 THERMAL, MOISTURE PROTECTION			**101,004**	**94,812**	**0**		**0**	**0**	**36.035/SF**	**195,816**
		5,434.00 SF										
		796.102 Labor hours										

DIVISION 08 OPENINGS

08.11.00.005 (72) Dewatering Building - Interior Door - Steel 3'x7' - 3 EA

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
08 11 00.061		*Metal Doors & Frames (6070)*										
	1000	Frames, steel, knock down, hollow metal, single, 16 ga., up to 4-7/8" deep, 3'-0" x 7'-0"	3.00	EA	400	1,017	-		-	-	472.373 /EA	1,417
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	3.00	ea	376	3,469	-		-	-	1,281.71 /ea	3,845
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	3.00	ea	800	3,130	-		-	-	1,309.863 /ea	3,930
	0011	Thresholds, aluminum, 3' long door saddles	9.00	lf	200	189	-		-	-	43.174 /lf	389
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	4.50	pr	-	473	-		-	-	105.187 /pr	473
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	3.00	ea	161	12	-		-	-	57.713 /ea	173
		08 11 00.061 Metal Doors & Frames (6070)			*1,938*	*8,289*					*3,408.963/EA*	*10,227*
		3.00 EA										
		14.735 Labor hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	08.11.00.005 (72) Dewatering Building - Interior Door - Steel 3'x7' - 3 EA			*1,938*	*8,289*	*0*		*0*	*0*	*3,408.963/EA*	*10,227*
	3.00 EA										
	14.735 Labor hours										
08.11.00.010	*(72) Dewatering Building - Interior Door - Steel 6'x7' - 2 EA*										
08 11 00.061	*Metal Doors & Frames (6070)*										
3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	2.00	EA	356	817	-		-	-	586.37 /EA	1,173
1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	4.00	ea	502	4,625	-		-	-	1,281.71 /ea	5,127
3000	Door hardware, panic device, narrow stile, mortise bar, exit only	4.00	ea	1,067	4,173	-		-	-	1,309.870 /ea	5,239
0011	Thresholds, aluminum, 3' long door saddles	12.00	lf	267	251	-		-	-	43.172 /lf	518
1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	6.00	pr	-	631	-		-	-	105.19 /pr	631
1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	4.00	ea	215	16	-		-	-	57.713 /ea	231
	08 11 00.061 Metal Doors & Frames (6070)			*2,406*	*10,513*					*6,459.555/EA*	*12,919*
	2.00 EA										
	18.314 Labor hours										
	08.11.00.010 (72) Dewatering Building - Interior Door - Steel 6'x7' - 2 EA			*2,406*	*10,513*	*0*		*0*	*0*	*6,459.555/EA*	*12,919*
	2.00 EA										
	18.314 Labor hours										
08.11.19.005	*(72) Dewatering Building - Doors - Steel 3'x7'*										
08 11 00.061	*Metal Doors & Frames (6070)*										
1000	Frames, steel, knock down, hollow metal, single, 16 ga., up to 4-7/8" deep, 3'-0" x 7'-0"	6.00	EA	800	2,034	-		-	-	472.373 /EA	2,834
1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	6.00	ea	753	6,937	-		-	-	1,281.712 /ea	7,690
3000	Door hardware, panic device, narrow stile, mortise bar, exit only	6.00	ea	1,600	6,259	-		-	-	1,309.868 /ea	7,859
0011	Thresholds, aluminum, 3' long door saddles	18.00	lf	400	377	-		-	-	43.172 /lf	777
1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	9.00	pr	-	947	-		-	-	105.191 /pr	947
1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	6.00	ea	322	24	-		-	-	57.72 /ea	346
	08 11 00.061 Metal Doors & Frames (6070)			*3,875*	*16,579*					*3,408.975/EA*	*20,454*
	6.00 EA										
	29.471 Labor hours										

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		08 11 00.061 Metal Doors & Frames (6070)			*3,875*	*16,579*					*3,408.975/EA*	*20,454*
		6.00 EA										
		29.471 Labor hours										
		08.11.19.005 (72) Dewatering Building - Doors - Steel 3'x7'			*3,875*	*16,579*	*0*		*0*	*0*	*3,408.975/EA*	*20,454*
		6.00 EA										
		29.471 Labor hours										
08.11.19.010		*(72) Dewatering Building - Doors - Steel 6'x7'*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	1.00	EA	178	409	-		-	-	586.36 /EA	586
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	2.00	ea	251	2,312	-		-	-	1,281.705 /ea	2,563
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	2.00	ea	533	2,086	-		-	-	1,309.865 /ea	2,620
	0011	Thresholds, aluminum, 3' long door saddles	6.00	lf	133	126	-		-	-	43.173 /lf	259
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	3.00	pr	-	316	-		-	-	105.19 /pr	316
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	2.00	ea	107	8	-		-	-	57.71 /ea	115
		08 11 00.061 Metal Doors & Frames (6070)			*1,203*	*5,257*					*6,459.53 /EA*	*6,460*
		1.00 EA										
		9.157 Labor hours										
		08.11.19.010 (72) Dewatering Building - Doors - Steel 6'x7'			*1,203*	*5,257*	*0*		*0*	*0*	*6,459.53 /EA*	*6,460*
		1.00 EA										
		9.157 Labor hours										
08.36.15.005		*(72) Dewatering Building - Overhead Door - Steel 12' Wide x 12' High*										
08 36 15.000		*Overhead Door - Sectional Steel*										
	0300	Doors, rolling service, steel, manual, 20 gauge, 12' x 12' high, incl. hardware	1.00	EA	1,947	3,477	-		-	-	5,424.77 /EA	5,425
	3300	Doors, rolling service, steel, manual, for enamel finish, add	144.00	sf	-	551	-		-	-	3.825 /sf	551
	3700	Doors, rolling service, steel, manual, for safety edge bottom bar, electric, add	12.00	lf	-	939	-		-	-	78.242 /lf	939
	4000	Doors, rolling service, steel, manual, for weatherstripping, extruded rubber, jambs, add	36.00	lf	-	983	-		-	-	27.297 /lf	983
	4500	Doors, rolling service, steel, manual, motor operators for, to 14' x 14' opening	1.00	ea	467	2,086	-		-	-	2,553.81 /ea	2,554
	4700	Doors, rolling service, steel, manual, for fire door, additional fusible link, add	1.00	ea	-	54	-		-	-	53.90 /ea	54

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		08 36 15.000 Overhead Door - Sectional Steel			*2,415*	*8,090*					*10,504.89 /EA*	*10,505*
		1.00 EA										
		16.533 Labor hours										
		08.36.15.005 (72) Dewatering Building - Overhead Door - Steel 12' Wide x 12' High			*2,415*	*8,090*	*0*		*0*	*0*	*10,504.89 /EA*	*10,505*
		1.00 EA										
		16.533 Labor hours										
08.36.15.010		*(72) Dewatering Building - Overhead Door - Steel 14' Wide x 12' High*										
08 36 15.000		*Overhead Door - Sectional Steel*										
	0500	Doors, rolling service, steel, manual, 20 gauge, 14' x 14' high, incl. hardware	6.00	EA	17,526	33,644	-		-	-	8,528.315 /EA	51,170
	3300	Doors, rolling service, steel, manual, for enamel finish, add	1,008.00	sf	-	3,856	-		-	-	3.825 /sf	3,856
	3700	Doors, rolling service, steel, manual, for safety edge bottom bar, electric, add	72.00	lf	-	5,633	-		-	-	78.241 /lf	5,633
	4000	Doors, rolling service, steel, manual, for weatherstripping, extruded rubber, jambs, add	240.00	lf	-	6,551	-		-	-	27.297 /lf	6,551
	4500	Doors, rolling service, steel, manual, motor operators for, to 14' x 14' opening	6.00	ea	2,804	12,519	-		-	-	2,553.793 /ea	15,323
	4700	Doors, rolling service, steel, manual, for fire door, additional fusible link, add	36.00	ea	-	1,940	-		-	-	53.899 /ea	1,940
		08 36 15.000 Overhead Door - Sectional Steel			*20,330*	*64,143*					*14,078.908/EA*	*84,473*
		6.00 EA										
		139.200 Labor hours										
		08.36.15.010 (72) Dewatering Building - Overhead Door - Steel 14' Wide x 12' High			*20,330*	*64,143*	*0*		*0*	*0*	*14,078.908/EA*	*84,473*
		6.00 EA										
		139.200 Labor hours										
08.51.13.005		*(72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA*										
08 51 13.000		*Aluminum Windows*										
	2000	Windows, aluminum, commercial grade, stock units, awning, with screen, 4'-5" x 5'-3" opening, incl. frame and glazing	2.00	EA	584	1,426	-		-	-	1,004.97 /EA	2,010
		08 51 13.000 Aluminum Windows			*584*	*1,426*					*41.874/SF*	*2,010*
		48.00 SF										
		4.00 Labor hours										
		08.51.13.005 (72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA			*584*	*1,426*	*0*		*0*	*0*	*1,004.97 /EA*	*2,010*
		2.00 EA										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		08.51.13.005 (72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA			*584*	*1,426*	*0*		*0*	*0*	*1,004.97 /EA*	*2,010*
		2.00 EA										
		4.00 Labor hours										
		DIVISION 08 OPENINGS			**32,751**	**114,297**	**0**		**0**	**0**	**7,002.270/EA**	**147,048**
		21.00 EA										
		231.410 Labor hours										
DIVISION 22		**PLUMBING**										
22.20.00.005		*(74) Plumbing Allowance*										
22 05 03.300		*Plumbing, Other*										
	0100	Plumbing; includes fixtures, rough-in, drains and vents to 5' outside building - Conceptual Only based on building SF	5,200.00	SF	-	-	116,118		-	-	22.330 /SF	116,118
		22 05 03.300 Plumbing, Other					*116,118*				*116,117.67 /LS*	*116,118*
		1.00 LS										
		22.20.00.005 (74) Plumbing Allowance			*0*	*0*	*116,118*		*0*	*0*	*22.330/SF*	*116,118*
		5,200.00 SF										
		DIVISION 22 PLUMBING			**0**	**0**	**116,118**		**0**	**0**	**22.330/SF**	**116,118**
		5,200.00 SF										
DIVISION 23		**HEATING, VENTILATING & AIR-CONDITIONING (HVAC)**										
23.00.00.005		*(74) HVAC Allowance*										
23 00 00.000		*HVAC Basic Materials and Methods*										
n	0900	Project Allowance_HVAC Allowance	5,200.00	SF			309,647				59.548 /SF	309,647
		23 00 00.000 HVAC Basic Materials and Methods					*309,647*				*59.548/SF*	*309,647*
		5,200.00 SF										
		23.00.00.005 (74) HVAC Allowance			*0*	*0*	*309,647*		*0*	*0*	*59.548/SF*	*309,647*
		5,200.00 SF										

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Detail Report with Contractor Markups

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	DIVISION 23 HEATING, VENTILATING & AIR-CONDITIONING (HVAC)			**0**	**0**	**309,647**		**0**	**0**	**59.548/SF**	**309,647**
	5,200.00 SF										
DIVISION 31	**EARTHWORK**										
31.23.10.040	*(72) Dewatering Building, Excavation, Backfill and Haul Off-Site*										
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	496.00	CY	400	-	-		754	-	2.326 /CY	1,154
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	74.00	CY	91	-	-		157	-	3.347 /CY	248
n 0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	526.00	CY	12,761	-	-		13,059	-	49.089 /CY	25,821
0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	74.00	CY	73	-	-		112	-	2.502 /CY	185
	31 23 10.000 Excavation, Backfill, and Haul Off-Site			*13,325*				*14,082*		*23.425/CY*	*27,407*
	1,170.00 CY										
	112.537 Labor hours										
	110.440 Equipment hours										
	31.23.10.040 (72) Dewatering Building, Excavation, Backfill and Haul Off-Site			*13,325*	*0*	*0*		*14,082*	*0*	*23.425/CY*	*27,407*
	1,170.00 CY										
	112.537 Labor hours										
	110.440 Equipment hours										
	DIVISION 31 EARTHWORK			**13,325**	**0**	**0**		**14,082**	**0**	**23.425/CY**	**27,407**
	1,170.00 CY										
	112.537 Labor hours										
	110.440 Equipment hours										
DIVISION 40	**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
40.05.19.055	*(72) Exposed Pipe - TS - 6" Dia - 260 LF*										
40 05 19.006	*Pipe and Fittings - Ductile Iron, 06" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	260.00	LF	1,295	29	-		87	-	5.426 /LF	1,411

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	286.00	lf	1,226	81	-		-	-	4.568 /lf	1,306
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	15.00	ea	288	81	-		-	-	24.613 /ea	369
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	30.00	ea	5,763	2,613	-		-	-	279.195 /ea	8,376
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	813	5,073	-		-	-	981.007 /ea	5,886
n	0090	DIP,FLGxFLG,6"dia,19'-6" long,class 53,excl excav, backfill	14.00	ea	3,239	57,490	-		-	-	4,337.759 /ea	60,729
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	10.00	ea	1,354	4,478	-		-	-	583.23 /ea	5,832
n	1505	Fitting,DIP,FLG, Blind Flange,6"dia, water piping	2.00	ea	271	407	-		-	-	339.085 /ea	678
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*14,249*	*70,252*			*87*		*325.336/LF*	*84,587*
		260.00 LF										
		114.742 Labor hours										
		4.16 Equipment hours										
		40.05.19.055 (72) Exposed Pipe - TS - 6" Dia - 260 LF			*14,249*	*70,252*	*0*		*87*	*0*	*325.336/LF*	*84,587*
		260.00 LF										
		114.742 Labor hours										
		4.16 Equipment hours										
40.05.19.060		*(72) Exposed Pipe - TS - 6" Dia - Wall Pipe*										
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	40	1	-		3	-	5.426 /LF	43
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	4.00	ea	77	22	-		-	-	24.613 /ea	98
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	4.00	ea	768	348	-		-	-	279.203 /ea	1,117
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	542	4,440	-		-	-	1,245.395 /ea	4,982
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*1,427*	*4,811*			*3*		*780.031/LF*	*6,240*
		8.00 LF										
		10.987 Labor hours										
		0.128 Equipment hours										
		40.05.19.060 (72) Exposed Pipe - TS - 6" Dia - Wall Pipe			*1,427*	*4,811*	*0*		*3*	*0*	*780.031/LF*	*6,240*
		8.00 LF										
		10.987 Labor hours										
		0.128 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**15,676**	**75,063**	**0**		**89**	**0**	**338.909/LF**	**90,828**
		268.00 LF										
		125.729 Labor hours										
		4.288 Equipment hours										
DIVISION 46		**WATER AND WASTEWATER EQUIPMENT**										
41.12.13.005		*(72) Shaftless Screw Conveyor (SCW-72-1, SCW-72-2, SCW-72-3), 100 CF/H*										
41 12 13.000		*Conveyors: Screw*										
	0100	Conveyor, Screw, Shaftless, SS	3.00	EA	1,796	629,715	-		-	27	210,512.68 /EA	631,538
		41 12 13.000 Conveyors: Screw			*1,796*	*629,715*				*27*	*210,512.68 /EA*	*631,538*
		3.00 EA										
		15.69 Labor hours										
		41.12.13.005 (72) Shaftless Screw Conveyor (SCW-72-1, SCW-72-2, SCW-72-3), 100 CF/H			*1,796*	*629,715*	*0*		*0*	*27*	*210,512.68 /EA*	*631,538*
		3.00 EA										
		15.69 Labor hours										
46.01.70.010		*(72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)*										
46 36 09.000		*Chemical Feed Equipment - Dry Systems (Polymer)*										
	1200	Polymer Equipment	1.00	LS	11,448	519,552	-		6,466	-	537,466.180 /LS	537,466
		46 36 09.000 Chemical Feed Equipment - Dry Systems (Polymer)			*11,448*	*519,552*			*6,466*		*537,466.180/EA*	*537,466*
		1.00 EA										
		100.00 Labor hours										
		40.00 Equipment hours										
		46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)			*11,448*	*519,552*	*0*		*6,466*	*0*	*537,466.180/LS*	*537,466*
		1.00 LS										
		100.00 Labor hours										
		40.00 Equipment hours										
46.76.21.005		*(72) Belt Filter Press (BF-72-1, BFP-72-2), 1,800 LB/H, 160 GPM @ 2% Solids*										
46 76 21.000		*Belt Filter Press*										
	0001	Belt Filter Press / VFD / Feed Box 0.5 hp; Gravity 2 hp; Pressure 3 hp / Dimension 1.5 m	2.00	EA	9,159	1,548,980	-		6,466	-	782,302.12 /EA	1,564,604

John F. Kime Water Treatment Plant Expansion

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Detail Report with Contractor Markups

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46 76 21.000 Belt Filter Press		*9,159*	*1,548,980*			*6,466*		*782,302.12 /EA*	*1,564,604*
	2.00 EA									
	80.00 Labor hours 40.00 Equipment hours									
	46.76.21.005 (72) Belt Filter Press (BF-72-1, BFP-72-2), 1,800 LB/H, 160 GPM @ 2% Solids		*9,159*	*1,548,980*	*0*		*6,466*	*0*	*782,302.12 /EA*	*1,564,604*
	2.00 EA									
	80.00 Labor hours 40.00 Equipment hours									
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT		**22,403**	**2,698,247**	**0**		**12,931**	**27**	**546,721.692/EA**	**2,733,608**
	5.00 EA									
	195.69 Labor hours 80.00 Equipment hours									
	700 DEWATERING BUILDING		***568,838***	***3,389,248***	***425,765***		***43,330***	***27***	***4,427,206.99 /LS***	***4,427,207***
	1.00 LS									
	4,620.758 Labor hours 463.226 Equipment hours									

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report with Contractor Markups

Estimate Totals

Description	Amount	Totals	Rate
Labor	5,153,414		
Material	15,109,374		
Build America, Buy America Act			
Equipment	928,273		
Subcontract	8,179,508		
Other	867,953		
Subtotal Field Const Costs	**30,238,522**	**30,238,522**	
Sales Tax Estimate (Mat & Eq)			
Subtotal Field Const Costs		**30,238,522**	
Design Contingency	8,747,985		30.000 %
Subtotal Field Const Costs	**8,747,985**	**38,986,507**	
Escalation Project (Year)	4,374,576		11.540 %
Construction Subtotal	**4,374,576**	**43,361,083**	
Market Volatility Adjustment Factor	2,166,979		5.000 %
Construction Subtotal	**2,166,979**	**45,528,062**	
I&C Allowance	3,329,748		6.000 %
Electrical Allowance	6,659,495		12.000 %
Factored Allowance	**9,989,243**	**55,517,305**	
Total		***55,517,305***	

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Project name — **John F. Kime Water Treatment Plant Expansion Rev02 - MF**

Estimator — Feuerhelm, Matt / MPS

Labor rate table — HDR_2023_Union

Equipment rate table — HDR_EQ_2023

Project — Water Treatment

Notes — OPCC Caveat

Any opinions of probable construction cost or cost estimates provided by HDR, Inc. are made based on information available to HDR, Inc. and based on the cost estimator's experience and qualifications and represents its judgment as an experienced and qualified professional engineer. However, HDR, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over the contractor(s') methods of determining prices, or over competitive bidding or market conditions. HDR, Inc. does not guarantee that proposals, bids, or actual project or construction cost will not vary from opinions of probable cost or cost estimates prepared by HDR, Inc.

A recent AGC report indicated that Jan. of 2020 and Jan. of 2021 saw a 21% increase in residential construction spending, while private, non-residential construction spending tumbled 10% during that same period. Also, during this period, substantial material prices increase in primary materials such as wood, steel and concrete, copper, and PVC. Contractors are experiencing supply-chain issues, transportation issues, short pricing guarantees (1 to 7 days), longer than average fabrication durations, and limited availability of material supplies. This combination has produced a potentially volatile situation for owners as general contractors are drastically recovering costs. A project owner would be wise to ask many questions, work to obtain as much bid competition as possible, and retain a higher than usual contingency.

Report format — Sorted by 'WBS_MAIN/MF04_DIV/Work Activity/HDR04SPEC'

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

'Detail' summary

006 SITEWORK

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 02	**EXISTING CONDITIONS**										
02.41.00.005	*Demo Existing Fence*										
02 41 00.010	*General Site Demolition*										
0600	Selective demolition, chain link fences & gates, fence, 6' high	491.00	LF	681	-	-		125	-	1.642 /LF	806
	02 41 00.010 General Site Demolition	*1.00*	*LS*	*681*				*125*		*806.01 /LS*	*806*
	13.240 Labor hours 4.414 Equipment hours										
	02.41.00.005 Demo Existing Fence	*491.00*	*LF*	*681*	*0*	*0*		*125*	*0*	*1.642/LF*	*806*
	13.240 Labor hours 4.414 Equipment hours										
02.41.00.025	*Site - Additional Site Demo Allowance*										
02 41 00.010	*General Site Demolition*										
n 0900	Project Allowance_Additional Site Demo	1.00	LS			350,000				350,000.00 /LS	350,000
	02 41 00.010 General Site Demolition	*1.00*	*LS*			*350,000*				*350,000.00 /LS*	*350,000*
	02.41.00.025 Site - Additional Site Demo Allowance	*1.00*	*LS*	*0*	*0*	*350,000*		*0*	*0*	*350,000.00 /LS*	*350,000*
	DIVISION 02 EXISTING CONDITIONS	**1.00**	**LS**	**681**	**0**	**350,000**		**125**	**0**	**350,806.01 /LS**	**350,806**
	13.240 Labor hours 4.414 Equipment hours										
DIVISION 31	**EARTHWORK**										
31.11.00.005	*Site - Clearing and Grubbing - 1.25 Ac*										
31 11 00.000	*Clearing and Gubbing*										
0020	Clearing & grubbing, cut & chip light trees, to 6" diameter	1.40	ACRE	3,397	-	-		2,449	-	4,175.714 /ACRE	5,846

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 11 00.000		*Clearing and Gubbing*										
	0260	Clearing & grubbing, dense brush, including stumps, clear and grub	1.19	ACRE	3,523	-	-		4,938	-	7,110.69 /ACRE	8,462
		31 11 00.000 Clearing and Gubbing			*6,920*				*7,387*		*5,524.216/ACRE*	*14,308*
		2.59 ACRE										
		127.966 Labor hours										
		105.566 Equipment hours										
		31.11.00.005 Site - Clearing and Grubbing - 1.25 Ac			*6,920*	*0*	*0*		*7,387*	*0*	*5,524.216/ACRE*	*14,308*
		2.59 ACRE										
		127.966 Labor hours										
		105.566 Equipment hours										
31.23.10.005		*Overall Site - Cut/Fill and Haul Off-Site*										
31 23 10.008		*Mass Excavation - Cut/Fill and Haul Off-Site*										
n	0900	Project Allowance_Earthwork Allowance	1.00	LS			500,000				500,000.000 /LS	500,000
		31 23 10.008 Mass Excavation - Cut/Fill and Haul Off-Site					*500,000*				*6.667/CY*	*500,000*
		75,000.00 CY										
		31.23.10.005 Overall Site - Cut/Fill and Haul Off-Site			*0*	*0*	*500,000*		*0*	*0*	*6.667/CY*	*500,000*
		75,000.00 CY										
31.25.00.005		*Erosion Control Allowance*										
31 25 00.000		*Erosion and Sedimentation Controls*										
n	0900	Project Allowance_Erosion Controls	1.00	LS			150,000				150,000.00 /LS	150,000
		31 25 00.000 Erosion and Sedimentation Controls					*150,000*				*11.962/SY*	*150,000*
		12,540.00 SY										
		31.25.00.005 Erosion Control Allowance			*0*	*0*	*150,000*		*0*	*0*	*150,000.00 /LS*	*150,000*
		1.00 LS										
		DIVISION 31 EARTHWORK			**6,920**	**0**	**650,000**		**7,387**	**0**		**664,308**
		127.966 Labor hours										
		105.566 Equipment hours										
DIVISION 32		**EXTERIOR IMPROVEMENTS**										
32.12.16.005		*Site - Asphalt Paving, Site Roads, 4" Thick - 2,436 SY*										
32 12 16.000		*Asphalt Vehicular Paving*										
n	0900	Project Allowance_Site Roads Paving	1.00	LS			500,000				500,000.000 /LS	500,000

John F. Kime Water Treatment Plant Expansion
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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32 12 16.000		*Asphalt Vehicular Paving*										
	0100	Aggregate for earthwork, bank run gravel, spread with 200 H.P. dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	812.00	lcy	2,139	22,330	-		3,815	-	34.833 /lcy	28,284
	0012	Fine grading, finish grading, small area, to be paved with grader	2,436.00	sy	5,374	-	-		6,881	-	5.031 /sy	12,254
	5020	Compaction, riding, vibrating roller, 3 passes, 6" lifts	812.00	ecy	245	-	-		217	-	0.569 /ecy	462
	0160	Plant-mix asphalt paving, for highways and large paved areas, binder course, 3" thick, no hauling included	2,436.00	SY	2,269	27,040	-		1,426	-	12.617 /SY	30,735
	0460	Plant-mix asphalt paving, for highways and large paved areas, wearing course, 3" thick, no hauling included	2,436.00	sy	2,522	29,719	-		1,553	-	13.873 /sy	33,794
n	0560	Hauling, asphalt material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	467.00	lcy	5,312	-	-		7,298	-	27.002 /lcy	12,610
		32 12 16.000 Asphalt Vehicular Paving			*17,861*	*79,089*	*500,000*		*21,190*		*253.752/SY*	*618,140*
		2,436.00 SY 326.795 Labor hours 207.648 Equipment hours										
		32.12.16.005 Site - Asphalt Paving, Site Roads, 4" Thick - 2,436 SY			*17,861*	*79,089*	*500,000*		*21,190*	*0*	*253.752/SY*	*618,140*
		2,436.00 SY 326.795 Labor hours 207.648 Equipment hours										
32.16.13.005		*Site - Concrete Curb & Gutter, Site Roads, 2' wide x 6" thick - 1,984 LF*										
32 16 13.010		*Concrete Curb and Gutter*										
	0446	Cast-in place concrete curbs & gutters, radius, machine formed, 6" high curb, 6" thick gutter, 24" wide, includes concrete	1,984.00	LF	5,486	17,757	-		2,854	-	13.153 /LF	26,097
		32 16 13.010 Concrete Curb and Gutter			*5,486*	*17,757*			*2,854*		*13.153/LF*	*26,097*
		1,984.00 LF 105.813 Labor hours 17.636 Equipment hours										
		32.16.13.005 Site - Concrete Curb & Gutter, Site Roads, 2' wide x 6" thick - 1,984 LF			*5,486*	*17,757*	*0*		*2,854*	*0*	*13.153/LF*	*26,097*
		1,984.00 LF 105.813 Labor hours 17.636 Equipment hours										
32.31.13.005		*Security Fence, Chain Link, 8' High*										
32 31 13.200		*Security Fence*										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
32 31 13.200		*Security Fence*										
	0920	Fence, chain link industrial, galvanized steel, 6 ga. wire, 2-1/2" posts @ 10' OC, 8' high, includes excavation, in concrete, excludes barbed wire	665.00	LF	4,356	25,603	-		983	-	46.529 /LF	30,942
		32 31 13.200 Security Fence			*4,356*	*25,603*			*983*		*46.529/LF*	*30,942*
		665.00 LF										
		88.667 Labor hours										
		59.111 Equipment hours										
		32.31.13.005 Security Fence, Chain Link, 8' High			*4,356*	*25,603*	*0*		*983*	*0*	*46.529/LF*	*30,942*
		665.00 LF										
		88.667 Labor hours										
		59.111 Equipment hours										
32.92.00.005		*Site - Seeding - 11,010 SY*										
32 92 00.005		*Seeding*										
	0310	Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	11,010.00	SY	26,420	4,955	-		2,504	-	3.077 /SY	33,878
		32 92 00.005 Seeding			*26,420*	*4,955*			*2,504*		*3.077/SY*	*33,878*
		11,010.00 SY										
		528.48 Labor hours										
		88.08 Equipment hours										
		32.92.00.005 Site - Seeding - 11,010 SY			*26,420*	*4,955*	*0*		*2,504*	*0*	*3.077/SY*	*33,878*
		11,010.00 SY										
		528.48 Labor hours										
		88.08 Equipment hours										
		DIVISION 32 EXTERIOR IMPROVEMENTS			**54,123**	**127,403**	**500,000**		**27,531**	**0**	**709,056.34 /LS**	**709,056**
		1.00 LS										
		1,049.755 Labor hours										
		372.475 Equipment hours										
DIVISION 33		**UTILITIES (BURIED PIPE AND VALVES)**										
33.05.19.055		*Site - Potable Water System Allowance*										
33 05 19.008		*Buried Pipe, Ductile Iron, 08" Dia*										
n	0900	Project Allowance_Potable Water System, Allowance	1.00	LS			300,000				300,000.00 /LS	300,000

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Detail Report - Direct Costs

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	33 05 19.008 Buried Pipe, Ductile Iron, 08" Dia				*300,000*				*300.00 /LF*	*300,000*
	1,000.00 LF									
	33.05.19.055 Site - Potable Water System Allowance		*0*	*0*	*300,000*		*0*	*0*	*300.00 /LF*	*300,000*
	1,000.00 LF									
33.05.39.010	*Site - Storm Sewer*									
33 05 39.124 n 0900	*Buried Pipe, RCP, 24" Dia* Project Allowance_Storm Sewer System, Allowance	1.00 LS			450,000				450,000.00 /LS	450,000
	33 05 39.124 Buried Pipe, RCP, 24" Dia				*450,000*				*225.00 /LF*	*450,000*
	2,000.00 LF									
	33.05.39.010 Site - Storm Sewer		*0*	*0*	*450,000*		*0*	*0*	*225.00 /LF*	*450,000*
	2,000.00 LF									
	DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)		**0**	**0**	**750,000**		**0**	**0**	**250.00 /LF**	**750,000**
	3,000.00 LF									
	006 SITEWORK		***61,724***	***127,403***	***2,250,000***		***35,044***	***0***	***2,474,170.070/LS***	***2,474,170***
	1.00 LS									
	1,190.962 Labor hours									
	482.454 Equipment hours									

007 YARD PIPING

DIVISION 31 EARTHWORK

31.11.00.010 *(RW) - Clearing and Grubbing - 1.0 Ac*

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 11 00.000 0260	*Clearing and Gubbing* Clearing & grubbing, dense brush, including stumps, clear and grub	2.02 ACRE	5,981	-	-		8,383	-	7,110.69 /ACRE	14,364
	31 11 00.000 Clearing and Gubbing		*5,981*				*8,383*		*7,110.69 /ACRE*	*14,364*
	2.02 ACRE									
	103.149 Labor hours									
	103.149 Equipment hours									

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	31.11.00.010 (RW) - Clearing and Grubbing - 1.0 Ac			*5,981*	*0*	*0*		*8,383*	*0*	*7,110.69 /ACRE*	*14,364*
	2.02 ACRE										
	103.149 Labor hours										
	103.149 Equipment hours										
	DIVISION 31 EARTHWORK			**5,981**	**0**	**0**		**8,383**	**0**		**14,364**
	103.149 Labor hours										
	103.149 Equipment hours										
DIVISION 32	**EXTERIOR IMPROVEMENTS**										
32.92.00.010	*(RW) - Seeding - 13,890 SY*										
32 92 00.005	*Seeding*										
0310	Seeding, mechanical seeding, fine grading and seeding, with equipment, includes lime, fertilizer & seed	13,890.00	SY	33,331	6,251	-		3,159	-	3.077 /SY	42,740
	32 92 00.005 Seeding			*33,331*	*6,251*			*3,159*		*3.077/SY*	*42,740*
	13,890.00 SY										
	666.72 Labor hours										
	111.12 Equipment hours										
	32.92.00.010 (RW) - Seeding - 13,890 SY			*33,331*	*6,251*	*0*		*3,159*	*0*	*3.077/SY*	*42,740*
	13,890.00 SY										
	666.72 Labor hours										
	111.12 Equipment hours										
	DIVISION 32 EXTERIOR IMPROVEMENTS			**33,331**	**6,251**	**0**		**3,159**	**0**	**42,739.76 /LS**	**42,740**
	1.00 LS										
	666.72 Labor hours										
	111.12 Equipment hours										
DIVISION 33	**UTILITIES (BURIED PIPE AND VALVES)**										
33.00.00.005	*(RW) Remove & Relocate Chemical Feed/Fiber Optic Lines - 1 LS*										
33 00 00.075	*Utility, Relocation - Allowance*										
n 0900	Project Allowance_Remove and Relocate Chemical Feed/Fiber Optic Lines for 42" RW installation	1.00	LS						200,000	200,000.000 /LS	200,000
	33 00 00.075 Utility, Relocation - Allowance								*200,000*	*200,000.000/LS*	*200,000*
	1.00 LS										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33.00.00.005 (RW) Remove & Relocate Chemical Feed/Fiber Optic Lines - 1 LS	*1.00*	*LS*	*0*	*0*	*0*		*0*	*200,000*	*200,000.000/LS*	*200,000*

33.05.19.005 *(RW) 42" DIP and Fittings, Fully Restrained, 5' cover - 2,284 LF*

33 05 19.042 *Buried Pipe, Ductile Iron, 42" Dia*

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
n	7001	Pipeline Testing, Hydro (LF)	2,323.00	lf	5,733	174	-		520	-	2.767 /lf	6,428
	7060	Rent trench box, 9500 lbs, 8' x 20'	23.00	day	-	-	-		3,594	-	156.25 /day	3,594
	1371	Excavating, trench or continuous footing, common earth, 1-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	7,098.00	bcy	11,432	-	-		10,782	-	3.130 /bcy	22,214
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	3,718.00	lcy	2,864	-	-		6,610	-	2.548 /lcy	9,474
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	3,160.00	ecy	3,371	-	-		10,038	-	4.243 /ecy	13,409
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	3,514.00	lcy	28,899	108,934	-		5,327	-	40.74 /lcy	143,160
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	4,052.00	lcy	46,089	-	-		63,324	-	27.002 /lcy	109,413
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	3,056.00	ecy	11,909	-	-		1,558	-	4.407 /ecy	13,467
n	3246	Distribution piping,DIP,cement lined,fastite,20' lengths, 42"dia, Press Class 250, Excludes excavation, backfill, bedding	2,323.00	LF	63,910	1,451,875	-		36,205	-	668.098 /LF	1,551,991
n	4112	Distribution Piping,DIP,Flex-Ring Joint,42"dia,additional per linear foot of restrained pipe	2,323.00	lf		238,479	-			-	102.66 /lf	238,479
	8060	Fitting, 90 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	699	20,806	-		580	-	22,085.98 /ea	22,086
	8060	Fitting, 90 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	699	20,806	-		580	-	22,085.98 /ea	22,086
	8160	Fitting, tee, DIP, cement lined, MJ,42" diameter, C110 water piping	1.00	ea	1,023	17,802	-		564	-	19,388.760 /ea	19,389
	8260	Fitting, 45 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	1.00	ea	699	9,080	-		580	-	10,359.58 /ea	10,360
	8360	Fitting, 22.5 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	3.00	ea	2,098	23,321	-		1,741	-	9,053.177 /ea	27,160
	8674	Fitting, dished plug,DIP,cement lined,MJ,42"dia,C110 water piping	2.00	ea	1,399	12,272	-		1,161	-	7,415.575 /ea	14,831
n	4713	DIP,Polywrap 8 mil LDT 360ft,42"dia	7.00	roll	389	10,670	-		-	-	1,579.76 /roll	11,058
	8460	Fitting,11.25 degree bend,DIP,cement lined,MJ,42"dia,C110 water piping	12.00	ea	8,128	161,067	-			-	14,099.584 /ea	169,195

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.042 Buried Pipe, Ductile Iron, 42" Dia			*189,343*	*2,075,286*			*143,166*		*1,036.502/LF*	*2,407,795*
		2,323.00 LF										
		3,432.001 Labor hours										
		2,053.877 Equipment hours										
		33.05.19.005 (RW) 42" DIP and Fittings, Fully Restrained, 5' cover - 2,284 LF			*189,343*	*2,075,286*	*0*		*143,166*	*0*	*1,036.502/LF*	*2,407,795*
		2,323.00 LF										
		3,432.001 Labor hours										
		2,053.877 Equipment hours										
33.05.19.010		*(RW) 54" DIP and Fittings, Fully Restrained, 5' cover - 250 LF*										
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	191.00	lf	471	14	-		43	-	2.767 /lf	528
	7060	Rent trench box, 9500 lbs, 8' x 20'	4.00	day	-	-	-		625	-	156.25 /day	625
	1372	Excavating, trench or continuous footing, common earth, 2-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	729.00	bcy	704	-	-		1,306	-	2.758 /bcy	2,010
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	346.00	lcy	267	-	-		615	-	2.548 /lcy	882
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	294.00	ecy	314	-	-		934	-	4.243 /ecy	1,248
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	363.00	lcy	2,985	11,253	-		550	-	40.74 /lcy	14,789
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	432.00	lcy	4,914	-	-		6,751	-	27.002 /lcy	11,665
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	316.00	ecy	1,231	-	-		161	-	4.407 /ecy	1,393
n	3286	Distribution piping,DIP,cement lined,fastite,20' lengths, 54"dia, Press Class 250, Excludes excavation, backfill, bedding	191.00	LF	7,006	158,305	-		3,969	-	886.283 /LF	169,280
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	191.00	lf		31,580	-			-	165.34 /lf	31,580
	8171	Fitting, tee reducing, DIP, cement lined, LKR,54" x 42" diameter, C153 water piping	1.00	ea	1,212	36,381	-		1,117	-	38,710.10 /ea	38,710
	8270	Fitting, 45 degree bend,DIP,cement lined,LKR,54"dia,C153 water piping	1.00	ea	808	25,157	-		746	-	26,711.06 /ea	26,711
	8554	Fitting, reducer, DIP,cement lined,LKR, 54" x 48" diameter,C153-CC water piping	1.00	ea	808	16,389	-		746	-	17,943.04 /ea	17,943
n	4715	DIP,Polywrap 8 mil LDT 220ft,54"dia	2.00	roll	111	2,484	-		-	-	1,297.51 /roll	2,595
		33 05 19.054 Buried Pipe, Ductile Iron, 54" Dia			*20,833*	*281,562*			*17,564*		*1,675.176/LF*	*319,959*
		191.00 LF										
		376.438 Labor hours										
		225.580 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33.05.19.010 (RW) 54" DIP and Fittings, Fully Restrained, 5' cover - 250 LF			*20,833*	*281,562*	*0*		*17,564*	*0*	*1,675.176/LF*	*319,959*
		191.00 LF										
		376.438 Labor hours										
		225.580 Equipment hours										
33.05.19.015		*(RW) Connection to Existing System - 2 EA*										
33 05 19.042		*Buried Pipe, Ductile Iron, 42" Dia*										
	5500	Rent trash pump self-prime 2" diameter gas drive	4.00	day	-	-	-		311	-	77.86 /day	311
	3000	Utility removal, pipe, sewer/water, 42" diameter, remove, excludes excavation, hauling	4.00	LF	858	-	-		3,117	-	993.675 /LF	3,975
	3000	Utility removal, pipe, sewer/water, 42" diameter, remove, excludes excavation, hauling	4.00	LF	858	-	-		3,117	-	993.675 /LF	3,975
	0100	Selective demolition, dump charges, typical urban city, building construction materials, includes tipping fees only	1.00	ton	-	74	-		-	-	74.00 /ton	74
n	1250	Hauling,demolished material, loose cubic yards, 10 mile round trip, 0.75 loads/hour, 20 C.Y. dump trailer, highway haulers, excludes loading	10.00	lcy	40	-	-		62	-	10.27 /lcy	103
		33 05 19.042 Buried Pipe, Ductile Iron, 42" Dia			*1,756*	*74*			*6,608*		*1,054.693/LF*	*8,438*
		8.00 LF										
		32.727 Labor hours										
		65.455 Equipment hours										
		33.05.19.015 (RW) Connection to Existing System - 2 EA			*1,756*	*74*	*0*		*6,608*	*0*	*1,054.693/LF*	*8,438*
		8.00 LF										
		32.727 Labor hours										
		65.455 Equipment hours										
33.05.71.005		*(RW) ARV, 3" on 42" DIP- 3 EA*										
33 05 71.006		*Buried Valves, Air and Vacuum Relief, 06" Dia*										
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	9.00	CY	-	1,665	-		-	-	185.00 /CY	1,665
	1800	Roof hatch, 3'-0" x 3'-0"	3.00	ea	-	1,350	-		-	-	450.00 /ea	1,350
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	5.00	ea	51	29	-		-	-	16.042 /ea	80
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	6.00	ea	314	94	-		-	-	68.10 /ea	409
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	1.00	ea	115	52	-		-	-	167.28 /ea	167
	0900	Aggregate for earthwork, aggregate or sand, spread with 200 HP dozer, includes load at pit and haul, round trip, for 5 mile haul add	2.00	lcy	4	-	-		6	-	5.265 /lcy	11

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 71.006		*Buried Valves, Air and Vacuum Relief, 06" Dia*										
	0520	Utility structures, utility vaults precast concrete, meter pit, 5' x 5', 6' deep, excludes excavation and backfill	3.00	ea	3,084	12,750	-		569	-	5,467.50 /ea	16,403
n	1130	Water utility distribution valve, air release & vacuum valve, 3" diameter, excludes excavation and backfill	3.00	EA	396	5,625	-		-	-	2,006.85 /EA	6,021
n	0001	DIP,FLGxFLG,3"dia,1'-0" long,class 53,excl excav, backfill	3.00	ea	183	1,356	-		-	-	513.073 /ea	1,539
n	1428	Fitting,DIP,FLG,Tee,42"dia,c 110 water piping	3.00	ea	1,332	113,998	-		-	-	38,443.36 /ea	115,330
n	1606	Fitting,DIP,FLG, Tapped Blind Flange,8"dia, water piping	3.00	ea	242	811	-		-	-	350.903 /ea	1,053
n	2520	Fitting,DIP,FLG,Conc. Reducer,8"x3",c 110 water piping	3.00	ea	242	931	-		-	-	390.903 /ea	1,173
n	0501	Gate Valve Flange Res Wedge: 3" / Handwheel Operator NRS	3.00	ea	659	848	-		423	-	643.497 /ea	1,930
		33 05 71.006 Buried Valves, Air and Vacuum Relief, 06" Dia			*6,623*	*139,509*			*998*		*49,043.293/EA*	*147,130*
		3.00 EA 120.758 Labor hours 24.080 Equipment hours										
		33.05.71.005 (RW) ARV, 3" on 42" DIP- 3 EA			*6,623*	*139,509*	*0*		*998*	*0*	*49,043.293/EA*	*147,130*
		3.00 EA 120.758 Labor hours 24.080 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**218,554**	**2,496,432**	**0**		**168,335**	**200,000**	**1,222.570/LF**	**3,083,321**
		2,522.00 LF 3,961.924 Labor hours 2,368.992 Equipment hours										
		007 YARD PIPING			***257,865***	***2,502,682***	***0***		***179,876***	***200,000***	***1,245.212/LF***	***3,140,424***
		2,522.00 LF 4,731.793 Labor hours 2,583.261 Equipment hours										

083 RAW WATER PUMP STATION

DIVISION 02 EXISTING CONDITIONS

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report - Direct Costs

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
02.41.00.010		*(10) Raw Water Pump Station, Demo Process Piping, 36" Blind Flange and Steel Plate Cover*										
02 41 00.150		*Process Pipe Demolition*										
n	0005	Site Demolition Crew with Demolition Equipment (6 men x 8 hrs per day) (7 equip hours x 8 hrs per day)	1.00	DAY	2,542	-	-		6,830	-	9,371.720 /DAY	9,372
	0100	Selective demolition, dump charges, typical urban city, building construction materials, includes tipping fees only	1.00	ton	-	74	-		-	-	74.00 /ton	74
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1.00	lcy	11	-	-		16	-	27.00 /lcy	27
		02 41 00.150 Process Pipe Demolition			*2,554*	*74*			*6,845*		*473.636/LF*	*9,473*
		20.00 LF										
		48.205 Labor hours										
		56.205 Equipment hours										
		02.41.00.010 (10) Raw Water Pump Station, Demo Process Piping, 36" Blind Flange and Steel Plate Cover			*2,554*	*74*	*0*		*6,845*	*0*	*9,472.720/DAY*	*9,473*
		1.00 DAY										
		48.205 Labor hours										
		56.205 Equipment hours										
		DIVISION 02 EXISTING CONDITIONS			**2,554**	**74**	**0**		**6,845**	**0**	**9,472.720/LS**	**9,473**
		1.00 LS										
		48.205 Labor hours										
		56.205 Equipment hours										
DIVISION 40		**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
33.05.15.005		*(10) Flow Meter Vault, 10' x 5' x 6' - 1 EA*										
33 05 15.020		*Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep*										
	0100	Utility structures, utility vaults precast concrete, 5' x 10' x 6' high, I.D., 6" thick, excludes excavation and backfill	1.00	EA	1,452	18,000	-		1,043	-	20,494.80 /EA	20,495
		33 05 15.020 Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep			*1,452*	*18,000*			*1,043*		*20,494.80 /EA*	*20,495*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33.05.15.005 (10) Flow Meter Vault, 10' x 5' x 6' - 1 EA			*1,452*	*18,000*	*0*		*1,043*	*0*	*20,494.80 /EA*	*20,495*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										
40.05.17.005		*(10) Exposed Pipe - RW - Copper Air Release - 01" Dia*										
40 05 17.001		*Pipe and Fittings - Copper, 1/2" to 1" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	13.00	LF	32	1	-		3	-	2.767 /LF	36
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	14.30	lf	15	1	-		-	-	1.146 /lf	16
	1114	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 1" pipe	5.00	ea	36	14	-		-	-	10.026 /ea	50
	2200	Pipe, copper, tubing, solder, 1" diameter, type L, includes coupling & clevis hanger assembly 10' O.C.	13.00	lf	110	109	-		-	-	16.826 /lf	219
	0130	Elbow, 90 Deg., copper, wrought, copper x copper, 1"	4.00	ea	144	56	-		-	-	49.975 /ea	200
		40 05 17.001 Pipe and Fittings - Copper, 1/2" to 1" Dia			*337*	*181*			*3*		*40.086/LF*	*521*
		13.00 LF										
		4.850 Labor hours										
		0.208 Equipment hours										
		40.05.17.005 (10) Exposed Pipe - RW - Copper Air Release - 01" Dia			*337*	*181*	*0*		*3*	*0*	*40.086/LF*	*521*
		13.00 LF										
		4.850 Labor hours										
		0.208 Equipment hours										
40.05.19.005		*(10) Exposed Pipe - RW - 24" - 6 LF*										
40 05 19.024		*Pipe and Fittings - Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	6.00	LF	15	0	-		1	-	2.767 /LF	17
	7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	34.10	sf	135	26	-		-	-	4.722 /sf	161
	01084	Pipe Support, 24", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	1.00	ea	527	879	-		-	-	1,406.10 /ea	1,406
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	1,213	1,360	-		-	-	643.368 /ea	2,573
	02009	24" DIP Filler Flange 3" thick	1.00	ea	80	233	-		-	-	312.88 /ea	313
n	0420	DIP,FLGxFLG,24"dia,5'-0" long,class 53,excl excav, backfill	1.00	ea	225	6,918	-		-	-	7,143.26 /ea	7,143
n	1022	Fitting,DIP,FLG,90 degree bend,24"dia,c 110 water piping	1.00	ea	225	4,620	-		-	-	4,844.860 /ea	4,845

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia			*2,478*	*14,073*			*1*		*2,758.723/LF*	*16,552*
		6.00 LF										
		38.210 Labor hours										
		0.096 Equipment hours										
		40.05.19.005 (10) Exposed Pipe - RW - 24" - 6 LF			*2,478*	*14,073*	*0*		*1*	*0*	*2,758.723/LF*	*16,552*
		6.00 LF										
		38.210 Labor hours										
		0.096 Equipment hours										
40.05.19.125		*(10) Exposed Pipe - RW - 36"x24" Reducer - 1 EA*										
40 05 19.036		*Pipe and Fittings - Ductile Iron, 36" Dia*										
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	1.00	ea	303	340	-		-	-	643.37 /ea	643
	0830	Gasket and bolt set, for flanges, 150 lb., 36" pipe size	1.00	ea	524	1,675	-		-	-	2,199.00 /ea	2,199
n	2620	Fitting,DIP,FLG,Conc. Reducer,36"x24",c 110 water piping	1.00	EA	355	8,592	-		-	-	8,947.33 /EA	8,947
		40 05 19.036 Pipe and Fittings - Ductile Iron, 36" Dia			*1,183*	*10,607*					*11,789.70 /LF*	*11,790*
		1.00 LF										
		17.883 Labor hours										
		40.05.19.125 (10) Exposed Pipe - RW - 36"x24" Reducer - 1 EA			*1,183*	*10,607*	*0*		*0*	*0*	*11,789.70 /EA*	*11,790*
		1.00 EA										
		17.883 Labor hours										
40.05.52.005		*(10) Exposed Pipe - RW - Air Release Valve - 04" Dia*										
40 05 52.105		*Misc Valves - Air Release Valve, 04" Dia*										
	6000	Nipple, 316 stainless steel, threaded, standard weight, 2"x 4" long	1.00	ea	30	4	-		-	-	34.80 /ea	35
n	1140	Water utility distribution valve, air release & vacuum valve, 4" diameter, excludes excavation and backfill	1.00	EA	211	2,475	-		-	-	2,685.96 /EA	2,686
		40 05 52.105 Misc Valves - Air Release Valve, 04" Dia			*241*	*2,479*					*2,720.76 /EA*	*2,721*
		1.00 EA										
		3.621 Labor hours										
		40.05.52.005 (10) Exposed Pipe - RW - Air Release Valve - 04" Dia			*241*	*2,479*	*0*		*0*	*0*	*2,720.76 /EA*	*2,721*
		1.00 EA										
		3.621 Labor hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40.05.62.020		*(10) Exposed Pipe - RW - Plug Valve - 24" Dia - 4 EA*										
40 05 62.024		*Exposed Valves - Plug, Eccentric, Cast Iron, 24" Dia*										
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	8.00	ea	2,427	2,720	-		-	-	643.369 /ea	5,147
n	0510	Plug Valve Flange: 24" / Handwheel or Lever Operator / Includes Gear Operator	4.00	EA	1,292	82,229	-		731	-	21,063.065 /EA	84,252
		40 05 62.024 Exposed Valves - Plug, Eccentric, Cast Iron, 24" Dia			*3,719*	*84,949*			*731*		*22,349.803/EA*	*89,399*
		4.00 EA										
		57.684 Labor hours										
		8.00 Equipment hours										
		40.05.62.020 (10) Exposed Pipe - RW - Plug Valve - 24" Dia - 4 EA			*3,719*	*84,949*	*0*		*731*	*0*	*22,349.803/EA*	*89,399*
		4.00 EA										
		57.684 Labor hours										
		8.00 Equipment hours										
40.05.63.005		*(10) Exposed Pipe - RW - Ball Valve - 04" Dia*										
40 05 63.204		*Exposed Valves - AWWA C507, Cast Iron Ball Valve, 04" Dia*										
	5560	Valves, steel, forged, ball, flanged, 150 lb., 4"	1.00	EA	352	2,050	-		-	-	2,401.60 /EA	2,402
		40 05 63.204 Exposed Valves - AWWA C507, Cast Iron Ball Valve, 04" Dia			*352*	*2,050*					*2,401.60 /EA*	*2,402*
		1.00 EA										
		5.333 Labor hours										
		40.05.63.005 (10) Exposed Pipe - RW - Ball Valve - 04" Dia			*352*	*2,050*	*0*		*0*	*0*	*2,401.60 /EA*	*2,402*
		1.00 EA										
		5.333 Labor hours										
40.05.66.005		*(10) Exposed Pipe - RW - Check Valve - 24" Dia*										
40 05 66.124		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 24" Dia*										
n	010	Check Valve Flange, Swing: 24" / No Lever	1.00	EA	323	17,207	-		183	-	17,713.03 /EA	17,713
		40 05 66.124 Exposed Valves - Cushioned Swing Check, Ductile Iron, 24" Dia			*323*	*17,207*			*183*		*17,713.03 /EA*	*17,713*
		1.00 EA										
		6.00 Labor hours										
		2.00 Equipment hours										
		40.05.66.005 (10) Exposed Pipe - RW - Check Valve - 24" Dia			*323*	*17,207*	*0*		*183*	*0*	*17,713.03 /EA*	*17,713*
		1.00 EA										

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Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	40.05.66.005 (10) Exposed Pipe - RW - Check Valve - 24" Dia			*323*	*17,207*	*0*		*183*	*0*	*17,713.03 /EA*	*17,713*
	1.00 EA										
	6.00 Labor hours										
	2.00 Equipment hours										
40.71.00.010	*(10) Exposed Pipe - RW - Flow Meter - 54" Dia*										
40 71 00.154	*Flow Meter Magnetic, 54"*										
0833	Gasket and bolt set, for flanges, 150 lb., 54" pipe size	2.00	ea	1,594	5,268	-		-	-	3,430.945 /ea	6,862
0200	Flow Meter Magnetic, 54"	1.00	EA	1,616	21,000					22,616.40 /EA	22,616
	40 71 00.154 Flow Meter Magnetic, 54"			*3,210*	*26,268*					*29,478.29 /EA*	*29,478*
	1.00 EA										
	46.122 Labor hours										
	40.71.00.010 (10) Exposed Pipe - RW - Flow Meter - 54" Dia			*3,210*	*26,268*	*0*		*0*	*0*	*29,478.29 /EA*	*29,478*
	1.00 EA										
	46.122 Labor hours										
40.71.00.015	*(10) Exposed Pipe - RW - Flow Meter - 30" Dia*										
40 71 00.130	*Flow Meter Magnetic, 30"*										
0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	2.00	ea	823	1,800	-		-	-	1,311.715 /ea	2,623
0180	Flow Meter Magnetic, 30"	1.00	EA	1,010	7,000					8,010.25 /EA	8,010
	40 71 00.130 Flow Meter Magnetic, 30"			*1,834*	*8,800*					*10,633.68 /EA*	*10,634*
	1.00 EA										
	26.429 Labor hours										
	40.71.00.015 (10) Exposed Pipe - RW - Flow Meter - 30" Dia			*1,834*	*8,800*	*0*		*0*	*0*	*10,633.68 /EA*	*10,634*
	1.00 EA										
	26.429 Labor hours										
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**15,129**	**184,614**	**0**		**1,962**	**0**	**10,616.028/LF**	**201,705**
	19.00 LF										
	234.133 Labor hours										
	14.304 Equipment hours										

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Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 43	**PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT**										
26.29.23.005	*(10) Variable Frequency Drive, For RW Pump, 200 HP - 1 EA*										
26 29 23.200	*VARIABLE FREQ. DRIVES - 200HP*										
1250	Variable frequency drives, custom-engineered, 460 volt, 200 HP motor size	1.00	EA	4,686	60,000	-		694	-	65,379.04 /EA	65,379
	26 29 23.200 VARIABLE FREQ. DRIVES - 200HP			*4,686*	*60,000*			*694*		*65,379.04 /EA*	*65,379*
	1.00 EA										
	68.966 Labor hours										
	13.793 Equipment hours										
	26.29.23.005 (10) Variable Frequency Drive, For RW Pump, 200 HP - 1 EA			*4,686*	*60,000*	*0*		*694*	*0*	*65,379.04 /EA*	*65,379*
	1.00 EA										
	68.966 Labor hours										
	13.793 Equipment hours										
43.23.31.005	*(10) Raw Water PS - (P-10-4) Raw Water Feed Pump, 200 HP, 7107 GPM @ 79'*										
43 23 31.000	*Pumping Equipment - Vertical End Suction Helical Screw Centifugal Pumps*										
n 0100	Vertical, centrifugal pump, 200 HP, 7107 GPM @ 79'	1.00	EA	2,255	301,311	-		217	-	303,783.36 /EA	303,783
	43 23 31.000 Pumping Equipment - Vertical End Suction Helical Screw Centifugal Pumps			*2,255*	*301,311*			*217*		*303,783.36 /EA*	*303,783*
	1.00 EA										
	40.00 Labor hours										
	2.00 Equipment hours										
	43.23.31.005 (10) Raw Water PS - (P-10-4) Raw Water Feed Pump, 200 HP, 7107 GPM @ 79'			*2,255*	*301,311*	*0*		*217*	*0*	*303,783.36 /EA*	*303,783*
	1.00 EA										
	40.00 Labor hours										
	2.00 Equipment hours										
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**6,941**	**361,311**	**0**		**911**	**0**	**184,581.20 /EA**	**369,162**
	2.00 EA										
	108.966 Labor hours										
	15.793 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		083 RAW WATER PUMP STATION			***24,623***	***545,999***	***0***		***9,717***	***0***	***580,339.65 /LS***	***580,340***
		1.00 LS										
		391.304 Labor hours										
		86.302 Equipment hours										

095 SPLITTER BOX

DIVISION 03 — **CONCRETE**

03.11.13.005 — *(11) Splitter Box - Base Slab - 575 sf - 18" Thick*

03 11 13.766 — *18" Foundation Slab*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	160.50	sfca	658	196	-		-	-	5.322 /sfca	854
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	2.80	ton	101	-	-		58	-	56.818 /ton	159
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	2.80	ton	2,515	4,060	-		-	-	2,348.086 /ton	6,575
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	2.80	ton	288	-	-		167	-	162.332 /ton	455
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	32.00	cy	561	-	-		85	-	20.206 /cy	647
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	3.20	cy	56	-	-		9	-	20.206 /cy	65
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.00	CY	-	5,920	-		-	-	185.00 /CY	5,920
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.20	cy	-	592	-		-	-	185.00 /cy	592
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	575.00	sf	422	-	-		31	-	0.787 /sf	453
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	28.75	lf	13	1	-		2	-	0.529 /lf	15
n	0215	Control joint, clean out control joint of debris_SOG	28.75	lf	2	-	-			-	0.073 /lf	2
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	28.75	lf	47	5	-		-	-	1.790 /lf	51
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	5.75	csf	46	43	-		-	-	15.409 /csf	89

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.766		*18" Foundation Slab*										
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	5.75	sq	73	47	-		-	-	20.819 /sq	120
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	24.00	ecy	262	768	-		30	-	44.143 /ecy	1,059
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	24.00	lcy	197	-	-		298	-	20.626 /lcy	495
		03 11 13.766 18" Foundation Slab			*5,239*	*11,631*			*679*		*548.435/CY*	*17,550*
		32.00 CY										
		89.157 Labor hours										
		16.209 Equipment hours										
		03.11.13.005 (11) Splitter Box - Base Slab - 575 sf - 18" Thick			*5,239*	*11,631*	*0*		*679*	*0*	*548.435/CY*	*17,550*
		32.00 CY										
		89.157 Labor hours										
		16.209 Equipment hours										
03.11.13.010		*(11) Splitter Box - Walls - 21' High - 12" Thick - 134 LF*										
03 11 13.804		*12" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	141.00	lf	1,465	479	-		-	-	13.792 /lf	1,945
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	5,628.00	sfca	39,239	5,572	-		-	-	7.962 /sfca	44,811
	2551	BLOCKOUT-C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	22.50	sfca	157	22	-		-	-	7.962 /sfca	179
	5200	Chamfer strip, wood, 3/4" wide	282.00	lf	252	39	-		-	-	1.033 /lf	291
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	5.00	c	-	325	-		-	-	65.00 /c	325
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	132.618	lf	429	995	-		-	-	10.733 /lf	1,423
	0105	Splice rebar, standard, self-aligning type, taper threaded, #5 bars, includes holding rebar in place while splicing	115.50	ea	1,107	1,733	-		-	-	24.581 /ea	2,839
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	10.50	ton	378	-	-		219	-	56.816 /ton	597
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	10.50	ton	410	-	-		238	-	61.758 /ton	648
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	10.50	ton	7,230	15,225	-		-	-	2,138.533 /ton	22,455
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	105.00	cy	3,097	-	-		471	-	33.983 /cy	3,568

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	10.50	cy	310	-	-		47	-	33.982 /cy	357
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	105.00	CY	-	19,425	-		-	-	185.00 /CY	19,425
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	10.50	cy	-	1,943	-		-	-	185.00 /cy	1,943
n	0210	Control joint, clean out control joint of debris_WALLS	141.00	lf	10	-	-			-	0.073 /lf	10
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	141.00	lf	230	23	-		-	-	1.790 /lf	252
	0020	Concrete finishing, walls, includes breaking ties and patching voids	5,628.00	sf	4,586	225	-		-	-	0.855 /sf	4,811
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,814.00	sf	2,751	113	-		-	-	1.018 /sf	2,864
		03 11 13.804 12" CIP Wall			*61,650*	*46,118*			*975*		*1,035.651/CY*	*108,743*
		105.00 CY										
		1,074.779 Labor hours										
		26.953 Equipment hours										
		03.11.13.010 (11) Splitter Box - Walls - 21' High - 12" Thick - 134 LF			*61,650*	*46,118*	*0*		*975*	*0*	*1,035.651/CY*	*108,743*
		105.00 CY										
		1,074.779 Labor hours										
		26.953 Equipment hours										
		DIVISION 03 CONCRETE			**66,890**	**57,749**	**0**		**1,655**	**0**	**921.849/CY**	**126,293**
		137.00 CY										
		1,163.935 Labor hours										
		43.162 Equipment hours										

DIVISION 05 METALS

05.50.00.005 (11) Splitter Box - Aluminum Grating - 2" Thick - 340 SF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	340.00	SF	712	25,500	-		53	-	77.252 /SF	26,266
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	162.00	lf	2,390	423	-		-	-	17.364 /lf	2,813

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		05 50 00.305 Metal Grating - Aluminum			*3,103*	*25,923*			*53*		*85.525/SF*	*29,079*
		340.00 SF										
		47.909 Labor hours 2.72 Equipment hours										
		05.50.00.005 (11) Splitter Box - Aluminum Grating - 2" Thick - 340 SF			*3,103*	*25,923*	*0*		*53*	*0*	*85.525/SF*	*29,079*
		340.00 SF										
		47.909 Labor hours 2.72 Equipment hours										
05.50.00.035		*(11) Splitter Box - Metal Ladder into Splitter Box Cells, 21 LF - 5 EA*										
05 50 00.450		*Metal Ladders - Aluminum*										
	0400	Ladder, shop fabricated, aluminum, 20" W, bolted to concrete, excl cage	105.00	LF	2,588	5,618	-		193	-	79.989 /LF	8,399
		05 50 00.450 Metal Ladders - Aluminum			*2,588*	*5,618*			*193*		*79.989/LF*	*8,399*
		105.00 LF										
		39.529 Labor hours 9.882 Equipment hours										
		05.50.00.035 (11) Splitter Box - Metal Ladder into Splitter Box Cells, 21 LF - 5 EA			*2,588*	*5,618*	*0*		*193*	*0*	*79.989/LF*	*8,399*
		105.00 LF										
		39.529 Labor hours 9.882 Equipment hours										
05.50.00.040		*(11) Splitter Box - Metal Stairs, Exterior - 32 Riser*										
05 50 00.315		*Metal Stairs - Aluminum*										
	0050	Stair, shop fabricated, steel, 4'-0" W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser	32.00	RISR	2,235	16,480	-		167	-	590.053 /RISR	18,882
	0132	Floor grating, aluminum, 1-1/2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., up to 300 S.F., field fabricated from panels	16.00	sf	48	736	-		4	-	49.216 /sf	787
		05 50 00.315 Metal Stairs - Aluminum			*2,283*	*17,216*			*170*		*614.661/RISR*	*19,669*
		32.00 RISR										
		34.865 Labor hours 8.716 Equipment hours										
		05.50.00.040 (11) Splitter Box - Metal Stairs, Exterior - 32 Riser			*2,283*	*17,216*	*0*		*170*	*0*	*614.661/RISR*	*19,669*
		32.00 RISR										
		34.865 Labor hours 8.716 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.52.02.005		*(11) Splitter Box - Aluminum Handrail - 3-Rail - 4' High - 95 LF*										
05 52 02.002		*Aluminum Railings - 3 Rail*										
	0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	95.00	LF	1,453	9,073	-		108	-	111.935 /LF	10,634
		05 52 02.002 Aluminum Railings - 3 Rail			*1,453*	*9,073*			*108*		*111.935/LF*	*10,634*
		95.00 LF										
		22.190 Labor hours										
		5.547 Equipment hours										
		05.52.02.005 (11) Splitter Box - Aluminum Handrail - 3-Rail - 4' High - 95 LF			*1,453*	*9,073*	*0*		*108*	*0*	*111.935/LF*	*10,634*
		95.00 LF										
		22.190 Labor hours										
		5.547 Equipment hours										
		DIVISION 05 METALS			**9,426**	**57,829**	**0**		**525**	**0**		**67,780**
		144.493 Labor hours										
		26.866 Equipment hours										
DIVISION 31		**EARTHWORK**										
31.23.10.015		*(11) Splitter Box, Excavation, Backfill and Haul Off-Site*										
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	83.00	CY	31	-	-		79	-	1.335 /CY	111
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	12.40	CY	7	-	-		17	-	1.911 /CY	24
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	88.00	CY	1,001	-	-		1,375	-	27.002 /CY	2,376
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	12.40	CY	6	-	-		12	-	1.418 /CY	18
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*1,045*				*1,483*		*12.913/CY*	*2,528*
		195.80 CY										
		18.828 Labor hours										
		18.477 Equipment hours										
		31.23.10.015 (11) Splitter Box, Excavation, Backfill and Haul Off-Site			*1,045*	*0*	*0*		*1,483*	*0*	*12.913/CY*	*2,528*
		195.80 CY										
		18.828 Labor hours										
		18.477 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 31 EARTHWORK			**1,045**	**0**	**0**		**1,483**	**0**	**12.913/CY**	**2,528**
		195.80 CY										
		18.828 Labor hours										
		18.477 Equipment hours										
DIVISION 33		**UTILITIES (BURIED PIPE AND VALVES)**										
33.05.15.010		*(11) Flow Meter Vault, 10' x 5' x 6' - 1 EA*										
33 05 15.020		*Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep*										
	0100	Utility structures, utility vaults precast concrete, 5' x 10' x 6' high, I.D., 6" thick, excludes excavation and backfill	1.00	EA	1,452	18,000	-		1,043	-	20,494.80 /EA	20,495
		33 05 15.020 Precast Utility (Vault) Structures, 10' Long x 5' Wide x 06' Deep			*1,452*	*18,000*			*1,043*		*20,494.80 /EA*	*20,495*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										
		33.05.15.010 (11) Flow Meter Vault, 10' x 5' x 6' - 1 EA			*1,452*	*18,000*	*0*		*1,043*	*0*	*20,494.80 /EA*	*20,495*
		1.00 EA										
		28.00 Labor hours										
		4.00 Equipment hours										
33.05.19.020		*(11) Buried Pipe, INF - 54" Dia - 11 LF*										
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	11.00	lf	27	1	-		2	-	2.767 /lf	30
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		136	-	136.44 /day	136
	1372	Excavating, trench or continuous footing, common earth, 2-1/2 C.Y. excavator, 6' to 10' deep, includes trench box, excludes dewatering	44.00	bcy	43	-	-		79	-	2.758 /bcy	121
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	23.00	lcy	18	-	-		41	-	2.548 /lcy	59
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	20.00	ecy	21	-	-		64	-	4.244 /ecy	85
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	21.00	lcy	173	651	-		32	-	40.74 /lcy	856
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	19.00	ecy	74	-	-		10	-	4.407 /ecy	84
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41
n	3286	Distribution piping,DIP,cement lined,fastite,20' lengths, 54"dia, Press Class 250, Excludes excavation, backfill, bedding	11.00	LF	757	9,117	-		429	-	936.564 /LF	10,302

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Unit Cost	Total Amount
33 05 19.054		*Buried Pipe, Ductile Iron, 54" Dia*										
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	11.00	lf		1,819	-			-	165.34 /lf	1,819
	8070	Fitting, 90 degree bend,DIP,cement lined,LKR,54"dia,C153 water piping	2.00	ea	1,616	62,748	-		1,492	-	32,928.285 /ea	65,857
n	4715	DIP,Polywrap 8 mil LDT 220ft,54"dia	1.00	roll	56	1,242	-		-	-	1,297.51 /roll	1,298
		33 05 19.054 Buried Pipe, Ductile Iron, 54" Dia			*2,787*	*75,616*			*2,285*		*7,335.154/LF*	*80,687*
		11.00 LF										
		49.249 Labor hours										
		22.168 Equipment hours										
		33.05.19.020 (11) Buried Pipe, INF - 54" Dia - 11 LF			*2,787*	*75,616*	*0*		*2,285*	*0*	*7,335.154/LF*	*80,687*
		11.00 LF										
		49.249 Labor hours										
		22.168 Equipment hours										
33.05.19.025		*(11) Buried Pipe, PSG - 30" Dia - 156 LF*										
33 05 19.030		*Buried Pipe, Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	156.00	lf	385	12	-		35	-	2.767 /lf	432
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		136	-	136.44 /day	136
	0500	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 6' to 10' deep, excludes sheeting or dewatering	395.00	bcy	1,595	-	-		1,297	-	7.320 /bcy	2,891
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	243.00	lcy	187	-	-		432	-	2.548 /lcy	619
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	211.00	ecy	225	-	-		670	-	4.243 /ecy	895
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	179.00	lcy	1,472	5,549	-		271	-	40.74 /lcy	7,292
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	156.00	ecy	608	-	-		80	-	4.407 /ecy	687
	00500	6" Wide Underground Utility Marking Tape	2.00	clf	5	76	-		-	-	40.70 /clf	81
n	3206	Distribution piping,DIP,cement lined,fastite,20' lengths, 30"dia, Press Class 250, Excludes excavation, backfill, bedding	156.00	LF	6,977	35,565	-		2,631	-	289.574 /LF	45,174
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	52.00	lf		8,598	-			-	165.34 /lf	8,598
	8050	Fitting, 90 degree bend,DIP,cement lined,MJ,30"dia,C110 water piping	4.00	ea	2,303	32,560	-		1,077	-	8,985.015 /ea	35,940
	8620	Fitting, dished cap,DIP,cement lined,MJ,30"dia,C110 water piping	2.00	ea	1,152	4,413	-		538	-	3,051.41 /ea	6,103
n	4711	DIP,Polywrap 8 mil LDT 440ft,30"dia	1.00	roll	56	1,548	-		-	-	1,603.26 /roll	1,603

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.030 Buried Pipe, Ductile Iron, 30" Dia			*14,965*	*88,320*			*7,167*		*708.031/LF*	*110,453*
		156.00 LF										
		270.685 Labor hours										
		87.873 Equipment hours										
		33.05.19.025 (11) Buried Pipe, PSG - 30" Dia - 156 LF			*14,965*	*88,320*	*0*		*7,167*	*0*	*708.031/LF*	*110,453*
		156.00 LF										
		270.685 Labor hours										
		87.873 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**19,204**	**181,935**	**0**		**10,495**	**0**	**1,267.271/LF**	**211,634**
		167.00 LF										
		347.933 Labor hours										
		114.041 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.010 (11) Exposed Pipe - INF - 54" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.054		*Pipe and Fittings - Ductile Iron, 54" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	5	0	-		0	-	2.77 /LF	6
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	12	7	-		-	-	18.83 /ea	19
	0833	Gasket and bolt set, for flanges, 150 lb., 54" pipe size	1.00	ea	797	2,634	-		-	-	3,430.95 /ea	3,431
n	0640	DIP,FLGxFLG,54"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	627	25,539	-		-	-	26,166.68 /ea	26,167
		40 05 19.054 Pipe and Fittings - Ductile Iron, 54" Dia			*1,441*	*28,181*			*0*		*14,811.00 /LF*	*29,622*
		2.00 LF										
		22.601 Labor hours										
		0.032 Equipment hours										
		40.05.19.010 (11) Exposed Pipe - INF - 54" Dia - Wall Pipe			*1,441*	*28,181*	*0*		*0*	*0*	*14,811.00 /LF*	*29,622*
		2.00 LF										
		22.601 Labor hours										
		0.032 Equipment hours										

40.05.19.015 (11) Exposed Pipe - PSG - 30" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	20	1	-		2	-	2.766 /LF	22

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	4.00	ea	46	29	-		-	-	18.828 /ea	75
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	4.00	ea	1,647	3,600	-		-	-	1,311.715 /ea	5,247
n	0460	DIP,FLGxFLG,30"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	1,066	32,957	-		-	-	8,505.695 /ea	34,023
		40 05 19.030 Pipe and Fittings - Ductile Iron, 30" Dia *8.00 LF* 43.017 Labor hours 0.128 Equipment hours			*2,779*	*36,587*			*2*		*4,920.885/LF*	*39,367*
		40.05.19.015 (11) Exposed Pipe - PSG - 30" Dia - Wall Pipe *8.00 LF* 43.017 Labor hours 0.128 Equipment hours			*2,779*	*36,587*	*0*		*2*	*0*	*4,920.885/LF*	*39,367*
40.05.59.005		*(11) Water Control Gates - 60" x 36"*										
40 05 59.160		*Fabricated Stainless Steel Slide or Weir Gate, 60" x 36"*										
	9999	Slide gates, hydraulic structures, 316 stainless steel, self contained, incl embedded frame, yoke mounted handwheel, BY SQUARE FOOT	15.00	SF	1,839	10,950	-		4,754	59	1,173.49 /SF	17,602
	9999	Slide gates, hydraulic structures, 316 stainless steel, self contained, incl embedded frame, yoke mounted handwheel, BY SQUARE FOOT	15.00	SF	1,839	10,950	-		4,754	59	1,173.49 /SF	17,602
		40 05 59.160 Fabricated Stainless Steel Slide or Weir Gate, 60" x 36" *30.00 SF* 55.80 Labor hours 62.50 Equipment hours			*3,678*	*21,900*			*9,508*	*119*	*1,173.49 /SF*	*35,205*
		40.05.59.005 (11) Water Control Gates - 60" x 36" *30.00 SF* 55.80 Labor hours 62.50 Equipment hours			*3,678*	*21,900*	*0*		*9,508*	*119*	*1,173.49 /SF*	*35,205*
40.05.64.005		*(11) Exposed Valves - PSG - Butterfly Valve - 30" Dia - 2 EA*										
40 05 64.130		*Exposed Valves - Butterfly Valve, Ductille Iron, 30" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	4.00	ea	1,647	3,600	-		-	-	1,311.715 /ea	5,247
	02010	30" DIP Filler Flange 3" thick	2.00	ea	160	466	-		-	-	312.875 /ea	626

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 64.130		*Exposed Valves - Butterfly Valve, Ductile Iron, 30" Dia*										
n	1110	Butterfly Valve Flange Res Seated: 30" / Handwheel Operator with Gearing	2.00	EA	3,818	28,288	-			-	16,052.795 /EA	32,106
		40 05 64.130 Exposed Valves - Butterfly Valve, Ductile Iron, 30" Dia			*5,682*	*32,391*					*19,036.170/EA*	*38,072*
		2.00 EA										
		78.917 Labor hours										
		40.05.64.005 (11) Exposed Valves - PSG - Butterfly Valve - 30" Dia - 2 EA			*5,682*	*32,391*	*0*		*0*	*0*	*19,036.170/EA*	*38,072*
		2.00 EA										
		78.917 Labor hours										
40.71.00.020		*(11) Exposed Pipe - PSG - Flow Meter - 30" Dia*										
40 71 00.130		*Flow Meter Magnetic, 30"*										
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	2.00	ea	823	1,800	-		-	-	1,311.715 /ea	2,623
	0180	Flow Meter Magnetic, 30"	1.00	EA	1,010	7,000					8,010.25 /EA	8,010
		40 71 00.130 Flow Meter Magnetic, 30"			*1,834*	*8,800*					*10,633.68 /EA*	*10,634*
		1.00 EA										
		26.429 Labor hours										
		40.71.00.020 (11) Exposed Pipe - PSG - Flow Meter - 30" Dia			*1,834*	*8,800*	*0*		*0*	*0*	*10,633.68 /EA*	*10,634*
		1.00 EA										
		26.429 Labor hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**15,413**	**127,858**	**0**		**9,511**	**119**	**15,289.98 /LF**	**152,900**
		10.00 LF										
		226.764 Labor hours										
		62.66 Equipment hours										
		095 SPLITTER BOX			***111,978***	***425,371***	***0***		***23,669***	***119***	***561,136.04 /LS***	***561,136***
		1.00 LS										
		1,901.953 Labor hours										
		265.206 Equipment hours										

100 SUPER PULSATORS

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03			**CONCRETE**									
03.11.13.015		*(15) Super Pulsators - Base Slab - 7,255 sf - 18" Thick*										
03 11 13.766		*18" Foundation Slab*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	585.00	sfca	2,400	714	-		-	-	5.322 /sfca	3,113
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	35.35	ton	1,271	-	-		737	-	56.816 /ton	2,008
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	35.35	ton	31,747	51,258	-		-	-	2,348.087 /ton	83,005
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	35.35	ton	3,632	-	-		2,107	-	162.331 /ton	5,738
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	404.00	cy	7,085	-	-		1,078	-	20.206 /cy	8,163
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	40.40	cy	709	-	-		108	-	20.206 /cy	816
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	404.00	CY	-	74,740	-		-	-	185.00 /CY	74,740
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	40.40	cy	-	7,474	-		-	-	185.00 /cy	7,474
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	7,255.00	sf	5,320	-	-		391	-	0.787 /sf	5,711
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	362.75	lf	160	11	-		22	-	0.529 /lf	192
n	0215	Control joint, clean out control joint of debris_SOG	362.75	lf	27	-	-			-	0.073 /lf	27
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	362.75	lf	591	58	-		-	-	1.790 /lf	649
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	72.55	csf	577	541	-		-	-	15.408 /csf	1,118
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	72.55	sq	919	591	-		-	-	20.820 /sq	1,511
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	309.00	ecy	3,370	9,888	-		382	-	44.143 /ecy	13,640
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	309.00	lcy	2,538	-	-		3,835	-	20.626 /lcy	6,373

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report - Direct Costs

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.766 18" Foundation Slab			*60,346*	*145,274*			*8,660*		*530.395/CY*	*214,280*
		404.00 CY										
		1,021.686 Labor hours										
		206.611 Equipment hours										
		03.11.13.015 (15) Super Pulsators - Base Slab - 7,255 sf - 18" Thick			*60,346*	*145,274*	*0*		*8,660*	*0*	*530.395/CY*	*214,280*
		404.00 CY										
		1,021.686 Labor hours										
		206.611 Equipment hours										
	03.11.13.020	*(15) Super Pulsators - Walls - 17'-6" High - 18" Thick - 228 LF*										
	03 11 13.811	*18" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	200.00	lf	2,078	680	-		-	-	13.792 /lf	2,758
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	7,980.00	sfca	55,638	7,900	-		-	-	7.962 /sfca	63,538
	5200	Chamfer strip, wood, 3/4" wide	399.00	lf	356	56	-		-	-	1.033 /lf	412
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	7.00	c	-	455	-		-	-	65.00 /c	455
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	157.916	lf	511	1,184	-		-	-	10.733 /lf	1,695
	0100	Splice rebar, standard, self-aligning type, taper threaded, #4 bars, includes holding rebar in place while splicing	244.20	ea	2,093	3,126	-		-	-	21.373 /ea	5,219
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	22.20	ton	798	-	-		463	-	56.816 /ton	1,261
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	22.20	ton	868	-	-		503	-	61.758 /ton	1,371
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	22.20	ton	15,285	32,190	-		-	-	2,138.533 /ton	47,475
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	222.00	cy	6,548	-	-		996	-	33.983 /cy	7,544
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	22.20	cy	655	-	-		100	-	33.982 /cy	754
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	222.00	CY	-	41,070	-		-	-	185.00 /CY	41,070
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	22.20	cy	-	4,107	-		-	-	185.00 /cy	4,107

John F. Kime Water Treatment Plant Expansion

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0210	Control joint, clean out control joint of debris_WALLS	200.00	lf	15	-	-			-	0.073 /lf	15
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	200.00	lf	326	32	-		-	-	1.790 /lf	358
	0020	Concrete finishing, walls, includes breaking ties and patching voids	7,980.00	sf	6,502	319	-		-	-	0.855 /sf	6,821
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	3,990.00	sf	3,901	160	-		-	-	1.018 /sf	4,061
		03 11 13.811 18" CIP Wall			*95,575*	*91,279*			*2,062*		*850.973/CY*	*188,916*
		222.00 CY										
		1,662.041 Labor hours										
		56.987 Equipment hours										
		03.11.13.020 (15) Super Pulsators - Walls - 17'-6" High - 18" Thick - 228 LF			*95,575*	*91,279*	*0*		*2,062*	*0*	*850.973/CY*	*188,916*
		222.00 CY										
		1,662.041 Labor hours										
		56.987 Equipment hours										
03.11.13.025		*(15) Super Pulsators - Walls - 12'-6" High - 18" Thick - 85 LF*										
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	54.00	lf	561	184	-		-	-	13.792 /lf	745
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,125.00	sfca	14,816	2,104	-		-	-	7.962 /sfca	16,920
n	5200	Chamfer strip, wood, 3/4" wide	107.00	lf	96	15	-		-	-	1.033 /lf	111
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	130	-		-	-	65.00 /c	130
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	139.00	lf	449	1,015	-		-	-	10.533 /lf	1,464
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.00	ton	4,131	8,700	-		-	-	2,138.533 /ton	12,831
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	6.00	ton	216	-	-		125	-	56.817 /ton	341
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	6.00	ton	235	-	-		136	-	61.758 /ton	371
n	0210	Control joint, clean out control joint of debris_WALLS	54.00	lf	4	-	-		-	-	0.073 /lf	4
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	54.00	lf	88	9	-		-	-	1.790 /lf	97
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,125.00	sf	1,731	85	-		-	-	0.855 /sf	1,816
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,062.50	sf	1,039	43	-		-	-	1.018 /sf	1,081

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	60.00	cy	1,770	-	-		269	-	33.983 /cy	2,039
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	60.00	CY	-	11,100	-		-	-	185.00 /CY	11,100
		03 11 13.811 18" CIP Wall			*25,135*	*23,383*			*530*		*817.484/CY*	*49,049*
		60.00 CY										
		435.272 Labor hours										
		14.093 Equipment hours										
		03.11.13.025 (15) Super Pulsators - Walls - 12'-6" High - 18" Thick - 85 LF			*25,135*	*23,383*	*0*		*530*	*0*	*817.484/CY*	*49,049*
		60.00 CY										
		435.272 Labor hours										
		14.093 Equipment hours										
03.11.13.030		*(15) Super Pulsators - Walls - 21' High - 14" Thick - 69 LF*										
03 11 13.806		*14" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	73.00	lf	759	248	-		-	-	13.792 /lf	1,007
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,898.00	sfca	20,205	2,869	-		-	-	7.962 /sfca	23,074
n	5200	Chamfer strip, wood, 3/4" wide	145.00	lf	129	20	-		-	-	1.033 /lf	150
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	195	-		-	-	65.00 /c	195
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	142.00	lf	459	1,037	-		-	-	10.533 /lf	1,496
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.30	ton	4,338	9,135	-		-	-	2,138.533 /ton	13,473
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	6.30	ton	227	-	-		131	-	56.816 /ton	358
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	6.30	ton	246	-	-		143	-	61.757 /ton	389
n	0210	Control joint, clean out control joint of debris_WALLS	73.00	lf	5	-	-		-	-	0.073 /lf	5
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	73.00	lf	119	12	-		-	-	1.790 /lf	131
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,898.00	sf	2,361	116	-		-	-	0.855 /sf	2,477
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,449.00	sf	1,417	58	-		-	-	1.018 /sf	1,475

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.806		*14" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	63.00	cy	1,858	-	-		283	-	33.983 /cy	2,141
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	63.00	CY	-	11,655	-		-	-	185.00 /CY	11,655
		03 11 13.806 14" CIP Wall			*32,124*	*25,345*			*557*		*921.037/CY*	*58,025*
		63.00 CY										
		557.599 Labor hours										
		14.797 Equipment hours										
		03.11.13.030 (15) Super Pulsators - Walls - 21' High - 14" Thick - 69 LF			*32,124*	*25,345*	*0*		*557*	*0*	*921.037/CY*	*58,025*
		63.00 CY										
		557.599 Labor hours										
		14.797 Equipment hours										
03.11.13.035		*(15) Super Pulsators - Walls - 17' High - 12" Thick - 54 LF*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	46.00	lf	478	156	-		-	-	13.792 /lf	634
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	1,836.00	sfca	12,801	1,818	-		-	-	7.962 /sfca	14,619
n	5200	Chamfer strip, wood, 3/4" wide	92.00	lf	82	13	-		-	-	1.033 /lf	95
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	130	-		-	-	65.00 /c	130
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	100.00	lf	323	730	-		-	-	10.533 /lf	1,053
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.40	ton	2,341	4,930	-		-	-	2,138.532 /ton	7,271
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	3.40	ton	122	-	-		71	-	56.815 /ton	193
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	3.40	ton	133	-	-		77	-	61.756 /ton	210
n	0210	Control joint, clean out control joint of debris_WALLS	46.00	lf	3	-	-		-	-	0.073 /lf	3
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	46.00	lf	75	7	-		-	-	1.790 /lf	82
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	1,836.00	sf	1,496	73	-		-	-	0.855 /sf	1,569
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	918.00	sf	898	37	-		-	-	1.018 /sf	934

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	34.00	cy	1,003	-	-		153	-	33.983 /cy	1,155
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	34.00	CY	-	6,290	-		-	-	185.00 /CY	6,290
		03 11 13.804 12" CIP Wall			*19,755*	*14,184*			*301*		*1,007.067/CY*	*34,240*
		34.00 CY										
		343.326 Labor hours										
		7.986 Equipment hours										
		03.11.13.035 (15) Super Pulsators - Walls - 17' High - 12" Thick - 54 LF			*19,755*	*14,184*	*0*		*301*	*0*	*1,007.067/CY*	*34,240*
		34.00 CY										
		343.326 Labor hours										
		7.986 Equipment hours										
03.11.13.040		*(15) Super Pulsators - Walls - 20' High - 12" Thick - 72 LF*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	72.00	lf	748	245	-		-	-	13.793 /lf	993
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,880.00	sfca	20,080	2,851	-		-	-	7.962 /sfca	22,931
n	5200	Chamfer strip, wood, 3/4" wide	144.00	lf	129	20	-		-	-	1.033 /lf	149
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	195	-		-	-	65.00 /c	195
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	144.00	lf	466	1,051	-		-	-	10.533 /lf	1,517
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.40	ton	3,718	7,830	-		-	-	2,138.533 /ton	11,548
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.40	ton	194	-	-		113	-	56.815 /ton	307
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.40	ton	211	-	-		122	-	61.757 /ton	333
n	0210	Control joint, clean out control joint of debris_WALLS	72.00	lf	5	-	-		-	-	0.073 /lf	5
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	72.00	lf	117	12	-		-	-	1.790 /lf	129
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,880.00	sf	2,347	115	-		-	-	0.855 /sf	2,462
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,440.00	sf	1,408	58	-		-	-	1.018 /sf	1,466

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	54.00	cy	1,593	-	-		242	-	33.983 /cy	1,835
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	54.00	CY	-	9,990	-		-	-	185.00 /CY	9,990
		03 11 13.804 12" CIP Wall			*31,015*	*22,367*			*477*		*997.399/CY*	*53,860*
		54.00 CY										
		538.980 Labor hours										
		12.683 Equipment hours										
		03.11.13.040 (15) Super Pulsators - Walls - 20' High - 12" Thick - 72 LF			*31,015*	*22,367*	*0*		*477*	*0*	*997.399/CY*	*53,860*
		54.00 CY										
		538.980 Labor hours										
		12.683 Equipment hours										
03.11.13.045		*(15) Super Pulsators - Walls - 21' High - 12" Thick - 69 LF*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	73.00	lf	759	248	-		-	-	13.792 /lf	1,007
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	2,898.00	sfca	20,205	2,869	-		-	-	7.962 /sfca	23,074
n	5200	Chamfer strip, wood, 3/4" wide	145.00	lf	129	20	-		-	-	1.033 /lf	150
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	3.00	c	-	195	-		-	-	65.00 /c	195
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	142.00	lf	459	1,037	-		-	-	10.533 /lf	1,496
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.40	ton	3,718	7,830	-		-	-	2,138.533 /ton	11,548
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.40	ton	194	-	-		113	-	56.815 /ton	307
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.40	ton	211	-	-		122	-	61.757 /ton	333
n	0210	Control joint, clean out control joint of debris_WALLS	73.00	lf	5	-	-		-	-	0.073 /lf	5
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	73.00	lf	119	12	-		-	-	1.790 /lf	131
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	2,898.00	sf	2,361	116	-		-	-	0.855 /sf	2,477
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	1,449.00	sf	1,417	58	-		-	-	1.018 /sf	1,475

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Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804	*12" CIP Wall*										
5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	54.00	cy	1,593	-	-		242	-	33.983 /cy	1,835
n 0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	54.00	CY	-	9,990	-		-	-	185.00 /CY	9,990
	03 11 13.804 12" CIP Wall			*31,171*	*22,375*			*477*		*1,000.427/CY*	*54,023*
	54.00 CY										
	541.711 Labor hours										
	12.683 Equipment hours										
	03.11.13.045 (15) Super Pulsators - Walls - 21' High - 12" Thick - 69 LF			*31,171*	*22,375*	*0*		*477*	*0*	*1,000.427/CY*	*54,023*
	54.00 CY										
	541.711 Labor hours										
	12.683 Equipment hours										
03.11.13.050	*(15) Super Pulsators - Walls - 4'-7" High - 8" Thick - 78 LF*										
03 11 13.801	*08" CIP Wall*										
n 0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	18.00	lf	187	61	-		-	-	13.792 /lf	248
n 2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	714.48	sfca	4,981	707	-		-	-	7.962 /sfca	5,689
n 5200	Chamfer strip, wood, 3/4" wide	36.00	lf	32	5	-		-	-	1.033 /lf	37
n 1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n 3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	96.00	lf	310	701	-		-	-	10.533 /lf	1,011
n 0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.90	ton	620	1,305	-		-	-	2,138.533 /ton	1,925
n 2020	Reinforcing steel, unload and sort, add to base_WALLS	0.90	ton	32	-	-		19	-	56.811 /ton	51
n 2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.90	ton	35	-	-		20	-	61.76 /ton	56
n 0210	Control joint, clean out control joint of debris_WALLS	18.00	lf	1	-	-		-	-	0.073 /lf	1
n 0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	18.00	lf	29	3	-		-	-	1.789 /lf	32
n 0020	Concrete finishing, walls, includes breaking ties and patching voids	714.48	sf	582	29	-		-	-	0.855 /sf	611
n 0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	357.24	sf	349	14	-		-	-	1.018 /sf	364

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	9.00	cy	265	-	-		40	-	33.982 /cy	306
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	9.00	CY	-	1,665	-		-	-	185.00 /CY	1,665
		03 11 13.801 08" CIP Wall			*7,426*	*4,555*			*80*		*1,340.057/CY*	*12,061*
		9.00 CY										
		129.309 Labor hours 2.114 Equipment hours										
		03.11.13.050 (15) Super Pulsators - Walls - 4'-7" High - 8" Thick - 78 LF			*7,426*	*4,555*	*0*		*80*	*0*	*1,340.057/CY*	*12,061*
		9.00 CY										
		129.309 Labor hours 2.114 Equipment hours										
03.11.13.055		*(15) Super Pulsators - Walls - 3'-6" High - 8" Thick - 674 LF*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	118.00	lf	1,226	401	-		-	-	13.792 /lf	1,628
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	4,718.00	sfca	32,895	4,671	-		-	-	7.962 /sfca	37,565
n	5200	Chamfer strip, wood, 3/4" wide	236.00	lf	211	33	-		-	-	1.033 /lf	244
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	4.00	c	-	260	-		-	-	65.00 /c	260
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	792.00	lf	2,561	5,782	-		-	-	10.533 /lf	8,342
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	5.90	ton	4,062	8,555	-		-	-	2,138.534 /ton	12,617
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	5.90	ton	212	-	-		123	-	56.815 /ton	335
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	5.90	ton	231	-	-		134	-	61.758 /ton	364
n	0210	Control joint, clean out control joint of debris_WALLS	118.00	lf	9	-	-		-	-	0.073 /lf	9
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	118.00	lf	192	19	-		-	-	1.790 /lf	211
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	4,718.00	sf	3,844	189	-		-	-	0.855 /sf	4,033
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,359.00	sf	2,307	94	-		-	-	1.018 /sf	2,401

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	59.00	cy	1,740	-	-		265	-	33.983 /cy	2,005
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	59.00	CY	-	10,915	-		-	-	185.00 /CY	10,915
		03 11 13.801 08" CIP Wall			*49,489*	*30,919*			*522*		*1,371.687/CY*	*80,930*
		59.00 CY										
		861.634 Labor hours										
		13.858 Equipment hours										
		03.11.13.055 (15) Super Pulsators - Walls - 3'-6" High - 8" Thick - 674 LF			*49,489*	*30,919*	*0*		*522*	*0*	*1,371.687/CY*	*80,930*
		59.00 CY										
		861.634 Labor hours										
		13.858 Equipment hours										
03.11.13.060		*(15) Super Pulsators - Column Footings - 16"x16"x 16" Thick - 4 EA*										
03 11 13.250		*Column Footings*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	32.00	sfca	163	22	-		-	-	5.798 /sfca	186
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.563	ton	20	-	-		12	-	56.803 /ton	32
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.563	ton	22	-	-		13	-	61.758 /ton	35
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.563	ton	506	524	-		-	-	1,828.08 /ton	1,029
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.00	cy	88	-	-		13	-	20.206 /cy	101
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.50	cy	9	-	-		1	-	20.20 /cy	10
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.00	CY	-	900	-		-	-	180.00 /CY	900
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.50	cy	-	90	-		-	-	180.00 /cy	90
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	16.00	sf	5	-	-		-	-	0.314 /sf	5
		03 11 13.250 Column Footings			*813*	*1,536*			*39*		*477.534/CY*	*2,388*
		5.00 CY										
		13.416 Labor hours										
		0.808 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.060 (15) Super Pulsators - Colunm Footings - 16"x16"x 16" Thick - 4 EA			*813*	*1,536*	*0*		*39*	*0*	*477.534/CY*	*2,388*
		5.00 CY										
		13.416 Labor hours										
		0.808 Equipment hours										
03.11.13.065		*(15) Super Pulsators - Colunms for Effluent Trough - 12"x12"x 6'-4" High - 4 EA*										
03 11 13.709		*CIP Sqr Col 12"*										
	6650	C.I.P. concrete forms, column, square, plywood, 24" x 24", 4 use, includes erecting, bracing, stripping and cleaning	58.64	sfca	440	84	-		-	-	8.928 /sfca	524
n	0202	Ties, for coil tie system, for CIP column forms, 1/2", 6000#, 36", includes material only	4.00	c	-	1,900	-		-	-	475.00 /c	1,900
n	2030	Reinforcing steel, unload and sort, add to base_COLUMNS	0.234	ton	8	-	-		5	-	56.80 /ton	13
n	2216	Reinforcing steel, crane cost for handling, average, add_COLUMNS	0.234	ton	9	-	-		5	-	61.80 /ton	14
	0250	Reinforcing steel, in place, columns, #8 to #18, A615, grade 60, incl labor for accessories, excl material for accessories	0.234	ton	210	339	-		-	-	2,348.08 /ton	549
	0400	Structural concrete, placing, column, square or round, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	0.938	cy	51	-	-		8	-	62.30 /cy	58
	0400	Structural concrete, placing, column, square or round, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	0.094	cy	5	-	-		1	-	62.20 /cy	6
n	0625	Struct COLUMNS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.938	CY	-	174	-		-	-	185.00 /CY	174
n	0625	Struct COLUMNS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.094	cy	-	17	-		-	-	185.00 /cy	17
n	0022	Concrete finishing, columns, includes breaking ties and patching voids	58.64	sf	48	2	-		-	-	0.845 /sf	50
		03 11 13.709 CIP Sqr Col 12"			*771*	*2,516*			*19*		*3,523.94 /CY*	*3,305*
		0.938 CY										
		13.383 Labor hours										
		0.452 Equipment hours										
		03.11.13.065 (15) Super Pulsators - Colunms for Effluent Trough - 12"x12"x 6'-4" High - 4 EA			*771*	*2,516*	*0*		*19*	*0*	*3,523.94 /CY*	*3,305*
		0.938 CY										
		13.383 Labor hours										
		0.452 Equipment hours										

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.070		*(15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick*										
03 11 13.303		*12" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	16.00	csf	3,000	-	-		-	-	187.52 /csf	3,000
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	48.00	csf	-	3,096	-		-	-	64.50 /csf	3,096
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,599.00	sf	8,095	3,518	-		-	-	7.263 /sf	11,613
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1.00	lf	4	0	-		-	-	3.88 /lf	4
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	6.638	ton	239	-	-		138	-	56.817 /ton	377
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	6.638	ton	259	-	-		151	-	61.758 /ton	410
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.638	ton	4,728	9,625	-		-	-	2,162.276 /ton	14,353
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	59.00	cy	1,196	-	-		182	-	23.363 /cy	1,378
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	5.90	cy	120	-	-		18	-	23.363 /cy	138
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	59.00	CY	-	10,915	-		-	-	185.00 /CY	10,915
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.90	cy	-	1,092	-		-	-	185.00 /cy	1,092
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,599.00	sf	1,173	-	-		86	-	0.787 /sf	1,259
n	9000	Concrete finishing, elev slabs, includes patching voids	1,599.00	sf	1,302	48	-		-	-	0.845 /sf	1,350
		03 11 13.303 12" Elevated Slab			*20,116*	*28,294*			*575*		*830.258/CY*	*48,985*
		59.00 CY										
		345.368 Labor hours										
		18.295 Equipment hours										
		03.11.13.070 (15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick			*20,116*	*28,294*	*0*		*575*	*0*	*830.258/CY*	*48,985*
		59.00 CY										
		345.368 Labor hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.070 (15) Super Pulsators - Elevated Slab - 1,599 SF - 12" Thick			*20,116*	*28,294*	*0*		*575*	*0*	*830.258/CY*	*48,985*
		59.00 CY										
		345.368 Labor hours										
		18.295 Equipment hours										
03.11.13.075		*(15) Super Pulsators - Elevated Slab - 1,341 SF - 8" Thick*										
03 11 13.301		*08" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	14.00	csf	2,625	-	-		-	-	187.52 /csf	2,625
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	41.00	csf	-	2,645	-		-	-	64.50 /csf	2,645
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,341.00	sf	6,789	2,950	-		-	-	7.263 /sf	9,739
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	314.00	lf	1,121	97	-		-	-	3.879 /lf	1,218
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	3.713	ton	134	-	-		77	-	56.814 /ton	211
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	3.713	ton	145	-	-		84	-	61.756 /ton	229
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.713	ton	2,645	5,384	-		-	-	2,162.276 /ton	8,029
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	33.00	cy	669	-	-		102	-	23.363 /cy	771
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	3.30	cy	67	-	-		10	-	23.364 /cy	77
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	33.00	CY	-	6,105	-		-	-	185.00 /CY	6,105
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.30	cy	-	611	-		-	-	185.00 /cy	611
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,341.00	sf	983	-	-		72	-	0.787 /sf	1,056
n	9000	Concrete finishing, elev slabs, includes patching voids	1,341.00	sf	1,092	40	-		-	-	0.845 /sf	1,133

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.301 08" Elevated Slab			*16,270*	*17,832*			*346*		*1,043.858/CY*	*34,447*
		33.00 CY										
		281.671 Labor hours										
		12.314 Equipment hours										
		03.11.13.075 (15) Super Pulsators - Elevated Slab - 1,341 SF - 8" Thick			*16,270*	*17,832*	*0*		*346*	*0*	*1,043.858/CY*	*34,447*
		33.00 CY										
		281.671 Labor hours										
		12.314 Equipment hours										
03.11.13.080		*(15) Super Pulsators - Elevated Slab - 1,493 SF - 6" Thick*										
03 11 13.300		*06" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	15.00	csf	2,813	-	-		-	-	187.52 /csf	2,813
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	45.00	csf	-	2,903	-		-	-	64.50 /csf	2,903
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,493.00	sf	7,558	3,285	-		-	-	7.263 /sf	10,843
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	584.00	lf	2,084	181	-		-	-	3.879 /lf	2,265
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	3.15	ton	113	-	-		66	-	56.816 /ton	179
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	3.15	ton	123	-	-		71	-	61.759 /ton	195
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.15	ton	2,244	4,568	-		-	-	2,162.276 /ton	6,811
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	28.00	cy	568	-	-		86	-	23.363 /cy	654
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	2.80	cy	57	-	-		9	-	23.364 /cy	65
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	28.00	CY	-	5,180	-		-	-	185.00 /CY	5,180
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.80	cy	-	518	-		-	-	185.00 /cy	518
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,493.00	sf	1,095	-	-		80	-	0.787 /sf	1,175

John F. Kime Water Treatment Plant Expansion

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.300		*06" Elevated Slab*										
n	9000	Concrete finishing, elev slabs, includes patching voids	1,493.00	sf	1,216	45	-		-	-	0.845 /sf	1,261
		03 11 13.300 06" Elevated Slab			*17,871*	*16,678*			*313*		*1,245.070/CY*	*34,862*
		28.00 CY										
		310.870 Labor hours										
		12.103 Equipment hours										
		03.11.13.080 (15) Super Pulsators - Elevated Slab - 1,493 SF - 6" Thick			*17,871*	*16,678*	*0*		*313*	*0*	*1,245.070/CY*	*34,862*
		28.00 CY										
		310.870 Labor hours										
		12.103 Equipment hours										
03.11.13.085		*(15) Super Pulsators - Grout Topping - 6" Thick - 2,521 SF*										
03 11 13.406		*Grout Fill*										
	4350	Structural concrete, placing, slab on grade, pumped, up to 6" thick, includes leveling (strike off) & consolidation, excludes material	47.00	cy	1,173	-	-		178	-	28.755 /cy	1,351
n	4350	Strt concret,ready mix,flowabl fill,strt,1000 psi,includs ash,portlnd cement type i,aggregt,sand and water,delivrd,excluds all additvs and treatments (Flow Fill)	47.00	CY	-	4,700	-		-	-	100.00 /CY	4,700
		03 11 13.406 Grout Fill			*1,173*	*4,700*			*178*		*128.754/CY*	*6,051*
		47.00 CY										
		23.138 Labor hours										
		8.677 Equipment hours										
		03.11.13.085 (15) Super Pulsators - Grout Topping - 6" Thick - 2,521 SF			*1,173*	*4,700*	*0*		*178*	*0*	*128.754/CY*	*6,051*
		47.00 CY										
		23.138 Labor hours										
		8.677 Equipment hours										
		DIVISION 03 CONCRETE			**409,050**	**451,236**	**0**		**15,137**	**0**	**773.383/CY**	**875,422**
		1,131.938 CY										
		7,079.405 Labor hours										
		394.460 Equipment hours										
DIVISION 05		**METALS**										
05.12.00.005		*(15) Super Pulsators - Structural Beams - W4x13 - 10 LF*										
05 12 00.000		*Structural Steel*										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05 12 00.000		*Structural Steel*										
n	0115	Structural steel member, 100-ton project, 1 to 2 story building, W4x13, A992 steel, shop fabricated, incl shop primer, bolted connections	10.00	LF	60	215	-		30	-	30.494 /LF	305
		05 12 00.000 Structural Steel			*60*	*215*			*30*		*4,356.30 /TON*	*305*
		0.07 TON										
		0.933 Labor hours										
		0.133 Equipment hours										
		05.12.00.005 (15) Super Pulsators - Structural Beams - W4x13 - 10 LF			*60*	*215*	*0*		*30*	*0*	*30.494/LF*	*305*
		10.00 LF										
		0.933 Labor hours										
		0.133 Equipment hours										
05.50.00.010		*(15) Super Pulsators - Aluminum Grating - 2" Thick - 184 SF*										
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	184.00	SF	386	13,800	-		29	-	77.252 /SF	14,214
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	106.00	lf	1,564	277	-		-	-	17.364 /lf	1,841
		05 50 00.305 Metal Grating - Aluminum			*1,949*	*14,077*			*29*		*87.255/SF*	*16,055*
		184.00 SF										
		30.117 Labor hours										
		1.472 Equipment hours										
		05.50.00.010 (15) Super Pulsators - Aluminum Grating - 2" Thick - 184 SF			*1,949*	*14,077*	*0*		*29*	*0*	*87.255/SF*	*16,055*
		184.00 SF										
		30.117 Labor hours										
		1.472 Equipment hours										
05.50.00.015		*(15) Super Pulsators - Metal Access Hatch - 3'-6" Long x 3'-6" Wide - 2 EA*										
05 50 00.335		*Metal Hatches*										
n	0050	Doors, specialty, access, floor, commercial, aluminum tile, steel frame, one leaf, 3'-6" x 3'-6" opening	2.00	EA	590	7,000	-		-	-	3,795.085 /EA	7,590
		05 50 00.335 Metal Hatches			*590*	*7,000*					*3,795.085/EA*	*7,590*
		2.00 EA										
		9.143 Labor hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	05.50.00.015 (15) Super Pulsators - Metal Access Hatch - 3'-6" Long x 3'-6" Wide - 2 EA			*590*	*7,000*	*0*		*0*	*0*	*3,795.085/EA*	*7,590*
	2.00 EA										
	9.143 Labor hours										
	DIVISION 05 METALS			**2,600**	**21,292**	**0**		**59**	**0**	**23,950.01 /LS**	**23,950**
	1.00 LS										
	40.193 Labor hours 1.605 Equipment hours										

DIVISION 31 EARTHWORK

31.23.10.010 (15) Super Pulsators, Excavation, Backfill and Haul Off-Site

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	982.00	CY	372	-	-		939	-	1.335 /CY	1,311
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	148.00	CY	86	-	-		197	-	1.911 /CY	283
n 0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1,045.00	CY	11,886	-	-		16,331	-	27.002 /CY	28,217
0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	148.00	CY	68	-	-		142	-	1.418 /CY	210
	31 23 10.000 Excavation, Backfill, and Haul Off-Site			*12,412*				*17,609*		*12.923/CY*	*30,021*
	2,323.00 CY										
	223.572 Labor hours 219.410 Equipment hours										
	31.23.10.010 (15) Super Pulsators, Excavation, Backfill and Haul Off-Site			*12,412*	*0*	*0*		*17,609*	*0*	*12.923/CY*	*30,021*
	2,323.00 CY										
	223.572 Labor hours 219.410 Equipment hours										
	DIVISION 31 EARTHWORK			**12,412**	**0**	**0**		**17,609**	**0**	**12.923/CY**	**30,021**
	2,323.00 CY										
	223.572 Labor hours 219.410 Equipment hours										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 33		**UTILITIES (BURIED PIPE AND VALVES)**										
33.05.19.030		*(15) Buried Pipe, IN - 30" Dia - 4 LF*										
33 05 19.030		Buried Pipe, Ductile Iron, 30" Dia										
n	7001	Pipeline Testing, Hydro (LF)	4.00	lf	10	0	-		1	-	2.768 /lf	11
	7050	Rent trench box, 8000 lb., 8' x 16'	0.50	day	-	-	-		68	-	136.44 /day	68
	0500	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 6' to 10' deep, excludes sheeting or dewatering	11.00	bcy	44	-	-		36	-	7.32 /bcy	81
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	7.00	lcy	5	-	-		12	-	2.547 /lcy	18
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	6.00	ecy	6	-	-		19	-	4.243 /ecy	25
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	5.00	lcy	41	155	-		8	-	40.74 /lcy	204
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	5.00	ecy	19	-	-		3	-	4.406 /ecy	22
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41
n	3206	Distribution piping,DIP,cement lined,fastite,20' lengths, 30"dia, Press Class 250, Excludes excavation, backfill, bedding	4.00	LF	179	912	-		67	-	289.575 /LF	1,158
n	4301	Distribution Piping,DIP,Lok-Ring Joint,54"dia,additional per linear foot of restrained pipe	4.00	lf		661	-			-	165.34 /lf	661
	8050	Fitting, 90 degree bend,DIP,cement lined,MJ,30"dia,C110 water piping	1.00	ea	576	8,140	-		269	-	8,985.01 /ea	8,985
n	4711	DIP,Polywrap 8 mil LDT 440ft,30"dia	1.00	roll	56	1,548	-		-	-	1,603.26 /roll	1,603
		33 05 19.030 Buried Pipe, Ductile Iron, 30" Dia			*940*	*11,454*			*483*		*3,219.365/LF*	*12,877*
		4.00 LF										
		16.916 Labor hours										
		8.005 Equipment hours										
		33.05.19.030 (15) Buried Pipe, IN - 30" Dia - 4 LF			*940*	*11,454*	*0*		*483*	*0*	*3,219.365/LF*	*12,877*
		4.00 LF										
		16.916 Labor hours										
		8.005 Equipment hours										
33.05.19.035		*(15) Buried Pipe, RW - 24" Dia - 70 LF*										
33 05 19.024		Buried Pipe, Ductile Iron, 24" Dia										
n	7001	Pipeline Testing, Hydro (LF)	70.00	lf	173	5	-		16	-	2.767 /lf	194
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		136	-	136.44 /day	136
	0300	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, truck mounted, 4' to 6' deep, excludes sheeting or dewatering	156.00	bcy	709	-	-		702	-	9.045 /bcy	1,411

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.024		*Buried Pipe, Ductile Iron, 24" Dia*										
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	103.00	lcy	79	-	-		183	-	2.548 /lcy	262
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	89.00	ecy	95	-	-		283	-	4.244 /ecy	378
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	68.00	lcy	559	2,108	-		103	-	40.74 /lcy	2,770
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	60.00	ecy	234	-	-		31	-	4.407 /ecy	264
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41
n	2180	Distribution piping,DIP,cement lined,fastite,20' lengths, 24"dia, Press Class 250, Excludes excavation, backfill, bedding	70.00	LF	2,261	9,101	-		640	-	171.461 /LF	12,002
n	4203	Distribution Piping,DIP,Field Flex-Ring Joint,24"dia,additional per linear foot of restrained pipe	24.00	lf		1,996	-			-	83.16 /lf	1,996
n	8045	Fitting, 90 degree bend,DIP,cement lined,MJ,24"dia,C110 water piping	4.00	ea	2,013	18,480	-		623	-	5,278.94 /ea	21,116
n	4710	DIP,Polywrap 8 mil LDT 500ft,24"dia	1.00	roll	56	1,418	-		-	-	1,473.06 /roll	1,473
		33 05 19.024 Buried Pipe, Ductile Iron, 24" Dia			*6,181*	*33,146*			*2,717*		*600.623/LF*	*42,044*
		70.00 LF										
		114.582 Labor hours										
		40.850 Equipment hours										
		33.05.19.035 (15) Buried Pipe, RW - 24" Dia - 70 LF			*6,181*	*33,146*	*0*		*2,717*	*0*	*600.623/LF*	*42,044*
		70.00 LF										
		114.582 Labor hours										
		40.850 Equipment hours										
33.05.19.040		*(15) Buried Pipe, DR - 12" Dia - 18 LF*										
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	18.00	lf	44	1	-		4	-	2.767 /lf	50
	7050	Rent trench box, 8000 lb., 8' x 16'	0.50	day	-	-	-		68	-	136.44 /day	68
	0090	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	30.00	bcy	132	-	-		37	-	5.648 /bcy	169
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	22.00	lcy	17	-	-		39	-	2.548 /lcy	56
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	20.00	ecy	21	-	-		64	-	4.244 /ecy	85
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	12.00	lcy	99	372	-		18	-	40.74 /lcy	489
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	11.00	ecy	43	-	-		6	-	4.407 /ecy	48
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	2100	Distribution piping,DIP,cement lined,fastite,20' lengths, 12"dia, Press Class 350, Excludes excavation, backfill, bedding	18.00	LF	148	891	-		95	-	63.028 /LF	1,135
n	4104	Distribution Piping,DIP,Flex-Ring Joint,12"dia,additional per linear foot of restrained pipe	18.00	lf		294	-			-	16.36 /lf	294
n	8020	Fitting, 90 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	2.00	ea	505	2,027	-		161	-	1,346.64 /ea	2,693
n	4705	DIP,Polywrap 8 mil LDT 500ft,12"dia	1.00	roll	56	709	-		-	-	764.31 /roll	764
		33 05 19.012 Buried Pipe, Ductile Iron, 12" Dia			*1,069*	*4,333*			*492*		*327.391/LF*	*5,893*
		18.00 LF										
		19.567 Labor hours										
		10.143 Equipment hours										
		33.05.19.040 (15) Buried Pipe, DR - 12" Dia - 18 LF			*1,069*	*4,333*	*0*		*492*	*0*	*327.391/LF*	*5,893*
		18.00 LF										
		19.567 Labor hours										
		10.143 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**8,189**	**48,933**	**0**		**3,692**	**0**	**661.023/LF**	**60,814**
		92.00 LF										
		151.065 Labor hours										
		58.998 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.020 (15) Exposed Pipe - SW - 42" Dia

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.042		*Pipe and Fittings - Ductile Iron, 42" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	20.00	LF	49	2	-		4	-	2.767 /LF	55
	7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	242.00	sf	961	182	-		-	-	4.722 /sf	1,143
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0831	Gasket and bolt set, for flanges, 150 lb., 42" pipe size	4.00	ea	2,096	6,376	-		-	-	2,118.00 /ea	8,472
n	0575	DIP,FLGxFLG,42"dia,15'-0" long,class 53,excl excav, backfill	1.00	ea	711	40,763	-		-	-	41,473.86 /ea	41,474
n	1028	Fitting,DIP,FLG,90 degree bend,42"dia,c 110 water piping	2.00	ea	854	41,613	-		-	-	21,233.475 /ea	42,467

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 19.042 Pipe and Fittings - Ductile Iron, 42" Dia			*4,729*	*88,972*			*4*		*4,685.251/LF*	*93,705*
		20.00 LF										
		78.236 Labor hours										
		0.32 Equipment hours										
		40.05.19.020 (15) Exposed Pipe - SW - 42" Dia			*4,729*	*88,972*	*0*		*4*	*0*	*4,685.251/LF*	*93,705*
		20.00 LF										
		78.236 Labor hours										
		0.32 Equipment hours										
40.05.19.025		*(15) Exposed Pipe - IN - 30" Dia - Wall Pipe*										
40 05 19.030		*Pipe and Fittings - Ductile Iron, 30" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	5	0	-		0	-	2.77 /LF	6
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	12	7	-		-	-	18.83 /ea	19
	0810	Gasket and bolt set, for flanges, 150 lb., 30" pipe size	1.00	ea	412	900	-		-	-	1,311.71 /ea	1,312
n	0460	DIP,FLGxFLG,30"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	267	8,239	-		-	-	8,505.700 /ea	8,506
		40 05 19.030 Pipe and Fittings - Ductile Iron, 30" Dia			*695*	*9,147*			*0*		*4,920.890/LF*	*9,842*
		2.00 LF										
		10.754 Labor hours										
		0.032 Equipment hours										
		40.05.19.025 (15) Exposed Pipe - IN - 30" Dia - Wall Pipe			*695*	*9,147*	*0*		*0*	*0*	*4,920.890/LF*	*9,842*
		2.00 LF										
		10.754 Labor hours										
		0.032 Equipment hours										
40.05.19.030		*(15) Exposed Pipe - RW - 24" Dia - Wall Pipe*										
40 05 19.024		*Pipe and Fittings - Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	20	1	-		2	-	2.766 /LF	22
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	4.00	ea	46	29	-		-	-	18.828 /ea	75
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	1,213	1,360	-		-	-	643.368 /ea	2,573
n	0415	DIP,FLGxFLG,24"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	899	21,130	-		-	-	5,507.255 /ea	22,029
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia			*2,179*	*22,519*			*2*		*3,087.491/LF*	*24,700*
		8.00 LF										
		34.002 Labor hours										
		0.128 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40.05.19.030 (15) Exposed Pipe - RW - 24" Dia - Wall Pipe			*2,179*	*22,519*	*0*		*2*	*0*	*3,087.491/LF*	*24,700*
		8.00 LF										
		34.002 Labor hours										
		0.128 Equipment hours										
40.05.19.035		*(15) Exposed Pipe - RW - 24" Dia*										
40 05 19.024		*Pipe and Fittings - Ductile Iron, 24" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	30.00	LF	74	2	-		7	-	2.767 /LF	83
	7900	Paints & coatings, pipes, primer + 1 coat, brushwork, over 12" diameter	206.80	sf	821	155	-		-	-	4.722 /sf	977
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0780	Gasket and bolt set, for flanges, 150 lb., 24" pipe size	4.00	ea	1,213	1,360	-		-	-	643.368 /ea	2,573
n	0440	DIP,FLGxFLG,24"dia,15'-0" long,class 53,excl excav, backfill	2.00	ea	761	26,925	-		-	-	13,842.71 /ea	27,685
		40 05 19.024 Pipe and Fittings - Ductile Iron, 24" Dia			*2,927*	*28,479*			*7*		*1,047.085/LF*	*31,413*
		30.00 LF										
		49.086 Labor hours										
		0.48 Equipment hours										
		40.05.19.035 (15) Exposed Pipe - RW - 24" Dia			*2,927*	*28,479*	*0*		*7*	*0*	*1,047.085/LF*	*31,413*
		30.00 LF										
		49.086 Labor hours										
		0.48 Equipment hours										
40.05.19.040		*(15) Exposed Pipe - DR - 12" Dia - Wall Pipe*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	10	0	-		1	-	2.768 /LF	11
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	2.00	ea	23	15	-		-	-	18.83 /ea	38
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	2.00	ea	274	292	-		-	-	283.24 /ea	566
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	233	3,664	-		-	-	1,948.59 /ea	3,897
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*541*	*3,971*			*1*		*1,128.098/LF*	*4,512*
		4.00 LF										
		8.490 Labor hours										
		0.064 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40.05.19.040 (15) Exposed Pipe - DR - 12" Dia - Wall Pipe			*541*	*3,971*	*0*		*1*	*0*	*1,128.098/LF*	*4,512*
		4.00 LF										
		8.490 Labor hours										
		0.064 Equipment hours										
40.05.19.045		*(15) Exposed Pipe - GTD - 12" Dia*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	30.00	LF	74	2	-		7	-	2.767 /LF	83
	7800	Paints & coatings, pipes, primer + 1 coat, brushwork, 10" to 12" diameter	33.00	lf	103	19	-		-	-	3.718 /lf	123
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	2.00	ea	274	292	-		-	-	283.24 /ea	566
n	0215	DIP,FLGxFLG,12"dia,15'-0" long,class 53,excl excav, backfill	2.00	ea	400	10,384	-		-	-	5,391.87 /ea	10,784
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*909*	*10,734*			*7*		*388.335/LF*	*11,650*
		30.00 LF										
		15.088 Labor hours										
		0.48 Equipment hours										
		40.05.19.045 (15) Exposed Pipe - GTD - 12" Dia			*909*	*10,734*	*0*		*7*	*0*	*388.335/LF*	*11,650*
		30.00 LF										
		15.088 Labor hours										
		0.48 Equipment hours										
40.05.19.105		*(15) Exposed Pipe - PLI - 3" Dia - 34 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	34.00	LF	84	3	-		8	-	2.767 /LF	94
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	37.40	lf	39	4	-		-	-	1.145 /lf	43
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	41	18	-		-	-	11.864 /ea	59
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	18.00	ea	943	283	-		-	-	68.10 /ea	1,226
n	0001	DIP,FLGxFLG,3"dia,1'-0" long,class 53,excl excav, backfill	4.00	ea	244	1,808	-		-	-	513.073 /ea	2,052
n	0010	DIP,FLGxFLG,3"dia,5'-0" long,class 53,excl excav, backfill	6.00	ea	366	5,093	-		-	-	909.872 /ea	5,459

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*1,718*	*7,208*			*8*		*262.751/LF*	*8,934*
		34.00 LF										
		26.810 Labor hours										
		0.544 Equipment hours										
		40.05.19.105 (15) Exposed Pipe - PLI - 3" Dia - 34 LF			*1,718*	*7,208*	*0*		*8*	*0*	*262.751/LF*	*8,934*
		34.00 LF										
		26.810 Labor hours										
		0.544 Equipment hours										
40.05.19.110		*(15) Exposed Pipe - SHC - 3" Dia - 16 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	16.00	LF	39	1	-		4	-	2.767 /LF	44
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	17.60	lf	18	2	-		-	-	1.146 /lf	20
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	41	18	-		-	-	11.864 /ea	59
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	8.00	ea	419	126	-		-	-	68.10 /ea	545
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	1.00	ea	61	452	-		-	-	513.070 /ea	513
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	3.00	ea	183	2,546	-		-	-	909.873 /ea	2,730
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*763*	*3,145*			*4*		*244.453/LF*	*3,911*
		16.00 LF										
		11.800 Labor hours										
		0.256 Equipment hours										
		40.05.19.110 (15) Exposed Pipe - SHC - 3" Dia - 16 LF			*763*	*3,145*	*0*		*4*	*0*	*244.453/LF*	*3,911*
		16.00 LF										
		11.800 Labor hours										
		0.256 Equipment hours										
40.05.19.115		*(15) Exposed Pipe - FS - 3" Dia - 57 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	57.00	LF	141	4	-		13	-	2.767 /LF	158
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	62.70	lf	66	6	-		-	-	1.145 /lf	72
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	41	18	-		-	-	11.864 /ea	59
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	16.00	ea	838	251	-		-	-	68.10 /ea	1,090

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	2.00	ea	122	904	-		-	-	513.070 /ea	1,026
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	1.00	ea	61	849	-		-	-	909.87 /ea	910
n	0025	DIP,FLGxFLG,4"dia,10'-0" long,class 53,excl excav, backfill	5.00	ea	500	6,724	-		-	-	1,444.736 /ea	7,224
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*1,769*	*8,757*			*13*		*184.880/LF*	*10,538*
		57.00 LF										
		28.108 Labor hours										
		0.912 Equipment hours										
		40.05.19.115 (15) Exposed Pipe - FS - 3" Dia - 57 LF			*1,769*	*8,757*	*0*		*13*	*0*	*184.880/LF*	*10,538*
		57.00 LF										
		28.108 Labor hours										
		0.912 Equipment hours										
40.05.19.120		*(15) Exposed Pipe - LM - 3" Dia - 14 LF*										
40 05 19.000		*** Pipe and Fittings - Ductile Iron*										
n	7001	Pipeline Testing, Hydro (LF)	14.00	LF	35	1	-		3	-	2.767 /LF	39
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	15.40	lf	16	2	-		-	-	1.146 /lf	18
	1118	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 3" pipe	5.00	ea	41	18	-		-	-	11.864 /ea	59
	0650	Gasket and bolt set, for flanges, 150 lb., 3" pipe size	12.00	ea	629	188	-		-	-	68.10 /ea	817
n	0001	DIP,FLGxFLG,4"dia,1'-0" long,class 53,excl excav, backfill	4.00	ea	244	1,808	-		-	-	513.073 /ea	2,052
n	0010	DIP,FLGxFLG,4"dia,5'-0" long,class 53,excl excav, backfill	2.00	ea	122	1,698	-		-	-	909.87 /ea	1,820
		*40 05 19.000 ** Pipe and Fittings - Ductile Iron*			*1,087*	*3,715*			*3*		*343.209/LF*	*4,805*
		14.00 LF										
		16.783 Labor hours										
		0.224 Equipment hours										
		40.05.19.120 (15) Exposed Pipe - LM - 3" Dia - 14 LF			*1,087*	*3,715*	*0*		*3*	*0*	*343.209/LF*	*4,805*
		14.00 LF										
		16.783 Labor hours										
		0.224 Equipment hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**17,316**	**186,646**	**0**		**48**	**0**	**948.882/LF**	**204,010**
		215.00 LF										

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)		**17,316**	**186,646**	**0**		**48**	**0**	**948.882/LF**	**204,010**
	215.00 LF									
	279.156 Labor hours 3.44 Equipment hours									

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

43.21.02.010 (15) Sample Pump - (SP-12B, SP-15B) 0.17HP, 40GPM @ 40'

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
43 23 57.000	*Pumping Equipment - Progressive Cavity Pump*									
0100	Sample Pump, 0.17HP, 40 GPM @ 40'	3.00 EA	4,059	15,000	-		1,303	-	6,787.44 /EA	20,362
	43 23 57.000 Pumping Equipment - Progressive Cavity Pump		*4,059*	*15,000*			*1,303*		*6,787.44 /EA*	*20,362*
	3.00 EA									
	72.00 Labor hours 12.00 Equipment hours									
	43.21.02.010 (15) Sample Pump - (SP-12B, SP-15B) 0.17HP, 40GPM @ 40'		*4,059*	*15,000*	*0*		*1,303*	*0*	*6,787.44 /EA*	*20,362*
	3.00 EA									
	72.00 Labor hours 12.00 Equipment hours									
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT		**4,059**	**15,000**	**0**		**1,303**	**0**	**6,787.44 /EA**	**20,362**
	3.00 EA									
	72.00 Labor hours 12.00 Equipment hours									

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

46.01.70.005 (15) Superpulsators - (SP-15C, SP-15D)

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 43 22.005	*Suction Header Retangular Clarifier Equipment*									
0001	Superpulsators	2.00 EA	4,510		2,640,000		2,172	-	1,323,341.00 /EA	2,646,682
	46 43 22.005 Suction Header Retangular Clarifier Equipment		*4,510*		*2,640,000*		*2,172*		*1,323,341.00 /EA*	*2,646,682*
	2.00 EA									
	80.00 Labor hours 20.00 Equipment hours									

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46.01.70.005 (15) Superpulsators - (SP-15C, SP-15D)			*4,510*	*0*	*2,640,000*		*2,172*	*0*	*1,323,341.00 /EA*	*2,646,682*
	2.00 EA										
	80.00 Labor hours										
	20.00 Equipment hours										
46.01.70.010	*(72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)*										
46 36 09.000	*Chemical Feed Equipment - Dry Systems (Polymer)*										
1200	Polymer Equipment	1.00	LS	5,638	349,000	-		4,343	-	358,981.20 /LS	358,981
	46 36 09.000 Chemical Feed Equipment - Dry Systems (Polymer)			*5,638*	*349,000*			*4,343*		*358,981.20 /EA*	*358,981*
	1.00 EA										
	100.00 Labor hours										
	40.00 Equipment hours										
	46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)			*5,638*	*349,000*	*0*		*4,343*	*0*	*358,981.20 /LS*	*358,981*
	1.00 LS										
	100.00 Labor hours										
	40.00 Equipment hours										
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**10,148**	**349,000**	**2,640,000**		**6,515**	**0**	**1,502,831.60 /EA**	**3,005,663**
	2.00 EA										
	180.00 Labor hours										
	60.00 Equipment hours										
	100 SUPER PULSATORS			***463,774***	***1,072,106***	***2,640,000***		***44,363***	***0***	***4,220,242.480/LS***	***4,220,242***
	1.00 LS										
	8,025.390 Labor hours										
	749.913 Equipment hours										

165 FERRIC SULFATE STORAGE

DIVISION 03 CONCRETE

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.090	*(52) Ferric Sulfate Storage - Slab on Grade - 5,442 SF - 12" Thick*										
03 11 13.504	*12" Slab on Grade*										
3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	316.00	sfca	1,296	386	-		-	-	5.322 /sfca	1,682

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	270.00	sfca	660	122	-		-	-	2.894 /sfca	781
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	17.50	ton	629	-	-		365	-	56.816 /ton	994
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	17.50	ton	15,717	25,375	-		-	-	2,348.087 /ton	41,092
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	17.50	ton	1,798	-	-		1,043	-	162.331 /ton	2,841
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	200.00	cy	3,507	-	-		534	-	20.206 /cy	4,041
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	20.00	cy	351	-	-		53	-	20.206 /cy	404
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	200.00	CY	-	37,000	-		-	-	185.00 /CY	37,000
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	20.00	cy	-	3,700	-		-	-	185.00 /cy	3,700
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	5,400.00	sf	3,960	-	-		291	-	0.787 /sf	4,251
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	270.00	lf	119	8	-		16	-	0.529 /lf	143
n	0215	Control joint, clean out control joint of debris_SOG	270.00	lf	20	-	-			-	0.073 /lf	20
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	540.00	lf	880	86	-		-	-	1.790 /lf	966
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	54.00	csf	430	402	-		-	-	15.408 /csf	832
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	54.00	sq	684	440	-		-	-	20.820 /sq	1,124
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	230.00	ecy	2,509	7,360	-		284	-	44.143 /ecy	10,153
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	230.00	lcy	1,889	-	-		2,854	-	20.626 /lcy	4,744
		03 11 13.504 12" Slab on Grade			*34,448*	*74,879*			*5,441*		*573.841/CY*	*114,768*

200.00 CY

591.555 Labor hours
136.696 Equipment hours

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03.11.13.090 (52) Ferric Sulfate Storage - Slab on Grade - 5,442 SF - 12" Thick			*34,448*	*74,879*	*0*		*5,441*	*0*	*573.841/CY*	*114,768*
		200.00 CY										
		591.555 Labor hours										
		136.696 Equipment hours										
03.11.13.095		*(52) Ferric Sulfate Storage - Thickened Edge Footing - 1'-9" Thick x 1'-6" Wide - 311 LF*										
03 11 13.151		*Thickened Edge Footing, 1'-9" Thick*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	1,093.75	sfca	4,487	1,334	-		-	-	5.322 /sfca	5,821
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	40.819	sfca	100	18	-		-	-	2.894 /sfca	118
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	2.713	ton	98	-	-		57	-	56.815 /ton	154
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	2.713	ton	2,437	3,934	-		-	-	2,348.087 /ton	6,370
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	2.713	ton	279	-	-		162	-	162.330 /ton	440
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	31.00	cy	544	-	-		83	-	20.206 /cy	626
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	3.10	cy	54	-	-		8	-	20.206 /cy	63
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	31.00	CY	-	5,735	-		-	-	185.00 /CY	5,735
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.10	cy	-	574	-		-	-	185.00 /cy	574
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	466.50	sf	342	-	-		25	-	0.787 /sf	367
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	23.325	lf	10	1	-		1	-	0.529 /lf	12
n	0215	Control joint, clean out control joint of debris_SOG	23.325	lf	2	-	-			-	0.073 /lf	2
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	46.65	lf	76	7	-		-	-	1.790 /lf	83
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	4.665	csf	37	35	-		-	-	15.406 /csf	72
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	4.665	sq	59	38	-		-	-	20.82 /sq	97
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	20.00	ecy	218	640	-		25	-	44.144 /ecy	883

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.151		*Thickened Edge Footing, 1'-9" Thick*										
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	20.00	lcy	164	-	-		248	-	20.626 /lcy	413
		03 11 13.151 Thickened Edge Footing, 1'-9" Thick			*8,906*	*12,316*			*609*		*704.218/CY*	*21,831*
		31.00 CY										
		154.898 Labor hours										
		14.181 Equipment hours										
		03.11.13.095 (52) Ferric Sulfate Storage - Thickened Edge Footing - 1'-9" Thick x 1'-6" Wide - 311 LF			*8,906*	*12,316*	*0*		*609*	*0*	*704.218/CY*	*21,831*
		31.00 CY										
		154.898 Labor hours										
		14.181 Equipment hours										
03.11.13.100		*(52) Ferric Sulfate Storage - Tank Pads - 2,091 SF - 12" Thick*										
03 11 15.012		*12" CIP Equipment Pad*										
	3060	C.I.P. concrete forms, slab on grade, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	519.00	sfca	2,646	753	-		-	-	6.548 /sfca	3,399
	5200	Chamfer strip, wood, 3/4" wide	519.00	lf	463	73	-		-	-	1.033 /lf	536
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	6.825	ton	245	-	-		142	-	56.816 /ton	388
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	6.825	ton	6,129	9,896	-		-	-	2,348.086 /ton	16,026
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	6.825	ton	701	-	-		407	-	162.331 /ton	1,108
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	78.00	cy	1,368	-	-		208	-	20.206 /cy	1,576
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	7.80	cy	137	-	-		21	-	20.205 /cy	158
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	78.00	CY	-	14,430	-		-	-	185.00 /CY	14,430
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	7.80	cy	-	1,443	-		-	-	185.00 /cy	1,443
n	0200	Concrt fnshng,fresh concrt fltwrk,floors,basic fnshng for unspcf flatwrk,bull float,manual float&manual steel trowel,excl placing,strikng off&cnsldtng	2,091.00	sf	2,079	-	-		-	-	0.994 /sf	2,079
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	20.91	csf	166	156	-		-	-	15.408 /csf	322

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 15.012 12" CIP Equipment Pad			*13,936*	*26,750*			*778*		*531.594/CY*	*41,464*
		78.00 CY										
		237.933 Labor hours 13.237 Equipment hours										
		03.11.13.100 (52) Ferric Sulfate Storage - Tank Pads - 2,091 SF - 12" Thick			*13,936*	*26,750*	*0*		*778*	*0*	*531.594/CY*	*41,464*
		78.00 CY										
		237.933 Labor hours 13.237 Equipment hours										
03.11.13.105		*(52) Ferric Sulfate Storage - Wall - 8 LF - 1'-6" High - 18" Thick*										
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	1.00	lf	10	3	-		-	-	13.79 /lf	14
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	24.00	sfca	167	24	-		-	-	7.962 /sfca	191
n	5200	Chamfer strip, wood, 3/4" wide	2.00	lf	2	0	-		-	-	1.035 /lf	2
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	9.00	lf	29	66	-		-	-	10.533 /lf	95
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.10	ton	69	145	-		-	-	2,138.50 /ton	214
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.10	ton	4	-	-		2	-	56.90 /ton	6
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.10	ton	4	-	-		2	-	61.80 /ton	6
n	0210	Control joint, clean out control joint of debris_WALLS	1.00	lf	0	-	-		-	-	0.07 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	1.00	lf	2	0	-		-	-	1.79 /lf	2
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	24.00	sf	20	1	-		-	-	0.855 /sf	21
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	12.00	sf	12	0	-		-	-	1.018 /sf	12
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	1.00	cy	29	-	-		4	-	33.98 /cy	34
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	1.00	CY	-	185	-		-	-	185.00 /CY	185

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.811 18" CIP Wall			*347*	*490*			*9*		*846.04 /CY*	*846*
		1.00 CY										
		5.990 Labor hours										
		0.235 Equipment hours										
		03.11.13.105 (52) Ferric Sulfate Storage - Wall - 8 LF - 1'-6" High - 18" Thick			*347*	*490*	*0*		*9*	*0*	*846.04 /CY*	*846*
		1.00 CY										
		5.990 Labor hours										
		0.235 Equipment hours										
03.11.13.110		*(52) Ferric Sulfate Storage - Wall - 106 LF - 3'-6" High - 12" Thick*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	19.00	lf	197	65	-		-	-	13.793 /lf	262
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	742.00	sfca	5,173	735	-		-	-	7.962 /sfca	5,908
n	5200	Chamfer strip, wood, 3/4" wide	38.00	lf	34	5	-		-	-	1.033 /lf	39
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	125.00	lf	404	913	-		-	-	10.533 /lf	1,317
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	1.40	ton	964	2,030	-		-	-	2,138.536 /ton	2,994
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	1.40	ton	50	-	-		29	-	56.814 /ton	80
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	1.40	ton	55	-	-		32	-	61.76 /ton	86
n	0210	Control joint, clean out control joint of debris_WALLS	19.00	lf	1	-	-		-	-	0.073 /lf	1
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	19.00	lf	31	3	-		-	-	1.790 /lf	34
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	742.00	sf	605	30	-		-	-	0.855 /sf	634
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	371.00	sf	363	15	-		-	-	1.018 /sf	378
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	14.00	cy	413	-	-		63	-	33.983 /cy	476
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	14.00	CY	-	2,590	-		-	-	185.00 /CY	2,590

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		03 11 13.804 12" CIP Wall			*8,290*	*6,450*			*124*		*1,061.701/CY*	*14,864*
		14.00 CY										
		143.975 Labor hours										
		3.288 Equipment hours										
		03.11.13.110 (52) Ferric Sulfate Storage - Wall - 106 LF - 3'-6" High - 12" Thick			*8,290*	*6,450*	*0*		*124*	*0*	*1,061.701/CY*	*14,864*
		14.00 CY										
		143.975 Labor hours										
		3.288 Equipment hours										
03.11.13.110a		*(52) Ferric Sulfate Storage - Wall - 208 LF x 28'-4" High - 18" Thick*										
03 11 13.811		*18" CIP Wall*										
	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	295.00	lf	3,066	1,003	-		-	-	13.792 /lf	4,069
	2550	C.I.P. concrete forms, wall, job built, plywood, over 8' to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	11,785.28	sfca	82,169	11,667	-		-	-	7.962 /sfca	93,836
	5200	Chamfer strip, wood, 3/4" wide	590.00	lf	527	83	-		-	-	1.033 /lf	609
	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	10.00	c	-	650	-		-	-	65.00 /c	650
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	191.909	lf	620	1,439	-		-	-	10.733 /lf	2,060
	0100	Splice rebar, standard, self-aligning type, taper threaded, #4 bars, includes holding rebar in place while splicing	360.80	ea	3,093	4,618	-		-	-	21.373 /ea	7,711
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	32.80	ton	1,179	-	-		684	-	56.816 /ton	1,864
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	32.80	ton	1,282	-	-		744	-	61.758 /ton	2,026
	0700	Reinforcing steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	32.80	ton	22,584	47,560	-		-	-	2,138.533 /ton	70,144
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	328.00	cy	9,674	-	-		1,472	-	33.983 /cy	11,146
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	32.80	cy	967	-	-		147	-	33.983 /cy	1,115
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	328.00	CY	-	53,185	-		-	-	162.15 /CY	53,185
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.80	cy	-	5,319	-		-	-	162.15 /cy	5,319

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0210	Control joint, clean out control joint of debris_WALLS	295.00	lf	22	-	-			-	0.073 /lf	22
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	295.00	lf	481	47	-		-	-	1.790 /lf	528
	0020	Concrete finishing, walls, includes breaking ties and patching voids	11,785.28	sf	9,603	471	-		-	-	0.855 /sf	10,074
	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	5,892.64	sf	5,762	236	-		-	-	1.018 /sf	5,997
		03 11 13.811 18" CIP Wall			*141,029*	*126,279*			*3,047*		*824.251/CY*	*270,354*
		328.00 CY										
		2,452.522 Labor hours										
		84.196 Equipment hours										
		03.11.13.110a (52) Ferric Sulfate Storage - Wall - 208 LF x 28'-4" High - 18" Thick			*141,029*	*126,279*	*0*		*3,047*	*0*	*824.251/CY*	*270,354*
		328.00 CY										
		2,452.522 Labor hours										
		84.196 Equipment hours										
03.11.13.115		*(52) Ferric Sulfate Storage - Wall - 10 LF - 5'-6" High - 12" Thick*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	31	10	-		-	-	13.793 /lf	41
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	110.00	sfca	767	109	-		-	-	7.962 /sfca	876
n	5200	Chamfer strip, wood, 3/4" wide	6.00	lf	5	1	-		-	-	1.033 /lf	6
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	13.00	lf	42	95	-		-	-	10.533 /lf	137
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.30	ton	207	435	-		-	-	2,138.530 /ton	642
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.30	ton	11	-	-		6	-	56.833 /ton	17
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.30	ton	12	-	-		7	-	61.73 /ton	19
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.073 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	5	0	-		-	-	1.79 /lf	5
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	110.00	sf	90	4	-		-	-	0.855 /sf	94
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	55.00	sf	54	2	-		-	-	1.018 /sf	56

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
03 11 13.804		*12" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	3.00	cy	88	-	-		13	-	33.98 /cy	102
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.00	CY	-	555	-		-	-	185.00 /CY	555
		03 11 13.804 12" CIP Wall			*1,312*	*1,277*			*27*		*871.673/CY*	*2,615*
		3.00 CY										
		22.715 Labor hours										
		0.705 Equipment hours										
		03.11.13.115 (52) Ferric Sulfate Storage - Wall - 10 LF - 5'-6" High - 12" Thick			*1,312*	*1,277*	*0*		*27*	*0*	*871.673/CY*	*2,615*
		3.00 CY										
		22.715 Labor hours										
		0.705 Equipment hours										
03.11.13.120		*(52) Ferric Sulfate Storage - Wall - 17 LF - 3'-6" High - 8" Thick*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	31	10	-		-	-	13.793 /lf	41
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	119.00	sfca	830	118	-		-	-	7.962 /sfca	948
n	5200	Chamfer strip, wood, 3/4" wide	6.00	lf	5	1	-		-	-	1.033 /lf	6
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	20.00	lf	65	146	-		-	-	10.533 /lf	211
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.20	ton	138	290	-		-	-	2,138.550 /ton	428
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.20	ton	7	-	-		4	-	56.80 /ton	11
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.20	ton	8	-	-		5	-	61.75 /ton	12
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.073 /lf	0
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	5	0	-		-	-	1.79 /lf	5
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	119.00	sf	97	5	-		-	-	0.855 /sf	102
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	59.50	sf	58	2	-		-	-	1.018 /sf	61

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	2.00	cy	59	-	-		9	-	33.985 /cy	68
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.00	CY	-	370	-		-	-	185.00 /CY	370
		03 11 13.801 08" CIP Wall			*1,303*	*1,007*			*18*		*1,164.00 /CY*	*2,328*
		2.00 CY										
		22.643 Labor hours										
		0.470 Equipment hours										
		03.11.13.120 (52) Ferric Sulfate Storage - Wall - 17 LF - 3'-6" High - 8" Thick			*1,303*	*1,007*	*0*		*18*	*0*	*1,164.00 /CY*	*2,328*
		2.00 CY										
		22.643 Labor hours										
		0.470 Equipment hours										
		DIVISION 03 CONCRETE			**209,571**	**249,448**	**0**		**10,052**	**0**	**713.958/CY**	**469,071**
		657.00 CY										
		3,632.233 Labor hours										
		253.008 Equipment hours										

DIVISION 04 MASONRY

04.22.00.005 (52) CMU Block 8" Wall - 10' High x 48 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.208		*Concrete Masonry Unit (08" CMU) - Exterior*										
n	0440	Wall Insulation, Rigid, fiberglass, unfaced, 3" thick, R13, 3#/CF	480.00	sf	281	998	-		-	-	2.666 /sf	1,280
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	5.00	csf	879	-	-		-	-	175.80 /csf	879
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	5.00	csf	-	415	-		-	-	83.00 /csf	415
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	48.00	lf	58	59	-		7	-	2.576 /lf	124
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	480.00	sf	1,189	658	-		142	-	4.141 /sf	1,988
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	158.611	lb	91	116	-		-	-	1.305 /lb	207
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	594.792	lb	421	434	-		-	-	1.438 /lb	855

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.208		*Concrete Masonry Unit (08" CMU) - Exterior*										
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	48.00	lf	181	227	-		-	-	8.484 /lf	407
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	480.00	SF	2,835	2,198	-		-	-	10.487 /SF	5,034
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	48.00	sf	284	220	-		-	-	10.487 /sf	503
		04 22 00.208 Concrete Masonry Unit (08" CMU) - Exterior			*6,218*	*5,476*			*148*		*24.671/SF*	*11,842*
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										
		04.22.00.005 (52) CMU Block 8" Wall - 10' High x 48 LF			*6,218*	*5,476*	*0*		*148*	*0*	*24.671/SF*	*11,842*
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										
		DIVISION 04 MASONRY			**6,218**	**5,476**	**0**		**148**	**0**	**24.671/SF**	**11,842**
		480.00 SF										
		114.457 Labor hours										
		5.921 Equipment hours										
DIVISION 05		**METALS**										
05.50.00.020		*(52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF*										
05 50 00.305		*Metal Grating - Aluminum*										
	0188	Floor grating, aluminum, 2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 2" O.C., over 300 S.F., field fabricated from panels	16.00	SF	34	1,200	-		3	-	77.251 /SF	1,236
	0150	Trench cover, frame only for grating, 2 sides, for 2" T grating, field fabricated	16.00	lf	236	42	-		-	-	17.364 /lf	278
		05 50 00.305 Metal Grating - Aluminum			*270*	*1,242*			*3*		*94.616/SF*	*1,514*
		16.00 SF										
		4.169 Labor hours										
		0.128 Equipment hours										
		05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF			*270*	*1,242*	*0*		*3*	*0*	*94.616/SF*	*1,514*
		16.00 SF										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		05.50.00.020 (52) Ferric Sulfate Storage - Aluminum Grating - 2" Thick - 16 SF			*270*	*1,242*	*0*		*3*	*0*	*94.616/SF*	*1,514*
		16.00 SF										
		4.169 Labor hours										
		0.128 Equipment hours										
05.50.00.025		*(52) Ferric Sulfate Storage - Aluminum Stairs - 20 Risers*										
05 50 00.315		*Metal Stairs - Aluminum*										
n	0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	12.00	lf	184	1,146	-		14	-	111.935 /lf	1,343
	0020	Stair, shop fabricated, steel, 3'-6" W, incl pipe railing, stringers, grating treads w/ safety nosing, per riser	20.00	RISR	1,197	7,400	-		89	-	434.331 /RISR	8,687
	0134	Floor grating, aluminum, 1-1/2" x 3/16" bearing bars @ 1-3/16" O.C., cross bars @ 4" O.C., over 300 S.F., field fabricated from panels	90.00	sf	189	3,780	-		14	-	44.252 /sf	3,983
		05 50 00.315 Metal Stairs - Aluminum			*1,569*	*12,326*			*117*		*700.624/RISR*	*14,012*
		20.00 RISR										
		23.969 Labor hours										
		5.992 Equipment hours										
		05.50.00.025 (52) Ferric Sulfate Storage - Aluminum Stairs - 20 Risers			*1,569*	*12,326*	*0*		*117*	*0*	*700.624/RISR*	*14,012*
		20.00 RISR										
		23.969 Labor hours										
		5.992 Equipment hours										
		DIVISION 05 METALS			**1,839**	**13,568**	**0**		**120**	**0**	**15,526.33 /LS**	**15,526**
		1.00 LS										
		28.138 Labor hours										
		6.120 Equipment hours										
DIVISION 08		**OPENINGS**										
08.11.19.015		*(52) Ferric Sulfate Storage - Doors - Steel 6'x7'*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	1.00	EA	78	235	-		-	-	313.13 /EA	313
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	2.00	ea	110	1,330	-		-	-	720.155 /ea	1,440
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	2.00	ea	234	1,200	-		-	-	717.20 /ea	1,434

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
08 11 00.061		*Metal Doors & Frames (6070)*										
	0011	Thresholds, aluminum, 3' long door saddles	6.00	lf	59	72	-		-	-	21.817 /lf	131
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	3.00	pr	-	182	-		-	-	60.50 /pr	182
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	2.00	ea	47	5	-		-	-	25.655 /ea	51
		08 11 00.061 Metal Doors & Frames (6070)			*528*	*3,023*					*3,551.55 /EA*	*3,552*
		1.00 EA										
		9.157 Labor hours										
		08.11.19.015 (52) Ferric Sulfate Storage - Doors - Steel 6'x7'			*528*	*3,023*	*0*		*0*	*0*	*3,551.55 /EA*	*3,552*
		1.00 EA										
		9.157 Labor hours										
		DIVISION 08 OPENINGS			**528**	**3,023**	**0**		**0**	**0**	**3,551.55 /EA**	**3,552**
		1.00 EA										
		9.157 Labor hours										

DIVISION 13 SPECIAL CONSTRUCTION

13.34.19.010 (52) Pre-Engineered Metal Building, Ferric Sulfate Storage

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
13 34 19.000		*Metal Building Systems*										
	5450	(73) Pre-Engineered Metal Building, Sludge Storage	180.00	SF	3,234	12,600	-		1,624	-	96.987 /SF	17,458
		13 34 19.000 Metal Building Systems			*3,234*	*12,600*			*1,624*		*96.987/SF*	*17,458*
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										
		13.34.19.010 (52) Pre-Engineered Metal Building, Ferric Sulfate Storage			*3,234*	*12,600*	*0*		*1,624*	*0*	*96.987/SF*	*17,458*
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										
		DIVISION 13 SPECIAL CONSTRUCTION			**3,234**	**12,600**	**0**		**1,624**	**0**	**96.987/SF**	**17,458**
		180.00 SF										
		50.40 Labor hours 7.20 Equipment hours										

Item	Description	Takeoff Qty	Unit	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 31	**EARTHWORK**										
31.23.10.020	*(52) Ferric Sulfate Storage, Excavation, Backfill and Haul Off-Site*										
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	485.00	CY	184	-	-		464	-	1.335 /CY	648
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	73.00	CY	42	-	-		97	-	1.911 /CY	140
n 0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	515.00	CY	5,858	-	-		8,048	-	27.002 /CY	13,906
0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	73.00	CY	34	-	-		70	-	1.418 /CY	104
	31 23 10.000 Excavation, Backfill, and Haul Off-Site	*1,146.00*	*CY*	*6,117*				*8,679*		*12.912/CY*	*14,797*
	110.189 Labor hours 108.135 Equipment hours										
	31.23.10.020 (52) Ferric Sulfate Storage, Excavation, Backfill and Haul Off-Site	*1,146.00*	*CY*	*6,117*	*0*	*0*		*8,679*	*0*	*12.912/CY*	*14,797*
	110.189 Labor hours 108.135 Equipment hours										
	DIVISION 31 EARTHWORK	**1,146.00**	**CY**	**6,117**	**0**	**0**		**8,679**	**0**	**12.912/CY**	**14,797**
	110.189 Labor hours 108.135 Equipment hours										
DIVISION 40	**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
40.05.23.005	*(52) Exposed Pipe - PSG - 2" Dia - 44 LF*										
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	44.00	LF	109	3	-		10	-	2.767 /LF	122
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	48.40	lf	51	5	-		-	-	1.145 /lf	55
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	10.00	ea	2,637	5,509	-		-	-	814.636 /ea	8,146
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	5.00	ea	38	11	-		-	-	9.866 /ea	49

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
	0590	Pipe, stainless steel, butt weld, 2" diameter, schedule 5, type 304, includes weld joint and clevis type hangers 10' OC	48.40	lf	740	1,888	-		79	-	55.928 /lf	2,707
		40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*3,575*	*7,416*			*89*		*251.813/LF*	*11,080*
		44.00 LF										
		54.535 Labor hours										
		6.316 Equipment hours										
		40.05.23.005 (52) Exposed Pipe - PSG - 2" Dia - 44 LF			*3,575*	*7,416*	*0*		*89*	*0*	*251.813/LF*	*11,080*
		44.00 LF										
		54.535 Labor hours										
		6.316 Equipment hours										
40.05.23.010		*(52) Exposed Pipe - PSG - 1.5" Dia - 124 LF*										
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	124.00	LF	306	9	-		28	-	2.767 /LF	343
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	136.40	lf	143	14	-		-	-	1.145 /lf	156
	01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	25.00	ea	6,593	13,773	-		-	-	814.636 /ea	20,366
	1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	10.00	ea	77	22	-		-	-	9.865 /ea	99
	4480	Pipe, stainless steel, threaded, 1-1/2" diameter, schedule 40, type 316	124.00	lf	1,896	5,022	-		-	-	55.787 /lf	6,918
	9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	12.00	ea	124	-	-		-	-	10.312 /ea	124
		40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*9,137*	*18,840*			*28*		*225.848/LF*	*28,005*
		124.00 LF										
		139.369 Labor hours										
		1.984 Equipment hours										
		40.05.23.010 (52) Exposed Pipe - PSG - 1.5" Dia - 124 LF			*9,137*	*18,840*	*0*		*28*	*0*	*225.848/LF*	*28,005*
		124.00 LF										
		139.369 Labor hours										
		1.984 Equipment hours										
40.05.23.015		*(52) Exposed Pipe - PSG - 1.25" Dia - 48 LF*										
40 05 23.002		*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	48.00	LF	118	4	-		11	-	2.767 /LF	133
	7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	52.80	lf	55	5	-		-	-	1.145 /lf	60

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	9.00	ea	2,373	4,958	-		-	-	814.636 /ea	7,332
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	5.00	ea	38	11	-		-	-	9.866 /ea	49
4475	Pipe, stainless steel, threaded, 1-1/4" diameter, schedule 40, type 316	48.00	lf	666	1,704	-		-	-	49.379 /lf	2,370
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	5.00	ea	52	-	-		-	-	10.312 /ea	52
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*3,303*	*6,682*			*11*		*208.252/LF*	*9,996*
	48.00 LF										
	50.386 Labor hours										
	0.768 Equipment hours										
	40.05.23.015 (52) Exposed Pipe - PSG - 1.25" Dia - 48 LF			*3,303*	*6,682*	*0*		*11*	*0*	*208.252/LF*	*9,996*
	48.00 LF										
	50.386 Labor hours										
	0.768 Equipment hours										
40.05.23.020	*(52) Exposed Pipe - FS - 2" Dia - 85 LF*										
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	85.00	LF	210	6	-		19	-	2.767 /LF	235
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	52.80	lf	55	5	-		-	-	1.145 /lf	60
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	17.00	ea	4,483	9,366	-		-	-	814.636 /ea	13,849
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	10.00	ea	77	22	-		-	-	9.865 /ea	99
4485	Pipe, stainless steel, threaded, 2" diameter, schedule 40, type 316	85.00	lf	1,573	4,675	-		-	-	73.505 /lf	6,248
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	9.00	ea	93	-	-		-	-	10.311 /ea	93
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*6,490*	*14,074*			*19*		*242.163/LF*	*20,584*
	85.00 LF										
	98.726 Labor hours										
	1.36 Equipment hours										
	40.05.23.020 (52) Exposed Pipe - FS - 2" Dia - 85 LF			*6,490*	*14,074*	*0*		*19*	*0*	*242.163/LF*	*20,584*
	85.00 LF										
	98.726 Labor hours										
	1.36 Equipment hours										

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Detail Report - Direct Costs

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40.05.23.025	*(52) Exposed Pipe - - 1.5" Dia - 212 LF*										
40 05 23.002	*Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia*										
n 7001	Pipeline Testing, Hydro (LF)	212.00	LF	523	16	-		47	-	2.767 /LF	587
7500	Paints & coatings, pipes, primer + 1 coat, brushwork, up to 4" diameter	23.10	lf	24	2	-		-	-	1.145 /lf	26
01060	Pipe Support, 2.5", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	45.00	ea	11,867	24,792	-		-	-	814.636 /ea	36,659
1116	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 2" pipe	15.00	ea	115	33	-		-	-	9.865 /ea	148
4480	Pipe, stainless steel, threaded, 1-1/2" diameter, schedule 40, type 316	212.00	lf	3,241	8,586	-		-	-	55.787 /lf	11,827
9120	Pipe, stainless steel, schedules 40 and 80, pipe, labor only, 1" through 2" pipe size, threading one end	21.00	ea	217	-	-		-	-	10.311 /ea	217
	40 05 23.002 Pipe and Fittings - Stainless Steel, 1-1/4" to 2" Dia			*15,987*	*33,429*			*47*		*233.316/LF*	*49,463*
	212.00 LF										
	242.731 Labor hours										
	3.392 Equipment hours										
	40.05.23.025 (52) Exposed Pipe - - 1.5" Dia - 212 LF			*15,987*	*33,429*	*0*		*47*	*0*	*233.316/LF*	*49,463*
	212.00 LF										
	242.731 Labor hours										
	3.392 Equipment hours										
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**38,492**	**80,442**	**0**		**194**	**0**	**232.218/LF**	**119,128**
	513.00 LF										
	585.747 Labor hours										
	13.820 Equipment hours										
DIVISION 43	**PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT**										
43.21.02.015	*(52) Magnetic Drive Transfer Pump - (TP-52A, TP-52B) 150 GPM, 10 HP*										
43 25 53.005	*Pumping Equipment - Chemical Transfer Pump*										
0010	Magnetic Drive Transfer Pump, 150 GPM, 10 HP	2.00	EA	1,753	40,000	-			500	21,126.60 /EA	42,253
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			*1,753*	*40,000*				*500*	*21,126.60 /EA*	*42,253*
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										

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Detail Report - Direct Costs

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	43.21.02.015 (52) Magnetic Drive Transfer Pump - (TP-52A, TP-52B) 150 GPM, 10 HP			*1,753*	*40,000*	*0*		*0*	*500*	*21,126.60 /EA*	*42,253*
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
43.21.02.020	*(52) Diaphragm Ferric Sulfate Pump - (P-52A, P-52B, P-52C) 100 GPH, 3 HP*										
43 25 53.005	*Pumping Equipment - Chemical Transfer Pump*										
0010	Diaphragm Ferric Sulfate Pump, 100 GPH, 3 HP	3.00	EA	2,630	45,000	-			750	16,126.60 /EA	48,380
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			*2,630*	*45,000*				*750*	*16,126.60 /EA*	*48,380*
	3.00 EA										
	36.00 Labor hours										
	3.00 Equipment hours										
	43.21.02.020 (52) Diaphragm Ferric Sulfate Pump - (P-52A, P-52B, P-52C) 100 GPH, 3 HP			*2,630*	*45,000*	*0*		*0*	*750*	*16,126.60 /EA*	*48,380*
	3.00 EA										
	36.00 Labor hours										
	3.00 Equipment hours										
43.21.02.025	*(52) Diaphragm Ferric Sulfate Pump, for Existng Chemical Tank Rehab - 100 GPH, 3 HP - 2 EA*										
43 25 53.005	*Pumping Equipment - Chemical Transfer Pump*										
0010	Diaphragm Ferric Sulfate Pump, 100 GPH, 3 HP	2.00	EA	1,753	30,000	-			500	16,126.60 /EA	32,253
	43 25 53.005 Pumping Equipment - Chemical Transfer Pump			*1,753*	*30,000*				*500*	*16,126.60 /EA*	*32,253*
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
	43.21.02.025 (52) Diaphragm Ferric Sulfate Pump, for Existng Chemical Tank Rehab - 100 GPH, 3 HP - 2 EA			*1,753*	*30,000*	*0*		*0*	*500*	*16,126.60 /EA*	*32,253*
	2.00 EA										
	24.00 Labor hours										
	2.00 Equipment hours										
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**6,136**	**115,000**	**0**		**0**	**1,750**	**17,555.171/EA**	**122,886**
	7.00 EA										
	84.00 Labor hours										
	7.00 Equipment hours										

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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 54		**STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED**										
54.16.23.005		*(52) Ferric Sulfate Bulk Tank (BTK-52A, BTK-52B, BTK-52C, BTK-52D), 12,000 Gal - 4 EA*										
54 16 24.010		*Steel Tank - Fiberglass Reinforced Plastic Coated*										
	0910	Steel water storage tanks, ground level, ht./diam. less than 1, 100,000 gallons, excl. foundation	4.00	EA	1,804	-	-		1,737	313,576	79,279.36 /EA	317,117
		54 16 24.010 Steel Tank - Fiberglass Reinforced Plastic Coated			*1,804*				*1,737*	*313,576*	*5.285/GAL*	*317,117*
		60,000.00 GAL										
		32.00 Labor hours										
		16.00 Equipment hours										
		54.16.23.005 (52) Ferric Sulfate Bulk Tank (BTK-52A, BTK-52B, BTK-52C, BTK-52D), 12,000 Gal - 4 EA			*1,804*	*0*	*0*		*1,737*	*313,576*	*79,279.36 /EA*	*317,117*
		4.00 EA										
		32.00 Labor hours										
		16.00 Equipment hours										
54.16.23.010		*(52) Ferric Sulfate Day Tank (TK-52A), 5,000 Gal - 1 EA*										
54 16 23.005		*Steel Tank - Glass Coated*										
	0900	Steel water storage tanks, ground level, ht./diam. less than 1, 100,000 gallons, excl. foundation, pumps or piping	1.00	EA	451	10,000	-		869	-	11,319.68 /EA	11,320
		54 16 23.005 Steel Tank - Glass Coated			*451*	*10,000*			*869*		*11,319.68 /EA*	*11,320*
		1.00 EA										
		8.00 Labor hours										
		8.00 Equipment hours										
		54.16.23.010 (52) Ferric Sulfate Day Tank (TK-52A), 5,000 Gal - 1 EA			*451*	*10,000*	*0*		*869*	*0*	*11,319.68 /EA*	*11,320*
		1.00 EA										
		8.00 Labor hours										
		8.00 Equipment hours										
54.16.24.010		*(52) Ferric Sulfate Storage - Rehab of Existing Chemical Tank - 2 EA*										
54 16 24.010		*Steel Tank - Fiberglass Reinforced Plastic Coated*										
n	0900	Project Allowance_Rehab of Existing Chemical Tank	2.00	EA			70,000				35,000.00 /EA	70,000
		54 16 24.010 Steel Tank - Fiberglass Reinforced Plastic Coated					*70,000*				*5.833/GAL*	*70,000*
		12,000.00 GAL										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		54.16.24.010 (52) Ferric Sulfate Storage - Rehab of Existing Chemical Tank - 2 EA			*0*	*0*	*70,000*		*0*	*0*	*35,000.00 /EA*	*70,000*
		2.00 EA										
		DIVISION 54 STORAGE TANKS - BURIED, AT GRADE, AND ELEVATED			**2,255**	**10,000**	**70,000**		**2,606**	**313,576**	**56,919.589/EA**	**398,437**
		7.00 EA										
		40.00 Labor hours										
		24.00 Equipment hours										
		165 FERRIC SULFATE STORAGE			***274,391***	***489,556***	***70,000***		***23,423***	***315,326***	***1,172,696.360/LS***	***1,172,696***
		1.00 LS										
		4,654.321 Labor hours										
		425.204 Equipment hours										

400 SLUDGE HOLDING TANK

DIVISION 02 EXISTING CONDITIONS

02.41.00.030 (71) Sludge Holding Tank - Demo and Rehab

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
02 41 00.190		*Process Equipment Demolition*										
n	0900	Project Allowance_Sludge Holding Tank, Demo and Rehab	1.00	LS	28,000	90,000			20,000		138,000.00 /LS	138,000
		02 41 00.190 Process Equipment Demolition			*28,000*	*90,000*			*20,000*		*138,000.00 /EA*	*138,000*
		1.00 EA										
		02.41.00.030 (71) Sludge Holding Tank - Demo and Rehab			*28,000*	*90,000*	*0*		*20,000*	*0*	*138,000.00 /LS*	*138,000*
		1.00 LS										
		DIVISION 02 EXISTING CONDITIONS			**28,000**	**90,000**	**0**		**20,000**	**0**	**138,000.00 /LS**	**138,000**
		1.00 LS										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.050 (71) Exposed Pipe - PSG - 6" Dia - 7 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	7.00	LF	17	1	-		2	-	2.769 /LF	19

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	7.70	lf	16	1	-		-	-	2.281 /lf	18
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	5.00	ea	48	18	-		-	-	13.236 /ea	66
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	16.00	ea	1,537	936	-		-	-	154.567 /ea	2,473
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	400	3,408	-		-	-	634.623 /ea	3,808
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	4.00	ea	267	1,203	-		-	-	367.425 /ea	1,470
n	2514	Fitting,DIP,FLG,Conc. Reducer,6"x5",c 110 water piping	2.00	ea	133	414	-		-	-	273.825 /ea	548
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*2,418*	*5,982*			*2*		*1,200.183/LF*	*8,401*
		7.00 LF										
		37.004 Labor hours										
		0.112 Equipment hours										
		40.05.19.050 (71) Exposed Pipe - PSG - 6" Dia - 7 LF			*2,418*	*5,982*	*0*		*2*	*0*	*1,200.183/LF*	*8,401*
		7.00 LF										
		37.004 Labor hours										
		0.112 Equipment hours										
40.05.62.005		*(71) Exposed Pipe - PSG - Plug Valve - 06" Dia*										
40 05 62.006		*Exposed Valves - Plug, Eccentric, Cast Iron, 06" Dia*										
n	0502	Plug Valve Flange: 6" / Handwheel or Lever Operator / Includes Gear Operator	2.00	EA	586	1,851	-		423	-	1,429.865 /EA	2,860
		40 05 62.006 Exposed Valves - Plug, Eccentric, Cast Iron, 06" Dia			*586*	*1,851*			*423*		*1,429.865/EA*	*2,860*
		2.00 EA										
		10.667 Labor hours										
		4.00 Equipment hours										
		40.05.62.005 (71) Exposed Pipe - PSG - Plug Valve - 06" Dia			*586*	*1,851*	*0*		*423*	*0*	*1,429.865/EA*	*2,860*
		2.00 EA										
		10.667 Labor hours										
		4.00 Equipment hours										
40.05.66.010		*(71) Exposed Pipe - PSG - Check Valve - 06" Dia*										
40 05 66.106		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia*										
n	0015	Check Valve, 250 lb, Swing: 6" / Flange End	2.00	EA	974		-			-	487.245 /EA	974

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Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	40 05 66.106 Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia		*974*						*487.245/EA*	*974*
	2.00 EA									
	13.34 Labor hours									
	40.05.66.010 (71) Exposed Pipe - PSG - Check Valve - 06" Dia		*974*	*0*	*0*		*0*	*0*	*487.245/EA*	*974*
	2.00 EA									
	13.34 Labor hours									
	DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)		**3,978**	**7,832**	**0**		**425**	**0**	**1,747.929/LF**	**12,236**
	7.00 LF									
	61.011 Labor hours 4.112 Equipment hours									

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

43.25.13.005 (71) Dry Pit Submersible Pump, Sludge Transfer Pump (P-71-1, P-71-2), 400 GPM - 2 EA

43 25 13.000 Pumping Equipment - Submersible End-Suction Sewage Pumps

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
9000	Submersible Pump_400 GPM	2.00 EA	2,255	124,000	-		217	398	63,435.18 /EA	126,870
	43 25 13.000 Pumping Equipment - Submersible End-Suction Sewage Pumps		*2,255*	*124,000*			*217*	*398*	*63,435.18 /EA*	*126,870*
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									
	43.25.13.005 (71) Dry Pit Submersible Pump, Sludge Transfer Pump (P-71-1, P-71-2), 400 GPM - 2 EA		*2,255*	*124,000*	*0*		*217*	*398*	*63,435.18 /EA*	*126,870*
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									
	DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT		**2,255**	**124,000**	**0**		**217**	**398**	**63,435.18 /EA**	**126,870**
	2.00 EA									
	40.00 Labor hours 2.00 Equipment hours									

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 46		**WATER AND WASTEWATER EQUIPMENT**										
46.41.00.005		*(71) Sludge Holding Tank - Mixing System*										
46 41 00.005		*Paddle Mixers*										
	1100	Mixing System	1.00	EA	8,274	152,500	-		4,285	-	165,058.830 /EA	165,059
		46 41 00.005 Paddle Mixers			*8,274*	*152,500*			*4,285*		*165,058.830/EA*	*165,059*
		1.00 EA										
		135.00 Labor hours										
		19.00 Equipment hours										
		46.41.00.005 (71) Sludge Holding Tank - Mixing System			*8,274*	*152,500*	*0*		*4,285*	*0*	*165,058.830/EA*	*165,059*
		1.00 EA										
		135.00 Labor hours										
		19.00 Equipment hours										
		DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**8,274**	**152,500**	**0**		**4,285**	**0**	**165,058.830/EA**	**165,059**
		1.00 EA										
		135.00 Labor hours										
		19.00 Equipment hours										
		400 SLUDGE HOLDING TANK			***42,507***	***374,332***	***0***		***24,927***	***398***	***442,164.69 /LS***	***442,165***
		1.00 LS										
		236.011 Labor hours										
		25.112 Equipment hours										

412 THICKENED SLUDGE PUMP STATION

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
DIVISION 03		**CONCRETE**										
03.11.13.210		*(75) Thickened Sludge Pump Station - Buried Slab, 1,050 SF - 12" Thick*										
03 11 13.763		*12" Foundation Slab*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	136.00	sfca	558	166	-		-	-	5.322 /sfca	724
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	52.80	sfca	129	24	-		-	-	2.894 /sfca	153
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	3.50	ton	126	-	-		73	-	56.817 /ton	199

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.50	ton	3,143	5,075	-		-	-	2,348.086 /ton	8,218
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	3.50	ton	360	-	-		209	-	162.330 /ton	568
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	40.00	cy	702	-	-		107	-	20.206 /cy	808
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	4.00	cy	70	-	-		11	-	20.205 /cy	81
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	40.00	CY	-	7,400	-		-	-	185.00 /CY	7,400
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	4.00	cy	-	740	-		-	-	185.00 /cy	740
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	1,056.00	sf	774	-	-		57	-	0.787 /sf	831
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	52.80	lf	23	2	-		3	-	0.529 /lf	28
n	0215	Control joint, clean out control joint of debris_SOG	52.80	lf	4	-	-			-	0.073 /lf	4
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	105.60	lf	172	17	-		-	-	1.790 /lf	189
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	10.56	csf	84	79	-		-	-	15.407 /csf	163
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	10.56	sq	134	86	-		-	-	20.82 /sq	220
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	45.00	ecy	491	1,440	-		56	-	44.144 /ecy	1,986
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	45.00	lcy	370	-	-		558	-	20.626 /lcy	928
		03 11 13.763 12" Foundation Slab			*7,139*	*15,028*			*1,073*		*581.006/CY*	*23,240*
		40.00 CY										
		122.737 Labor hours										
		26.890 Equipment hours										
		03.11.13.210 (75) Thickened Sludge Pump Station - Buried Slab, 1,050 SF - 12" Thick			*7,139*	*15,028*	*0*		*1,073*	*0*	*581.006/CY*	*23,240*
		40.00 CY										
		122.737 Labor hours										
		26.890 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.215		*(75) Thickened Sludge Pump Station - Walls, 22' High, 124 LF - 12" Thick*										
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	137.00	lf	1,424	466	-		-	-	13.793 /lf	1,890
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	5,456.00	sfca	38,040	5,401	-		-	-	7.962 /sfca	43,442
n	5200	Chamfer strip, wood, 3/4" wide	273.00	lf	244	38	-		-	-	1.033 /lf	282
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	5.00	c	-	325	-		-	-	65.00 /c	325
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	261.00	lf	844	1,905	-		-	-	10.533 /lf	2,749
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	10.20	ton	7,023	14,790	-		-	-	2,138.533 /ton	21,813
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	10.20	ton	367	-	-		213	-	56.816 /ton	580
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	10.20	ton	399	-	-		231	-	61.757 /ton	630
n	0210	Control joint, clean out control joint of debris_WALLS	137.00	lf	10	-	-		-	-	0.073 /lf	10
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	137.00	lf	223	22	-		-	-	1.790 /lf	245
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	5,456.00	sf	4,446	218	-		-	-	0.855 /sf	4,664
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,728.00	sf	2,667	109	-		-	-	1.018 /sf	2,777
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	102.00	cy	3,008	-	-		458	-	33.983 /cy	3,466
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	102.00	CY	-	18,870	-		-	-	185.00 /CY	18,870
		03 11 13.804 12" CIP Wall			*58,695*	*42,145*			*902*		*997.465/CY*	*101,741*
		102.00 CY										
		1,020.017 Labor hours										
		23.958 Equipment hours										
		03.11.13.215 (75) Thickened Sludge Pump Station - Walls, 22' High, 124 LF - 12" Thick			*58,695*	*42,145*	*0*		*902*	*0*	*997.465/CY*	*101,741*
		102.00 CY										
		1,020.017 Labor hours										
		23.958 Equipment hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 03 CONCRETE			**65,834**	**57,173**	**0**		**1,975**	**0**	**880.153/CY**	**124,982**
		142.00 CY										
		1,142.754 Labor hours 50.848 Equipment hours										
DIVISION 05		**METALS**										
05.12.00.010		*(75) Thickened Sludge Pump Station - Structural Columns - HSS8x8x3/8 - 10' High - 6 EA*										
05 12 00.000		*Structural Steel*										
n	0125	Structural steel member, 100-ton project, 1 to 2 story building, HSS8x8x3/8, A992 steel, shop fabricated, incl shop primer, bolted connections	60.00	LF	245	1,320	-		123	-	28.134 /LF	1,688
	4300	Column base plates, structural, light, 100-ton project, up to 150 lb each, A992 steel, shop fabricated, incl shop primer	900.00	lb	465	1,620	-		-	-	2.316 /lb	2,085
		05 12 00.000 Structural Steel			*710*	*2,940*			*123*		*3,338.735/TON*	*3,773*
		1.13 TON										
		11.018 Labor hours 0.545 Equipment hours										
		05.12.00.010 (75) Thickened Sludge Pump Station - Structural Columns - HSS8x8x3/8 - 10' High - 6 EA			*710*	*2,940*	*0*		*123*	*0*	*62.880/LF*	*3,773*
		60.00 LF										
		11.018 Labor hours 0.545 Equipment hours										
05.12.00.015		*(75) Thickened Sludge Pump Station - Roof Joists - W10x19 - 145 LF*										
05 12 00.000		*Structural Steel*										
n	0640	Structural steel member, 100-ton project, 1 to 2 story building, W10x20, A992 steel, shop fabricated, incl shop primer, bolted connections	145.00	LF	868	5,220	-		436	-	44.995 /LF	6,524
		05 12 00.000 Structural Steel			*868*	*5,220*			*436*		*4,727.72 /TON*	*6,524*
		1.38 TON										
		13.533 Labor hours 1.933 Equipment hours										
		05.12.00.015 (75) Thickened Sludge Pump Station - Roof Joists - W10x19 - 145 LF			*868*	*5,220*	*0*		*436*	*0*	*44.995/LF*	*6,524*
		145.00 LF										
		13.533 Labor hours 1.933 Equipment hours										

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
05.50.00.030	*(75) Canopy over Thickened Sludge Pump Station*										
05 50 00.500	*Fabricated, Metal Canopy*										
1160	(75) Canopy over Thickened Sludge Pump Station	861.00	SF	-	0	43,050		-	-	50.00 /SF	43,050
	05 50 00.500 Fabricated, Metal Canopy					*43,050*				*50.00 /SF*	*43,050*
	861.00 SF										
	05.50.00.030 (75) Canopy over Thickened Sludge Pump Station			*0*	*0*	*43,050*		*0*	*0*	*50.00 /SF*	*43,050*
	861.00 SF										
05.52.02.010	*(75) Thickened Sludge Pump Station - Aluminum Handrail - 3-Rail - 4' High - 116 LF*										
05 52 02.002	*Aluminum Railings - 3 Rail*										
0150	Railing, pipe, aluminum, clear finish, 3 rails, 3'-6" high, posts @ 5' O.C., 1-1/4" dia, shop fabricated	116.00	LF	1,774	11,078	-		132	-	111.935 /LF	12,984
	05 52 02.002 Aluminum Railings - 3 Rail			*1,774*	*11,078*			*132*		*111.935/LF*	*12,984*
	116.00 LF										
	27.095 Labor hours										
	6.774 Equipment hours										
	05.52.02.010 (75) Thickened Sludge Pump Station - Aluminum Handrail - 3-Rail - 4' High - 116 LF			*1,774*	*11,078*	*0*		*132*	*0*	*111.935/LF*	*12,984*
	116.00 LF										
	27.095 Labor hours										
	6.774 Equipment hours										
	DIVISION 05 METALS			**3,352**	**19,238**	**43,050**		**691**	**0**	**66,331.47 /LS**	**66,331**
	1.00 LS										
	51.646 Labor hours										
	9.252 Equipment hours										
DIVISION 31	**EARTHWORK**										
31.23.10.025	*(75) Thickened Sludge Pump Station, Excavation, Backfill and Haul Off-Site*										
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	1,058.00	CY	400	-	-		1,012	-	1.335 /CY	1,413
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	159.00	CY	92	-	-		212	-	1.911 /CY	304

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	1,125.00	CY	12,796	-	-		17,581	-	27.002 /CY	30,378
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	159.00	CY	74	-	-		152	-	1.418 /CY	226
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*13,362*				*18,957*		*12.923/CY*	*32,319*
		2,501.00 CY										
		240.687 Labor hours										
		236.206 Equipment hours										
		31.23.10.025 (75) Thickened Sludge Pump Station, Excavation, Backfill and Haul Off-Site			*13,362*	*0*	*0*		*18,957*	*0*	*12.923/CY*	*32,319*
		2,501.00 CY										
		240.687 Labor hours										
		236.206 Equipment hours										
31.23.19.005		*(75) Thickened Sludge Pump Station, Wellpoint Dewatering - 160 LF - 4 Months*										
31 23 19.020		*Dewatering - Wellpoint*										
n	0700	Wellpoints,complete installation,2"wellpoints,5'oc, 100'long header,6"diameter,includes one month operation,equipment rental,fuel and removal system	160.00	HDR	94,633	24,640	-		-	-	745.455 /HDR	119,273
	0800	Wellpoints, each additional month, 2" wellpoints, 5' O.C., 100' long header, 6" diameter, includes equipment rental, fuel and removal of system	480.00	hdr	222,032	59,040	-		-	-	585.567 /hdr	281,072
		31 23 19.020 Dewatering - Wellpoint			*316,665*	*83,680*					*100,086.195/MO*	*400,345*
		4.00 MO										
		5,304.268 Labor hours										
		31.23.19.005 (75) Thickened Sludge Pump Station, Wellpoint Dewatering - 160 LF - 4 Months			*316,665*	*83,680*	*0*		*0*	*0*	*2,502.155/HDR*	*400,345*
		160.00 HDR										
		5,304.268 Labor hours										
31.62.17.005		*(75) Thickened Sludge Pump Station, Sheeting and Shoring - 148 LF x 32' Deep - 4,736 SF*										
31 62 17.040		*Driven Steel Sheet Piling, 40' Deep*										
	1000	Sheet piling, steel, 38 psf, 40' excavation, per ton, drive, extract and salvage, excludes wales	90.00	TON	29,124	45,900	-		27,177	-	1,135.557 /TON	102,200
	2500	Sheet piling, wales, connections and struts, 2/3 salvage	90.00	ton	-	45,900	-		-	-	510.00 /ton	45,900
		31 62 17.040 Driven Steel Sheet Piling, 40' Deep			*29,124*	*91,800*			*27,177*		*1,645.557/TON*	*148,100*
		90.00 TON										
		470.204 Labor hours										
		117.551 Equipment hours										

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		31.62.17.005 (75) Thickened Sludge Pump Station, Sheeting and Shoring - 148 LF x 32' Deep - 4,736 SF			*29,124*	*91,800*	*0*		*27,177*	*0*	*1,645.557/TON*	*148,100*
		90.00 TON										
		470.204 Labor hours										
		117.551 Equipment hours										
		DIVISION 31 EARTHWORK			**359,150**	**175,480**	**0**		**46,134**	**0**	**232.213/CY**	**580,764**
		2,501.00 CY										
		6,015.158 Labor hours										
		353.757 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.085 (75) Exposed Pipe - TS - 8" Dia - Wall Pipe

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	10	0	-		1	-	2.768 /LF	11
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	2.00	ea	21	12	-		-	-	16.045 /ea	32
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	2.00	ea	231	104	-		-	-	167.28 /ea	335
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	161	2,176	-		-	-	1,168.505 /ea	2,337
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			*422*	*2,292*			*1*		*678.683/LF*	*2,715*
		4.00 LF										
		6.546 Labor hours										
		0.064 Equipment hours										
		40.05.19.085 (75) Exposed Pipe - TS - 8" Dia - Wall Pipe			*422*	*2,292*	*0*		*1*	*0*	*678.683/LF*	*2,715*
		4.00 LF										
		6.546 Labor hours										
		0.064 Equipment hours										

40.05.19.090 (75) Exposed Pipe - TS - 8" Dia - 12 LF

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	12.00	LF	30	1	-		3	-	2.768 /LF	33
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	13.20	lf	28	3	-		-	-	2.28 /lf	30
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	5.00	ea	51	29	-		-	-	16.042 /ea	80
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	24.00	ea	2,767	1,248	-		-	-	167.28 /ea	4,015

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.008		Pipe and Fittings - Ductile Iron, 08" Dia										
n	0095	DIP,FLGxFLG,8"dia,1'-0" long,class 53,excl excav, backfill	2.00	ea	161	1,677	-		-	-	918.905 /ea	1,838
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	322	4,352	-		-	-	1,168.505 /ea	4,674
n	1408	Fitting,DIP,FLG,Tee,8"dia,c 110 water piping	3.00	ea	242	2,198	-		-	-	813.303 /ea	2,440
n	2524	Fitting,DIP,FLG,Conc. Reducer,8"x6",c 110 water piping	3.00	ea	242	1,010	-		-	-	417.303 /ea	1,252
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			3,841	10,518			3		1,196.824/LF	14,362
		12.00 LF										
		57.550 Labor hours										
		0.192 Equipment hours										
		40.05.19.090 (75) Exposed Pipe - TS - 8" Dia - 12 LF			3,841	10,518	0		3	0	1,196.824/LF	14,362
		12.00 LF										
		57.550 Labor hours										
		0.192 Equipment hours										
40.05.19.095		(75) Exposed Pipe - TS - 6" Dia - Wall Pipe										
40 05 19.006		Pipe and Fittings - Ductile Iron, 06" Dia										
n	7001	Pipeline Testing, Hydro (LF)	4.00	LF	10	0	-		1	-	2.768 /LF	11
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	2.00	ea	19	7	-		-	-	13.235 /ea	26
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	2.00	ea	192	117	-		-	-	154.565 /ea	309
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	2.00	ea	133	1,491	-		-	-	812.225 /ea	1,624
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			354	1,616			1		492.78 /LF	1,971
		4.00 LF										
		5.493 Labor hours										
		0.064 Equipment hours										
		40.05.19.095 (75) Exposed Pipe - TS - 6" Dia - Wall Pipe			354	1,616	0		1	0	492.78 /LF	1,971
		4.00 LF										
		5.493 Labor hours										
		0.064 Equipment hours										
40.05.19.100		(75) Exposed Pipe - TS - 6" Dia - 60 LF										
40 05 19.006		Pipe and Fittings - Ductile Iron, 06" Dia										
n	7001	Pipeline Testing, Hydro (LF)	60.00	LF	148	5	-		13	-	2.767 /LF	166
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	66.00	lf	138	13	-		-	-	2.281 /lf	151
	01066	Pipe Support, 6", Stand, Stainless Steel, Inc. Material, Anchors, Grout, Labor	14.00	ea	3,692	7,870	-		-	-	825.836 /ea	11,562

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	5.00	ea	48	18	-		-	-	13.236 /ea	66
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	46.00	ea	4,419	2,691	-		-	-	154.567 /ea	7,110
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	400	3,408	-		-	-	634.623 /ea	3,808
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	22.00	ea	1,466	16,403	-		-	-	812.224 /ea	17,869
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	20.00	ea	1,332	6,016	-		-	-	367.424 /ea	7,348
n	1406	Fitting,DIP,FLG,Tee,6"dia,c 110 water piping	9.00	ea	600	3,960	-		-	-	506.624 /ea	4,560
n	2514	Fitting,DIP,FLG,Conc. Reducer,6"x4",c 110 water piping	3.00	ea	200	622	-		-	-	273.823 /ea	821
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*12,442*	*41,005*			*13*		*891.012/LF*	*53,461*
		60.00 LF										
		195.179 Labor hours										
		0.96 Equipment hours										
		40.05.19.100 (75) Exposed Pipe - TS - 6" Dia - 60 LF			*12,442*	*41,005*	*0*		*13*	*0*	*891.012/LF*	*53,461*
		60.00 LF										
		195.179 Labor hours										
		0.96 Equipment hours										
40.05.62.010		*(75) Exposed Pipe - TS - Plug Valve - 08" Dia*										
40 05 62.108		*Exposed Valves - Plug, Eccentric, Ductile Iron, 08" Dia*										
n	0503	Plug Valve Flange: 8" / Handwheel or Lever Operator / Includes Gear Operator	3.00	EA	879	4,075	-		635	-	1,862.777 /EA	5,588
		40 05 62.108 Exposed Valves - Plug, Eccentric, Ductile Iron, 08" Dia			*879*	*4,075*			*635*		*1,862.777/EA*	*5,588*
		3.00 EA										
		16.000 Labor hours										
		6.00 Equipment hours										
		40.05.62.010 (75) Exposed Pipe - TS - Plug Valve - 08" Dia			*879*	*4,075*	*0*		*635*	*0*	*1,862.777/EA*	*5,588*
		3.00 EA										
		16.000 Labor hours										
		6.00 Equipment hours										
40.05.62.015		*(75) Exposed Pipe - TS - Plug Valve - 06" Dia*										
40 05 62.106		*Exposed Valves - Plug, Eccentric, Ductile Iron, 06" Dia*										
n	0502	Plug Valve Flange: 6" / Handwheel or Lever Operator / Includes Gear Operator	19.00	EA	5,567	17,582	-		4,019	-	1,429.866 /EA	27,167

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		40 05 62.106 Exposed Valves - Plug, Eccentric, Ductile Iron, 06" Dia			*5,567*	*17,582*			*4,019*		*1,429.866/EA*	*27,167*
		19.00 EA										
		101.333 Labor hours										
		38.00 Equipment hours										
		40.05.62.015 (75) Exposed Pipe - TS - Plug Valve - 06" Dia			*5,567*	*17,582*	*0*		*4,019*	*0*	*1,429.866/EA*	*27,167*
		19.00 EA										
		101.333 Labor hours										
		38.00 Equipment hours										
40.05.66.015		*(75) Exposed Pipe - TS - Check Valve - 06" Dia*										
40 05 66.106		*Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia*										
n	102	Check Valve Flange, Swing: 6" / Lever and Weight	3.00	EA	659	3,548	-		423	-	1,543.517 /EA	4,631
		40 05 66.106 Exposed Valves - Cushioned Swing Check, Ductile Iron, 06" Dia			*659*	*3,548*			*423*		*1,543.517/EA*	*4,631*
		3.00 EA										
		12.00 Labor hours										
		4.000 Equipment hours										
		40.05.66.015 (75) Exposed Pipe - TS - Check Valve - 06" Dia			*659*	*3,548*	*0*		*423*	*0*	*1,543.517/EA*	*4,631*
		3.00 EA										
		12.00 Labor hours										
		4.000 Equipment hours										
40.71.00.005		*(75) Exposed Pipe - TS - Flow Meter - 06" Dia*										
40 71 00.106		*Flow Meter Magnetic, 06"*										
	0135	Flow Meter Magnetic, 6"	2.00	EA	471	6,600					3,535.725 /EA	7,071
		40 71 00.106 Flow Meter Magnetic, 06"			*471*	*6,600*					*3,535.725/EA*	*7,071*
		2.00 EA										
		7.00 Labor hours										
		40.71.00.005 (75) Exposed Pipe - TS - Flow Meter - 06" Dia			*471*	*6,600*	*0*		*0*	*0*	*3,535.725/EA*	*7,071*
		2.00 EA										
		7.00 Labor hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**24,636**	**87,235**	**0**		**5,094**	**0**	**1,462.078/LF**	**116,966**
		80.00 LF										
		401.101 Labor hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**24,636**	**87,235**	**0**		**5,094**	**0**	**1,462.078/LF**	**116,966**
		80.00 LF										
		401.101 Labor hours										
		49.280 Equipment hours										

DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT

43.23.57.005 (75) Progressive Cavity Pump - (P-75-1, P-75-2, P-75-3), 200 GPM, 50 PSI

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
43 23 57.000		*Pumping Equipment - Progressive Cavity Pump*										
n	9990	Progressive Cavity Pump,200 GPM, 50 PSI	3.00	EA	6,766	110,295	-		326	1,077	39,487.78 /EA	118,463
		43 23 57.000 Pumping Equipment - Progressive Cavity Pump			*6,766*	*110,295*			*326*	*1,077*	*39,487.78 /EA*	*118,463*
		3.00 EA										
		120.00 Labor hours										
		3.00 Equipment hours										
		43.23.57.005 (75) Progressive Cavity Pump - (P-75-1, P-75-2, P-75-3), 200 GPM, 50 PSI			*6,766*	*110,295*	*0*		*326*	*1,077*	*39,487.78 /EA*	*118,463*
		3.00 EA										
		120.00 Labor hours										
		3.00 Equipment hours										
		DIVISION 43 PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT			**6,766**	**110,295**	**0**		**326**	**1,077**	**39,487.78 /EA**	**118,463**
		3.00 EA										
		120.00 Labor hours										
		3.00 Equipment hours										

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

46.24.23.005 (75) Sludge Grinder - (SG-75-1, SG-75-2, SG-75-3), 3 HP

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 24 23.000		*Sludge Grinders*										
	9998	Sludge Grinders_3 HP	3.00	EA	1,353	55,341	-		2,606	-	19,766.68 /EA	59,300
		46 24 23.000 Sludge Grinders			*1,353*	*55,341*			*2,606*		*19,766.68 /EA*	*59,300*
		3.00 EA										
		24.00 Labor hours										
		24.00 Equipment hours										

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Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46.24.23.005 (75) Sludge Grinder - (SG-75-1, SG-75-2, SG-75-3), 3 HP	*3.00*	*EA*	*1,353*	*55,341*	*0*		*2,606*	*0*	*19,766.68 /EA*	*59,300*
	24.00 Labor hours 24.00 Equipment hours										
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT	**3.00**	**EA**	**1,353**	**55,341**	**0**		**2,606**	**0**	**19,766.68 /EA**	**59,300**
	24.00 Labor hours 24.00 Equipment hours										
	412 THICKENED SLUDGE PUMP STATION	***1.00***	***LS***	***461,091***	***504,762***	***43,050***		***56,826***	***1,077***	***1,066,807.19 /LS***	***1,066,807***
	7,754.660 Labor hours 490.136 Equipment hours										

500 SLUDGE THICKENER

DIVISION 03 — CONCRETE

03.11.13.180 — (74) Sludge Thickener - Center Slab, 9' Dia, 77 SF - 27" Thick

03 11 13.775 — 27" Foundation Slab

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	64.00	sfca	326	45	-		-	-	5.798 /sfca	371
n 9011	C.I.P. concrete forms, bulkhead for foundation w/ keyway, 12" and greater, exp metal, includes erecting, bracing, stripping and cleaning	41.00	sfca	87	10	-		-	-	2.375 /sfca	97
n 3005	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_FOUNDATIONS	18.00	lf	58	135	-		-	-	10.733 /lf	193
n 2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.563	ton	20	-	-		12	-	56.803 /ton	32
n 2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.563	ton	22	-	-		13	-	61.758 /ton	35
n 0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.563	ton	506	524	-		-	-	1,828.08 /ton	1,029
n 4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.00	cy	88	-	-		13	-	20.206 /cy	101
n 4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.50	cy	9	-	-		1	-	20.20 /cy	10

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Unit Cost	Total Amount
03 11 13.775		*27" Foundation Slab*										
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.00	CY	-	900	-		-	-	180.00 /CY	900
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.50	cy	-	90	-		-	-	180.00 /cy	90
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	64.00	sf	20	-	-		-	-	0.315 /sf	20
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	18.00	lf	1	-	-			-	0.073 /lf	1
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	18.00	lf	29	3	-		-	-	1.789 /lf	32
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	0.64	csf	5	5	-		-	-	15.40 /csf	10
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	2.00	ecy	40	64	-		5	-	54.26 /ecy	109
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	2.00	lcy	16	-	-		25	-	20.625 /lcy	41
		03 11 13.775 27" Foundation Slab			*1,228*	*1,775*			*69*		*614.406/CY*	*3,072*
		5.00 CY										
		20.946 Labor hours										
		1.533 Equipment hours										
		03.11.13.180 (74) Sludge Thickener - Center Slab, 9' Dia, 77 SF - 27" Thick			*1,228*	*1,775*	*0*		*69*	*0*	*614.406/CY*	*3,072*
		5.00 CY										
		20.946 Labor hours										
		1.533 Equipment hours										
03.11.13.185		*(74) Sludge Thickener - Bottom Slab, 105' Dia, 8630 SF - 12" Thick*										
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	330.00	sfca	1,682	231	-		-	-	5.798 /sfca	1,913
n	9011	C.I.P. concrete forms, bulkhead for foundation w/ keyway, 12" and greater, exp metal, includes erecting, bracing, stripping and cleaning	210.00	sfca	446	53	-		-	-	2.375 /sfca	499
n	3005	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_FOUNDATIONS	210.00	lf	679	1,575	-		-	-	10.733 /lf	2,254
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	36.113	ton	1,298	-	-		753	-	56.816 /ton	2,052
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	36.113	ton	1,411	-	-		819	-	61.758 /ton	2,230
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	36.113	ton	32,433	33,585	-		-	-	1,828.087 /ton	66,018

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	321.00	cy	5,630	-	-		857	-	20.206 /cy	6,486
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	32.10	cy	563	-	-		86	-	20.206 /cy	649
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	321.00	CY	-	57,780	-		-	-	180.00 /CY	57,780
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	32.10	cy	-	5,778	-		-	-	180.00 /cy	5,778
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	8,660.00	sf	2,724	-	-		-	-	0.315 /sf	2,724
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	210.00	lf	15	-	-			-	0.073 /lf	15
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	210.00	lf	342	34	-		-	-	1.790 /lf	376
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	86.60	csf	689	645	-		-	-	15.408 /csf	1,334
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	321.00	ecy	6,419	10,272	-		728	-	54.263 /ecy	17,419
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	369.00	lcy	3,031	-	-		4,580	-	20.626 /lcy	7,611
		03 11 13.763 12" Foundation Slab			*57,363*	*109,952*			*7,822*		*545.599/CY*	*175,137*
		321.00 CY										
		972.675 Labor hours										
		182.573 Equipment hours										
		03.11.13.185 (74) Sludge Thickener - Bottom Slab, 105' Dia, 8630 SF - 12" Thick			*57,363*	*109,952*	*0*		*7,822*	*0*	*545.599/CY*	*175,137*
		321.00 CY										
		972.675 Labor hours										
		182.573 Equipment hours										

03.11.13.190 *(74) Sludge Thickener - Thickened Edge Footing, 330' x 5'-3" Wide, 642 SF - 12" Thick*

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	670.50	sfca	3,418	469	-		-	-	5.798 /sfca	3,888
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	7.219	ton	260	-	-		151	-	56.817 /ton	410
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	7.219	ton	282	-	-		164	-	61.758 /ton	446
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	7.219	ton	6,483	6,714	-		-	-	1,828.087 /ton	13,197
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	64.167	cy	1,125	-	-		171	-	20.206 /cy	1,297

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	6.417	cy	113	-	-		17	-	20.206 /cy	130
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	64.167	CY	-	11,550	-		-	-	180.00 /CY	11,550
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	6.417	cy	-	1,155	-		-	-	180.00 /cy	1,155
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	1,732.50	sf	545	-	-		-	-	0.315 /sf	545
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	86.625	lf	6	-	-			-	0.073 /lf	6
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	86.625	lf	141	14	-		-	-	1.790 /lf	155
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	17.325	csf	138	129	-		-	-	15.408 /csf	267
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	64.00	ecy	1,280	2,048	-		145	-	54.263 /ecy	3,473
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	74.00	lcy	608	-	-		918	-	20.626 /lcy	1,526
		03 11 13.763 12" Foundation Slab			*14,399*	*22,079*			*1,566*		*592.898/CY*	*38,044*
		64.167 CY										
		247.155 Labor hours										
		36.555 Equipment hours										
		03.11.13.190 (74) Sludge Thickener - Thickened Edge Footing, 330' x 5'-3" Wide, 642 SF - 12" Thick			*14,399*	*22,079*	*0*		*1,566*	*0*	*592.898/CY*	*38,044*
		64.167 CY										
		247.155 Labor hours										
		36.555 Equipment hours										

03.11.13.195 *(74) Sludge Thickener - Walls, 15' High, 319 LF - 18" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	240.00	lf	2,494	816	-		-	-	13.792 /lf	3,310
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	9,570.00	sfca	66,724	9,474	-		-	-	7.962 /sfca	76,198
n	5200	Chamfer strip, wood, 3/4" wide	479.00	lf	428	67	-		-	-	1.033 /lf	495
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	8.00	c	-	520	-		-	-	65.00 /c	520
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	559.00	lf	1,807	4,081	-		-	-	10.533 /lf	5,888

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.811		*18" CIP Wall*										
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	26.60	ton	18,315	38,570	-		-	-	2,138.533 /ton	56,885
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	26.60	ton	956	-	-		555	-	56.816 /ton	1,511
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	26.60	ton	1,040	-	-		603	-	61.758 /ton	1,643
n	0210	Control joint, clean out control joint of debris_WALLS	240.00	lf	18	-	-		-	-	0.073 /lf	18
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	240.00	lf	391	38	-		-	-	1.790 /lf	430
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	9,570.00	sf	7,798	383	-		-	-	0.855 /sf	8,181
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	4,785.00	sf	4,679	191	-		-	-	1.018 /sf	4,870
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	266.00	cy	7,846	-	-		1,194	-	33.983 /cy	9,039
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	266.00	CY	-	49,210	-		-	-	185.00 /CY	49,210
		03 11 13.811 18" CIP Wall			*112,494*	*103,351*			*2,352*		*820.289/CY*	*218,197*
		266.00 CY										
		1,948.407 Labor hours										
		62.477 Equipment hours										
		03.11.13.195 (74) Sludge Thickener - Walls, 15' High, 319 LF - 18" Thick			*112,494*	*103,351*	*0*		*2,352*	*0*	*820.289/CY*	*218,197*
		266.00 CY										
		1,948.407 Labor hours										
		62.477 Equipment hours										
03.11.13.200		*(74) Sludge Thickener - Elevated Trough Wall, 2'-6" High, 295 LF - 8" Thick*										
03 11 13.801		*08" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	37.00	lf	385	126	-		-	-	13.792 /lf	510
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	1,475.00	sfca	10,284	1,460	-		-	-	7.962 /sfca	11,744
n	5200	Chamfer strip, wood, 3/4" wide	74.00	lf	66	10	-		-	-	1.033 /lf	76
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	2.00	c	-	130	-		-	-	65.00 /c	130
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	332.00	lf	1,073	2,424	-		-	-	10.533 /lf	3,497

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.801		*08" CIP Wall*										
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	1.90	ton	1,308	2,755	-		-	-	2,138.530 /ton	4,063
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	1.90	ton	68	-	-		40	-	56.816 /ton	108
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	1.90	ton	74	-	-		43	-	61.76 /ton	117
n	0210	Control joint, clean out control joint of debris_WALLS	37.00	lf	3	-	-		-	-	0.073 /lf	3
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	37.00	lf	60	6	-		-	-	1.790 /lf	66
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	1,475.00	sf	1,202	59	-		-	-	0.855 /sf	1,261
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	737.50	sf	721	30	-		-	-	1.018 /sf	751
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	19.00	cy	560	-	-		85	-	33.983 /cy	646
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	19.00	CY	-	3,515	-		-	-	185.00 /CY	3,515
		03 11 13.801 08" CIP Wall			*15,805*	*10,514*			*168*		*1,394.076/CY*	*26,487*
		19.00 CY										
		275.037 Labor hours										
		4.463 Equipment hours										
		03.11.13.200 (74) Sludge Thickener - Elevated Trough Wall, 2'-6" High, 295 LF - 8" Thick			*15,805*	*10,514*	*0*		*168*	*0*	*1,394.076/CY*	*26,487*
		19.00 CY										
		275.037 Labor hours										
		4.463 Equipment hours										
03.11.13.205		*(74) Sludge Thickener - Elevated Trough Slab, 3'-4" Wide, 1,040 SF - 12" Thick*										
03 11 13.303		*12" Elevated Slab*										
	6600	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, labor only to erect & dismantle, to 14'-8" high	11.00	csf	2,063	-	-		-	-	187.52 /csf	2,063
	6610	Scaffolding, steel tubular, heavy duty shoring for elevated slab forms, floor area, rent/month of materials only, to 14'-8" high	32.00	csf	-	2,064	-		-	-	64.50 /csf	2,064
	2150	C.I.P. concrete forms, elevated slab, flat slab with drop panels, to 15' high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1,040.00	sf	5,265	2,288	-		-	-	7.263 /sf	7,553
	7000	C.I.P. concrete forms, elevated slab, edge forms, to 6" high, 4 use, includes shoring, erecting, bracing, stripping and cleaning	1.00	lf	4	0	-		-	-	3.88 /lf	4
n	2040	Reinforcing steel, unload and sort, add to base_ELEVATE SLABS	4.388	ton	158	-	-		92	-	56.814 /ton	249

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.303		*12" Elevated Slab*										
n	2218	Reinforcing steel, crane cost for handling, average, add_ELEVATED SLABS	4.388	ton	172	-	-		100	-	61.76 /ton	271
	0400	Reinforcing steel, in place, elevated slabs, #4 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	4.388	ton	3,125	6,363	-		-	-	2,162.277 /ton	9,488
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	39.00	cy	791	-	-		120	-	23.363 /cy	911
	1500	Structural concrete, placing, elevated slab, pumped, 6" to 10" thick, includes leveling (strike off) & consolidation, excludes material	3.90	cy	79	-	-		12	-	23.362 /cy	91
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	39.00	CY	-	7,215	-		-	-	185.00 /CY	7,215
n	0825	Struct ELEV SLAB concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.90	cy	-	722	-		-	-	185.00 /cy	722
n	0256	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_ELEV SLAB	1,040.00	sf	763	-	-		56	-	0.787 /sf	819
n	9000	Concrete finishing, elev slabs, includes patching voids	1,040.00	sf	847	31	-		-	-	0.845 /sf	878
		03 11 13.303 12" Elevated Slab			*13,266*	*18,683*			*379*		*828.918/CY*	*32,328*
		39.00 CY										
		227.688 Labor hours										
		12.014 Equipment hours										
		03.11.13.205 (74) Sludge Thickener - Elevated Trough Slab, 3'-4" Wide, 1,040 SF - 12" Thick			*13,266*	*18,683*	*0*		*379*	*0*	*828.918/CY*	*32,328*
		39.00 CY										
		227.688 Labor hours										
		12.014 Equipment hours										
		DIVISION 03 CONCRETE			**214,556**	**266,354**	**0**		**12,356**	**0**	**690.687/CY**	**493,266**
		714.167 CY										
		3,691.907 Labor hours										
		299.616 Equipment hours										

DIVISION 31 EARTHWORK

31.23.10.030 (74) Sludge Thickener, Excavation, Backfill and Haul Off-Site

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	3,180.00	CY	1,204	-	-		3,042	-	1.335 /CY	4,246

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	477.00	CY	276	-	-		636	-	1.911 /CY	912
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	3,379.00	CY	38,434	-	-		52,806	-	27.002 /CY	91,241
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	477.00	CY	221	-	-		456	-	1.418 /CY	677
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*40,134*				*56,940*		*12.921/CY*	*97,074*
		7,513.00 CY 722.920 Labor hours 709.458 Equipment hours										
		31.23.10.030 (74) Sludge Thickener, Excavation, Backfill and Haul Off-Site			*40,134*	*0*	*0*		*56,940*	*0*	*12.921/CY*	*97,074*
		7,513.00 CY 722.920 Labor hours 709.458 Equipment hours										
		DIVISION 31 EARTHWORK			**40,134**	**0**	**0**		**56,940**	**0**	**12.921/CY**	**97,074**
		7,513.00 CY 722.920 Labor hours 709.458 Equipment hours										

DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)

33.05.19.045 (74) Buried Pipe, SLG - 12" Dia - 64 LF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	64.00	lf	158	5	-		14	-	2.767 /lf	177
	7050	Rent trench box, 8000 lb., 8' x 16'	1.00	day	-	-	-		136	-	136.44 /day	136
	0090	Excavating, trench or continuous footing, common earth, 1/2 C.Y. excavator, 4' to 6' deep, excludes sheeting or dewatering	107.00	bcy	472	-	-		132	-	5.648 /bcy	604
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	79.00	lcy	61	-	-		140	-	2.548 /lcy	201
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	69.00	ecy	74	-	-		219	-	4.244 /ecy	293
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	42.00	lcy	345	1,302	-		64	-	40.74 /lcy	1,711
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	37.00	ecy	144	-	-		19	-	4.407 /ecy	163
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
33 05 19.012		*Buried Pipe, Ductile Iron, 12" Dia*										
n	2100	Distribution piping,DIP,cement lined,fastite,20' lengths, 12"dia, Press Class 350, Excludes excavation, backfill, bedding	64.00	LF	527	3,168	-		338	-	63.028 /LF	4,034
n	4104	Distribution Piping,DIP,Flex-Ring Joint,12"dia,additional per linear foot of restrained pipe	64.00	lf		1,047	-			-	16.36 /lf	1,047
n	8020	Fitting, 90 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	1.00	ea	253	1,014	-		80	-	1,346.64 /ea	1,347
n	4705	DIP,Polywrap 8 mil LDT 500ft,12"dia	1.00	roll	56	709	-		-	-	764.31 /roll	764
	8420	Fitting,11.25 degree bend,DIP,cement lined,MJ,12"dia,C110 water piping	2.00	ea	523	1,069	-			-	796.11 /ea	1,592
		33 05 19.012 Buried Pipe, Ductile Iron, 12" Dia			*2,615*	*8,351*			*1,144*		*189.232/LF*	*12,111*
		64.00 LF										
		47.676 Labor hours										
		26.475 Equipment hours										
		33.05.19.045 (74) Buried Pipe, SLG - 12" Dia - 64 LF			*2,615*	*8,351*	*0*		*1,144*	*0*	*189.232/LF*	*12,111*
		64.00 LF										
		47.676 Labor hours										
		26.475 Equipment hours										
33.05.19.050		*(74) Buried Pipe, TS - 8" Dia - 55 LF*										
33 05 19.008		*Buried Pipe, Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	55.00	lf	136	4	-		12	-	2.767 /lf	152
	0062	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	83.00	bcy	279	-	-		227	-	6.10 /bcy	506
	1900	Backfill, trench, up to 300' haul, dozer backfilling, excludes compaction	65.00	lcy	50	-	-		116	-	2.548 /lcy	166
	2300	Backfill, trench, 6" to 12" lifts, dozer backfilling, compaction with sheepsfoot roller	57.00	ecy	61	-	-		181	-	4.244 /ecy	242
	0050	Fill by borrow and utility bedding, for pipe and conduit, crushed or screened bank run gravel, excludes compaction	30.00	lcy	247	930	-		45	-	40.74 /lcy	1,222
	8050	Compaction, 3 passes, 6" to 11", 4" lifts, rammer tamper	27.00	ecy	105	-	-		14	-	4.407 /ecy	119
	00500	6" Wide Underground Utility Marking Tape	1.00	clf	3	38	-		-	-	40.70 /clf	41
n	2060	Distribution piping,DIP,cement lined,fastite,20' lengths, 08"dia, Press Class 350, Excludes excavation, backfill, bedding	55.00	LF	403	1,653	-		259	-	42.085 /LF	2,315
n	4102	Distribution Piping,DIP,Flex-Ring Joint, 08"dia,additional per linear foot of restrained pipe	55.00	lf		586	-			-	10.66 /lf	586
n	4703	DIP,Polywrap 8 mil LDT 500ft,8"dia	1.00	roll	56	523	-		-	-	578.24 /roll	578

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		33 05 19.008 Buried Pipe, Ductile Iron, 08" Dia			*1,339*	*3,734*			*854*		*107.766/LF*	*5,927*
		55.00 LF										
		24.454 Labor hours										
		11.591 Equipment hours										
		33.05.19.050 (74) Buried Pipe, TS - 8" Dia - 55 LF			*1,339*	*3,734*	*0*		*854*	*0*	*107.766/LF*	*5,927*
		55.00 LF										
		24.454 Labor hours										
		11.591 Equipment hours										
		DIVISION 33 UTILITIES (BURIED PIPE AND VALVES)			**3,954**	**12,086**	**0**		**1,998**	**0**	**151.579/LF**	**18,038**
		119.00 LF										
		72.130 Labor hours										
		38.067 Equipment hours										

DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)

40.05.19.065 (74) Exposed Pipe - GTD - 12" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	5	0	-		0	-	2.77 /LF	6
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	12	7	-		-	-	18.83 /ea	19
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	1.00	ea	137	146	-		-	-	283.24 /ea	283
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	117	1,832	-		-	-	1,948.59 /ea	1,949
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*270*	*1,985*			*0*		*1,128.100/LF*	*2,256*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
		40.05.19.065 (74) Exposed Pipe - GTD - 12" Dia - Wall Pipe			*270*	*1,985*	*0*		*0*	*0*	*1,128.100/LF*	*2,256*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										

40.05.19.070 (74) Exposed Pipe - SLG - 12" Dia - Wall Pipe

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	5	0	-		0	-	2.77 /LF	6

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	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	1.00	ea	12	7	-		-	-	18.83 /ea	19
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	1.00	ea	137	146	-		-	-	283.24 /ea	283
n	0190	DIP,FLGxFLG,12"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	117	1,832	-		-	-	1,948.59 /ea	1,949
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*270*	*1,985*			*0*		*1,128.100/LF*	*2,256*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
		40.05.19.070 (74) Exposed Pipe - SLG - 12" Dia - Wall Pipe			*270*	*1,985*	*0*		*0*	*0*	*1,128.100/LF*	*2,256*
		2.00 LF										
		4.245 Labor hours										
		0.032 Equipment hours										
40.05.19.075		*(74) Exposed Pipe - TS - 8" Dia - Wall Pipe*										
40 05 19.008		*Pipe and Fittings - Ductile Iron, 08" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	2.00	LF	5	0	-		0	-	2.77 /LF	6
	1124	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 8" pipe	1.00	ea	10	6	-		-	-	16.04 /ea	16
	0700	Gasket and bolt set, for flanges, 150 lb., 8" pipe size	1.00	ea	115	52	-		-	-	167.28 /ea	167
n	0100	DIP,FLGxFLG,8"dia,2'-6" long,class 53,excl excav, backfill	1.00	ea	81	1,088	-		-	-	1,168.50 /ea	1,169
		40 05 19.008 Pipe and Fittings - Ductile Iron, 08" Dia			*211*	*1,146*			*0*		*678.68 /LF*	*1,357*
		2.00 LF										
		3.273 Labor hours										
		0.032 Equipment hours										
		40.05.19.075 (74) Exposed Pipe - TS - 8" Dia - Wall Pipe			*211*	*1,146*	*0*		*0*	*0*	*678.68 /LF*	*1,357*
		2.00 LF										
		3.273 Labor hours										
		0.032 Equipment hours										
40.05.19.080		*(74) Exposed Pipe - GTD - 12" Dia - 21 LF*										
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	21.00	LF	52	2	-		5	-	2.767 /LF	58
	7800	Paints & coatings, pipes, primer + 1 coat, brushwork, 10" to 12" diameter	23.10	lf	72	14	-		-	-	3.718 /lf	86

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.012		*Pipe and Fittings - Ductile Iron, 12" Dia*										
	1200	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, over 10" pipe size	5.00	ea	58	37	-		-	-	18.828 /ea	94
	0720	Gasket and bolt set, for flanges, 150 lb., 12" pipe size	8.00	ea	1,098	1,168	-		-	-	283.238 /ea	2,266
n	0185	DIP,FLGxFLG,12"dia,1'-0" long,class 53,excl excav, backfill	1.00	ea	117	1,429	-		-	-	1,545.39 /ea	1,545
n	0205	DIP,FLGxFLG,12"dia,10'-0" long,class 53,excl excav, backfill	2.00	ea	400	7,696	-		-	-	4,047.87 /ea	8,096
n	1012	Fitting,DIP,FLG,90 degree bend,12"dia,c 110 water piping	2.00	ea	233	2,027	-		-	-	1,130.19 /ea	2,260
		40 05 19.012 Pipe and Fittings - Ductile Iron, 12" Dia			*2,029*	*12,372*			*5*		*685.978/LF*	*14,406*
		21.00 LF										
		31.833 Labor hours										
		0.336 Equipment hours										
		40.05.19.080 (74) Exposed Pipe - GTD - 12" Dia - 21 LF			*2,029*	*12,372*	*0*		*5*	*0*	*685.978/LF*	*14,406*
		21.00 LF										
		31.833 Labor hours										
		0.336 Equipment hours										
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**2,781**	**17,489**	**0**		**6**	**0**	**750.937/LF**	**20,275**
		27.00 LF										
		43.596 Labor hours										
		0.432 Equipment hours										

DIVISION 46 WATER AND WASTEWATER EQUIPMENT

46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
46 71 33.000		*Rotary Drum Sludge Thickening System*										
	9201	Spiral Scraper Style, Center Drive, Hybrid (SS/CS), for 100' diameter mechanism	1.00	EA		565,500	-			-	565,500.00 /EA	565,500
		46 71 33.000 Rotary Drum Sludge Thickening System				*565,500*					*565,500.00 /EA*	*565,500*
		1.00 EA										
		100.00 Labor hours										
		20.00 Equipment hours										
		46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA			*0*	*565,500*	*0*		*0*	*0*	*565,500.00 /EA*	*565,500*
		1.00 EA										
		100.00 Labor hours										

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		46.71.33.005 (74) Primary Sludge Thickener Mechanism - 1 EA			*0*	*565,500*	*0*		*0*	*0*	*565,500.00 /EA*	*565,500*
		1.00 EA										
		100.00 Labor hours										
		20.00 Equipment hours										
		DIVISION 46 WATER AND WASTEWATER EQUIPMENT			**0**	**565,500**	**0**		**0**	**0**	**565,500.00 /EA**	**565,500**
		1.00 EA										
		100.00 Labor hours										
		20.00 Equipment hours										
		500 SLUDGE THICKENER			***261,425***	***861,429***	***0***		***71,300***	***0***	***1,194,153.42 /LS***	***1,194,153***
		1.00 LS										
		4,630.554 Labor hours										
		1,067.573 Equipment hours										

547 SLUDGE STORAGE

DIVISION 03 CONCRETE

03.11.13.145 (73) Sludge Storage - Buried Slab, Drainage Structure Base, 71 SF - 12" Thick

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	36.00	sfca	184	25	-		-	-	5.798 /sfca	209
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.30	ton	11	-	-		6	-	56.833 /ton	17
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.30	ton	12	-	-		7	-	61.73 /ton	19
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.30	ton	269	279	-		-	-	1,828.10 /ton	548
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	2.667	cy	47	-	-		7	-	20.206 /cy	54
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.267	cy	5	-	-		1	-	20.20 /cy	5
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	2.667	CY	-	480	-		-	-	180.00 /CY	480
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.267	cy	-	48	-		-	-	180.00 /cy	48

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.763		*12" Foundation Slab*										
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	72.00	sf	23	-	-		-	-	0.314 /sf	23
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	3.55	lf	0	-	-			-	0.073 /lf	0
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	3.60	lf	6	1	-		-	-	1.792 /lf	6
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	0.72	csf	6	5	-		-	-	15.40 /csf	11
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	3.00	ecy	60	96	-		7	-	54.263 /ecy	163
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	3.00	lcy	25	-	-		37	-	20.623 /lcy	62
		03 11 13.763 12" Foundation Slab			*646*	*934*			*65*		*616.888/CY*	*1,645*
		2.667 CY										
		11.140 Labor hours										
		1.520 Equipment hours										
		03.11.13.145 (73) Sludge Storage - Buried Slab, Drainage Structure Base, 71 SF - 12" Thick			*646*	*934*	*0*		*65*	*0*	*616.888/CY*	*1,645*
		2.667 CY										
		11.140 Labor hours										
		1.520 Equipment hours										
03.11.13.150		*(73) Sludge Storage - Wall, Drainage Structure, 2' High - 24 LF - 24" Thick*										
03 11 13.815		*24" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	3.00	lf	31	10	-		-	-	13.793 /lf	41
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	96.00	sfca	669	95	-		-	-	7.962 /sfca	764
n	5200	Chamfer strip, wood, 3/4" wide	5.00	lf	4	1	-		-	-	1.032 /lf	5
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	1.00	c	-	65	-		-	-	65.00 /c	65
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	27.00	lf	87	197	-		-	-	10.533 /lf	284
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.40	ton	275	580	-		-	-	2,138.525 /ton	855
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	0.40	ton	14	-	-		8	-	56.80 /ton	23
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	0.40	ton	16	-	-		9	-	61.75 /ton	25
n	0210	Control joint, clean out control joint of debris_WALLS	3.00	lf	0	-	-		-	-	0.073 /lf	0

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.815		*24" CIP Wall*										
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	3.00	lf	5	0	-		-	-	1.79 /lf	5
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	96.00	sf	78	4	-		-	-	0.855 /sf	82
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	48.00	sf	47	2	-		-	-	1.018 /sf	49
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	4.00	cy	118	-	-		18	-	33.983 /cy	136
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	4.00	CY	-	740	-		-	-	185.00 /CY	740
		03 11 13.815 24" CIP Wall			*1,346*	*1,694*			*35*		*768.89 /CY*	*3,076*
		4.00 CY 23.205 Labor hours 0.940 Equipment hours										
		03.11.13.150 (73) Sludge Storage - Wall, Drainage Structure, 2' High - 24 LF - 24" Thick			*1,346*	*1,694*	*0*		*35*	*0*	*768.89 /CY*	*3,076*
		4.00 CY 23.205 Labor hours 0.940 Equipment hours										
03.11.13.155		*(73) Sludge Storage - Slab on Grade - 6,750 SF - 12" Thick*										
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	340.00	sfca	1,395	415	-		-	-	5.322 /sfca	1,810
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	350.00	sfca	855	158	-		-	-	2.894 /sfca	1,013
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	22.75	ton	818	-	-		475	-	56.816 /ton	1,293
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	22.75	ton	20,431	32,988	-		-	-	2,348.087 /ton	53,419
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	22.75	ton	2,337	-	-		1,356	-	162.331 /ton	3,693
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	260.00	cy	4,560	-	-		694	-	20.206 /cy	5,254
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	26.00	cy	456	-	-		69	-	20.206 /cy	525
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	260.00	CY	-	48,100	-		-	-	185.00 /CY	48,100

	Item	Description	Takeoff Qty		Labor	Material	Subcontract		Equipment	Other	Total	
					Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
03 11 13.504		*12" Slab on Grade*										
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	26.00	cy	-	4,810	-		-	-	185.00 /cy	4,810
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	7,000.00	sf	5,133	-	-		377	-	0.787 /sf	5,511
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	350.00	lf	154	11	-		21	-	0.529 /lf	185
n	0215	Control joint, clean out control joint of debris_SOG	350.00	lf	26	-	-			-	0.073 /lf	26
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	700.00	lf	1,141	112	-		-	-	1.790 /lf	1,253
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	70.00	csf	557	522	-		-	-	15.408 /csf	1,079
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	70.00	sq	887	571	-		-	-	20.820 /sq	1,457
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	298.00	ecy	3,250	9,536	-		368	-	44.143 /ecy	13,155
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	298.00	lcy	2,448	-	-		3,698	-	20.626 /lcy	6,146
		03 11 13.504 12" Slab on Grade *260.00 CY* 762.978 Labor hours 177.275 Equipment hours			*44,448*	*97,220*			*7,059*		*572.027/CY*	*148,727*
		03.11.13.155 (73) Sludge Storage - Slab on Grade - 6,750 SF - 12" Thick *260.00 CY* 762.978 Labor hours 177.275 Equipment hours			*44,448*	*97,220*	*0*		*7,059*	*0*	*572.027/CY*	*148,727*
03.11.13.160		*(73) Sludge Storage - Thickened Edge Footing, 1'6" Wide - 99 LF - 12" Thick*										
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	201.00	sfca	825	245	-		-	-	5.322 /sfca	1,070
n	9015	C.I.P. concrete forms, bulkhead for slab on grade w/ keyway, up to 12", exp metal, includes erecting, bracing, stripping and cleaning	7.425	sfca	18	3	-		-	-	2.893 /sfca	21
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.525	ton	19	-	-		11	-	56.82 /ton	30
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.525	ton	472	761	-		-	-	2,348.10 /ton	1,233
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	0.525	ton	54	-	-		31	-	162.32 /ton	85

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		12" Slab on Grade										
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	6.00	cy	105	-	-		16	-	20.205 /cy	121
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	0.60	cy	11	-	-		2	-	20.20 /cy	12
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	6.00	CY	-	1,110	-		-	-	185.00 /CY	1,110
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.60	cy	-	111	-		-	-	185.00 /cy	111
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	148.50	sf	109	-	-		8	-	0.787 /sf	117
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	7.425	lf	3	0	-		0	-	0.529 /lf	4
n	0215	Control joint, clean out control joint of debris_SOG	7.425	lf	1	-	-			-	0.073 /lf	1
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	14.85	lf	24	2	-		-	-	1.79 /lf	27
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	1.485	csf	12	11	-		-	-	15.407 /csf	23
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	1.485	sq	19	12	-		-	-	20.82 /sq	31
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	6.00	ecy	65	192	-		7	-	44.143 /ecy	265
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	6.00	lcy	49	-	-		74	-	20.625 /lcy	124
		03 11 13.504 12" Slab on Grade			*1,785*	*2,449*			*150*		*730.623/CY*	*4,384*
		6.00 CY										
		31.189 Labor hours										
		3.736 Equipment hours										
		03.11.13.160 (73) Sludge Storage - Thickened Edge Footing, 1'6" Wide - 99 LF - 12" Thick			*1,785*	*2,449*	*0*		*150*	*0*	*730.623/CY*	*4,384*
		6.00 CY										
		31.189 Labor hours										
		3.736 Equipment hours										

03.11.13.165 *(73) Sludge Storage - Cont. Footing, 48" Wide - 242 LF - 12" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.153		Cont. Footing 48" x 24"										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	492.00	sfca	2,508	344	-		-	-	5.798 /sfca	2,853

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.153		*Cont. Footing 48" x 24"*										
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	4.033	ton	145	-	-		84	-	56.816 /ton	229
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	4.033	ton	158	-	-		91	-	61.758 /ton	249
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	4.033	ton	3,622	3,751	-		-	-	1,828.086 /ton	7,373
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	35.852	cy	629	-	-		96	-	20.206 /cy	724
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	3.585	cy	63	-	-		10	-	20.206 /cy	72
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	35.852	CY	-	6,453	-		-	-	180.00 /CY	6,453
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.585	cy	-	645	-		-	-	180.00 /cy	645
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	968.00	sf	304	-	-		-	-	0.315 /sf	304
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	48.40	lf	4	-	-			-	0.073 /lf	4
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	48.40	lf	79	8	-		-	-	1.790 /lf	87
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	9.68	csf	77	72	-		-	-	15.408 /csf	149
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	36.00	ecy	720	1,152	-		82	-	54.263 /ecy	1,953
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	41.00	lcy	337	-	-		509	-	20.626 /lcy	846
		03 11 13.153 Cont. Footing 48" x 24"			*8,645*	*12,426*			*871*		*612.019/CY*	*21,942*
		35.852 CY										
		148.862 Labor hours										
		20.338 Equipment hours										
		03.11.13.165 (73) Sludge Storage - Cont. Footing, 48" Wide - 242 LF - 12" Thick			*8,645*	*12,426*	*0*		*871*	*0*	*612.019/CY*	*21,942*
		35.852 CY										
		148.862 Labor hours										
		20.338 Equipment hours										

03.11.13.170 *(73) Sludge Storage - Wall, 10' High, 238 LF - 12" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	0500	C.I.P. concrete forms, wall, wood bulkhead with 2 piece keyway, 1 use, includes erecting, bracing, stripping and cleaning	119.00	lf	1,237	405	-		-	-	13.792 /lf	1,641

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.804		*12" CIP Wall*										
n	2550	C.I.P. concrete forms, wall, job built, plywood, 8 to 16' high, 4 use, includes erecting, bracing, stripping and cleaning	4,760.00	sfca	33,187	4,712	-		-	-	7.962 /sfca	37,900
n	5200	Chamfer strip, wood, 3/4" wide	238.00	lf	213	33	-		-	-	1.033 /lf	246
n	1400	Tie cones, plastic, for coil tie system, for CIP wall forms, 1/2" bolt diameter x 1" setback length, includes material only	4.00	c	-	260	-		-	-	65.00 /c	260
n	3010	Waterstop, rubber, center bulb, 1/4" thick x 6" wide_WALLS	357.00	lf	1,154	2,606	-		-	-	10.533 /lf	3,760
n	0700	Reinforcing Steel, in place, walls, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	8.90	ton	6,128	12,905	-		-	-	2,138.534 /ton	19,033
n	2020	Reinforcing steel, unload and sort, add to base_WALLS	8.90	ton	320	-	-		186	-	56.816 /ton	506
n	2214	Reinforcing steel, crane cost for handling, average, add_WALLS	8.90	ton	348	-	-		202	-	61.758 /ton	550
n	0210	Control joint, clean out control joint of debris_WALLS	119.00	lf	9	-	-		-	-	0.073 /lf	9
n	0366	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_WALLS	119.00	lf	194	19	-		-	-	1.790 /lf	213
n	0020	Concrete finishing, walls, includes breaking ties and patching voids	4,760.00	sf	3,879	190	-		-	-	0.855 /sf	4,069
n	0050	Concrete finishing, walls, burlap rub with grout, includes breaking ties and patching voids	2,380.00	sf	2,327	95	-		-	-	1.018 /sf	2,422
	5100	Structural concrete, placing, walls, pumped, 12" thick, includes leveling (strike off) & consolidation, excludes material	89.00	cy	2,625	-	-		399	-	33.983 /cy	3,024
n	0525	Struct WALLS concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	89.00	CY	-	16,465	-		-	-	185.00 /CY	16,465
		03 11 13.804 12" CIP Wall			*51,620*	*37,691*			*787*		*1,012.336/CY*	*90,098*

89.00 CY

896.938 Labor hours
20.904 Equipment hours

	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.170 (73) Sludge Storage - Wall, 10' High, 238 LF - 12" Thick	*51,620*	*37,691*	*0*	*787*	*0*	*1,012.336/CY*	*90,098*

89.00 CY

896.938 Labor hours
20.904 Equipment hours

03.11.13.175 *(73) Sludge Storage - Entrance Curb, 6" High, 98 LF - 6" Thick*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.006		*06" High CIP Curb*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	98.00	sfca	402	120	-		-	-	5.322 /sfca	522
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.088	ton	3	-	-		2	-	56.80 /ton	5

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.006		*06" High CIP Curb*										
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.088	ton	79	128	-		-	-	2,348.10 /ton	207
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	0.088	ton	9	-	-		5	-	162.300 /ton	14
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	1.00	cy	18	-	-		3	-	20.21 /cy	20
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	0.10	cy	2	-	-		0	-	20.20 /cy	2
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	1.00	CY	-	185	-		-	-	185.00 /CY	185
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.10	cy	-	19	-		-	-	185.00 /cy	19
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	49.00	sf	36	-	-		3	-	0.787 /sf	39
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	2.45	lf	1	0	-		0	-	0.53 /lf	1
n	0215	Control joint, clean out control joint of debris_SOG	2.45	lf	0	-	-			-	0.073 /lf	0
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	2.45	lf	4	0	-		-	-	1.788 /lf	4
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	0.49	csf	4	4	-		-	-	15.40 /csf	8
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	0.49	sq	6	4	-		-	-	20.82 /sq	10
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	2.00	ecy	22	64	-		2	-	44.14 /ecy	88
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	2.00	lcy	16	-	-		25	-	20.625 /lcy	41
		03 11 16.006 06" High CIP Curb			*602*	*523*			*40*		*1,164.92 /CY*	*1,165*
		1.00 CY										
		10.706 Labor hours										
		1.073 Equipment hours										
		03.11.13.175 (73) Sludge Storage - Entrance Curb, 6" High, 98 LF - 6" Thick			*602*	*523*	*0*		*40*	*0*	*1,164.92 /CY*	*1,165*
		1.00 CY										
		10.706 Labor hours										
		1.073 Equipment hours										

John F. Kime Water Treatment Plant Expansion
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Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	DIVISION 03 CONCRETE			**109,092**	**152,937**	**0**		**9,007**	**0**	**680.109/CY**	**271,037**
	398.519 CY										
	1,885.019 Labor hours										
	225.786 Equipment hours										
DIVISION 13	**SPECIAL CONSTRUCTION**										
13.34.19.005	*(73) Pre-Engineered Metal Building, Sludge Storage*										
13 34 19.000	*Metal Building Systems*										
5450	(73) Pre-Engineered Metal Building, Sludge Storage	7,000.00	SF	125,761	490,000	-		63,151	-	96.987 /SF	678,912
	13 34 19.000 Metal Building Systems			*125,761*	*490,000*			*63,151*		*96.987/SF*	*678,912*
	7,000.00 SF										
	1,960.000 Labor hours										
	280.00 Equipment hours										
	13.34.19.005 (73) Pre-Engineered Metal Building, Sludge Storage			*125,761*	*490,000*	*0*		*63,151*	*0*	*96.987/SF*	*678,912*
	7,000.00 SF										
	1,960.000 Labor hours										
	280.00 Equipment hours										
	DIVISION 13 SPECIAL CONSTRUCTION			**125,761**	**490,000**	**0**		**63,151**	**0**	**96.987/SF**	**678,912**
	7,000.00 SF										
	1,960.000 Labor hours										
	280.00 Equipment hours										
DIVISION 31	**EARTHWORK**										
31.23.10.035	*(73) Sludge Storage, Excavation, Backfill and Haul Off-Site*										
31 23 10.000	*Excavation, Backfill, and Haul Off-Site*										
0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	668.00	CY	253	-	-		639	-	1.335 /CY	892
4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	100.00	CY	58	-	-		133	-	1.911 /CY	191
n 0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	708.00	CY	8,053	-	-		11,065	-	27.002 /CY	19,118

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	100.00	CY	46	-	-		96	-	1.418 /CY	142
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*8,410*				*11,932*		*12.908/CY*	*20,342*
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		31.23.10.035 (73) Sludge Storage, Excavation, Backfill and Haul Off-Site			*8,410*	*0*	*0*		*11,932*	*0*	*12.908/CY*	*20,342*
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		DIVISION 31 EARTHWORK			**8,410**	**0**	**0**		**11,932**	**0**	**12.908/CY**	**20,342**
		1,576.00 CY										
		151.485 Labor hours										
		148.659 Equipment hours										
		547 SLUDGE STORAGE			***243,264***	***642,937***	***0***		***84,090***	***0***	***970,291.02 /LS***	***970,291***
		1.00 LS										
		3,996.504 Labor hours										
		654.444 Equipment hours										

700 DEWATERING BUILDING

DIVISION 03 CONCRETE

03.11.13.125 (72) Dewatering Building - Slab on Grade - 5,198 SF -12" Thick

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
	3050	C.I.P. concrete forms, slab on grade, edge, wood, 7" to 12" high, 4 use, includes erecting, bracing, stripping and cleaning	304.00	sfca	1,247	371	-		-	-	5.322 /sfca	1,618
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	16.538	ton	595	-	-		345	-	56.816 /ton	940
	0600	Reinforcing steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	16.538	ton	14,853	23,980	-		-	-	2,348.087 /ton	38,833
	2220	Reinforcing steel, crane cost for handling, 90 picks/day, up to 0.5 Ton/day	16.538	ton	1,699	-	-		986	-	162.331 /ton	2,685
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	189.00	cy	3,315	-	-		504	-	20.206 /cy	3,819

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.504		*12" Slab on Grade*										
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	18.90	cy	331	-	-		50	-	20.206 /cy	382
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	189.00	CY	-	34,965	-		-	-	185.00 /CY	34,965
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	18.90	cy	-	3,497	-		-	-	185.00 /cy	3,497
n	0255	Concrete finishing, floors, manual screed, bull float, machine float & steel trowel (walk-behind)_SOG	5,198.00	sf	3,812	-	-		280	-	0.787 /sf	4,092
n	0122	Control joint, concrete floor slab, sawcut in green concrete, 1" depth_SOG	259.900	lf	114	8	-		15	-	0.529 /lf	138
n	0215	Control joint, clean out control joint of debris_SOG	259.900	lf	19	-	-			-	0.073 /lf	19
n	0367	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_SOG	259.900	lf	424	42	-		-	-	1.790 /lf	465
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	51.98	csf	414	387	-		-	-	15.408 /csf	801
	1200	Vapor retarders, building paper, polyethylene vapor barrier, standard, 10 mil (.010" thick)	51.98	sq	659	424	-		-	-	20.820 /sq	1,082
n	1310	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 12" deep_SOG	217.00	ecy	2,367	6,944	-		268	-	44.143 /ecy	9,579
n	1136	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	221.00	lcy	1,816	-	-		2,743	-	20.626 /lcy	4,558
		03 11 13.504 12" Slab on Grade			*31,663*	*70,617*			*5,192*		*568.632/CY*	*107,471*
		189.00 CY										
		543.027 Labor hours										
		130.709 Equipment hours										
		03.11.13.125 (72) Dewatering Building - Slab on Grade - 5,198 SF -12" Thick			*31,663*	*70,617*	*0*		*5,192*	*0*	*568.632/CY*	*107,471*
		189.00 CY										
		543.027 Labor hours										
		130.709 Equipment hours										
03.11.13.130		*(72) Dewatering Building - Cont. Footing - 300 LF - 3'-0' Wide x 12" Thick*										
03 11 13.152		*Cont. Footing 36" x 12"*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	606.00	sfca	3,090	424	-		-	-	5.798 /sfca	3,514
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	3.75	ton	135	-	-		78	-	56.816 /ton	213
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	3.75	ton	147	-	-		85	-	61.757 /ton	232

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
03 11 13.152		*Cont. Footing 36" x 12"*										
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	3.75	ton	3,368	3,488	-		-	-	1,828.088 /ton	6,855
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	33.333	cy	585	-	-		89	-	20.206 /cy	674
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	3.333	cy	58	-	-		9	-	20.204 /cy	67
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	33.333	CY	-	6,000	-		-	-	180.00 /CY	6,000
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	3.333	cy	-	600	-		-	-	180.00 /cy	600
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	900.00	sf	283	-	-		-	-	0.315 /sf	283
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	45.00	lf	3	-	-			-	0.073 /lf	3
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	45.00	lf	73	7	-		-	-	1.790 /lf	81
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	9.00	csf	72	67	-		-	-	15.408 /csf	139
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	33.00	ecy	660	1,056	-		75	-	54.263 /ecy	1,791
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	38.00	lcy	312	-	-		472	-	20.626 /lcy	784
		03 11 13.152 Cont. Footing 36" x 12"			*8,785*	*11,642*			*808*		*637.044/CY*	*21,235*
		33.333 CY										
		151.786 Labor hours										
		18.842 Equipment hours										
		03.11.13.130 (72) Dewatering Building - Cont. Footing - 300 LF - 3'-0' Wide x 12" Thick			*8,785*	*11,642*	*0*		*808*	*0*	*637.044/CY*	*21,235*
		33.333 CY										
		151.786 Labor hours										
		18.842 Equipment hours										
03.11.13.135		*(72) Dewatering Building - Cont. Footing - 137 LF - 1'-8" Wide x 8" Thick*										
03 11 13.15		*Cont. Footing 20" x 8"*										
	3061	C. I. P. concrete forms, foundation, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	185.818	sfca	947	130	-		-	-	5.798 /sfca	1,077
n	2005	Reinforcing steel, unload and sort, add to base_FOUNDATIONS	0.639	ton	23	-	-		13	-	56.82 /ton	36
n	2211	Reinforcing steel, crane cost for handling, average, add_FOUNDATIONS	0.639	ton	25	-	-		14	-	61.75 /ton	39

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 13.15		*Cont. Footing 20" x 8"*										
n	0605	Reinforcing steel, in place, FOUNDATIONS, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.639	ton	574	594	-		-	-	1,828.09 /ton	1,168
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	5.677	cy	100	-	-		15	-	20.206 /cy	115
n	4652	Structural concrete, placing, foundations, pumped, over 6" thick, includes vibrating, excludes material	0.568	cy	10	-	-		2	-	20.21 /cy	11
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	5.677	CY	-	1,022	-		-	-	180.00 /CY	1,022
n	0300	Struct FOUNDATION concrete,ready mix,normal wt,4000 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	0.568	cy	-	102	-		-	-	180.00 /cy	102
n	0105	Concrete finishing, floors, manual screed, bull float_FOUNDATIONS	228.79	sf	72	-	-		-	-	0.315 /sf	72
n	0205	Control joint, clean out control joint of debris_FOUNDATIONS	11.44	lf	1	-	-			-	0.073 /lf	1
n	0365	Control joint, joint sealant, polyurethane, 1/4" x 1/4" (308 LF/Gal)_FOUNDATIONS	11.44	lf	19	2	-		-	-	1.789 /lf	20
n	0305	Concrete surface treatment, curing, sprayed membrane compound_FOUNDATIONS	2.288	csf	18	17	-		-	-	15.411 /csf	35
n	1005	Fill, gravel fill, compacted, under floor slabs, alternate pricing method, 4" deep_FOUND	8.00	ecy	160	256	-		18	-	54.263 /ecy	434
n	1135	Hauling, excavated borrow material, loose cubic yards, 20 mile round trip, 0.4 loads/hour, 16.5 c.y. dump trailer, highway haulers, excludes loading	9.00	lcy	74	-	-		112	-	20.626 /lcy	186
		03 11 13.15 Cont. Footing 20" x 8"			*2,022*	*2,123*			*174*		*760.95 /CY*	*4,320*

5.677 CY

35.433 Labor hours
4.117 Equipment hours

	Labor Amount	Material Amount	Subcontract Amount	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03.11.13.135 (72) Dewatering Building - Cont. Footing - 137 LF - 1'-8" Wide x 8" Thick	*2,022*	*2,123*	*0*	*174*	*0*	*760.95 /CY*	*4,320*

5.677 CY

35.433 Labor hours
4.117 Equipment hours

03.11.13.140 *(72) Dewatering Building - CIP Curb, 1'-6" High - 169 LF - 8" Wide*

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.100		*CIP Curb, Other*										
n	3060	C.I.P. concrete forms, slab on grade, edge, wood, over 12", 4 use, includes erecting, bracing, stripping and cleaning	509.01	sfca	2,595	738	-		-	-	6.548 /sfca	3,333
n	5200	Chamfer strip, wood, 3/4" wide	339.34	lf	303	48	-		-	-	1.033 /lf	351
n	0600	Reinforcing Steel, in place, slab on grade, #3 to #7, A615, grade 60, incl labor for accessories, excl material for accessories	0.613	ton	551	889	-		-	-	2,348.09 /ton	1,439
n	2050	Reinforcing steel, unload and sort, add to base_SLAB ON GRADE	0.613	ton	22	-	-		13	-	56.82 /ton	35

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
03 11 16.100		*CIP Curb, Other*										
n	2220	Reinforcing steel, crane cost for handling, average, add_SLAB ON GRADE	0.613	ton	24	-	-		14	-	61.76 /ton	38
n	0200	Concrete finishng,floors,basic finishng for unspecfd flatwork,bull float,manual float&manual steel trowel,excludes placing,striking off&consolidating	113.23	sf	113	-	-		-	-	0.994 /sf	113
n	0310	Concrete surface treatment, curing, sprayed membrane compound_SOG	1.132	csf	9	15	-		-	-	21.51 /csf	24
	4650	Structural concrete, placing, slab on grade, pumped, over 6" thick, includes leveling (strike off) & consolidation, excludes material	7.00	cy	123	-	-		19	-	20.206 /cy	141
n	0725	Struct SLAB ON GRADE concrete,ready mix,normal wt,4500 psi,includes local aggregate,sand,portland cement and water,delivered, includes all additives	7.00	CY	-	1,295	-		-	-	185.00 /CY	1,295
		03 11 16.100 CIP Curb, Other *7.00 CY* 65.715 Labor hours 1.010 Equipment hours			*3,739*	*2,985*			*45*		*967.02 /CY*	*6,769*
		03.11.13.140 (72) Dewatering Building - CIP Curb, 1'-6" High - 169 LF - 8" Wide *7.00 CY* 65.715 Labor hours 1.010 Equipment hours			*3,739*	*2,985*	*0*		*45*	*0*	*967.02 /CY*	*6,769*
03.41.33.005		*(72) Dewatering Building - Precast Double Tee Roof, 10DT32, 5,200 SF*										
03 41 33.060		*Precast Concrete - Tees - 10' Wide x 32" Deep*										
	0200	Precast tees, double, floor, 52' span, prestressed	5,200.00	SF	2,864	60,320	-		1,494	-	12.438 /SF	64,678
		03 41 33.060 Precast Concrete - Tees - 10' Wide x 32" Deep *5,200.00 SF* 44.571 Labor hours 4.952 Equipment hours			*2,864*	*60,320*			*1,494*		*12.438/SF*	*64,678*
		03.41.33.005 (72) Dewatering Building - Precast Double Tee Roof, 10DT32, 5,200 SF *5,200.00 SF* 44.571 Labor hours 4.952 Equipment hours			*2,864*	*60,320*	*0*		*1,494*	*0*	*12.438/SF*	*64,678*

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Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 03 CONCRETE			**49,073**	**147,687**	**0**		**7,714**	**0**	**870.061/CY**	**204,473**
		235.01 CY										
		840.532 Labor hours										
		159.631 Equipment hours										
DIVISION 04			**MASONRY**									
04.22.00.010		*(72) CMU Block 12" Wall - 24' High x 178 LF*										
04 22 00.212		*Concrete Masonry Unit (12" CMU) - Exterior*										
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	43.00	csf	7,559	-	-		-	-	175.80 /csf	7,559
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	43.00	csf	-	3,569	-		-	-	83.00 /csf	3,569
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	178.00	lf	288	283	-		34	-	3.402 /lf	606
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	4,272.00	sf	11,241	9,569	-		1,338	-	5.185 /sf	22,148
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	588.183	lb	338	429	-		-	-	1.305 /lb	768
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	5,293.649	lb	3,746	3,864	-		-	-	1.438 /lb	7,611
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	178.00	lf	872	1,086	-		-	-	11.001 /lf	1,958
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	4,272.00	SF	39,549	27,554	-		-	-	15.708 /SF	67,104
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	4,272.00	sf	-	3,717	-		-	-	0.87 /sf	3,717
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	4,272.00	sf	2,503	10,082	-		-	-	2.946 /sf	12,585
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*66,098*	*60,305*			*1,373*		*29.910/SF*	*127,775*
		4,272.00 SF										
		1,238.051 Labor hours										
		54.769 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		04.22.00.010 (72) CMU Block 12" Wall - 24' High x 178 LF			*66,098*	*60,305*	*0*		*1,373*	*0*	*29.910/SF*	*127,775*
		4,272.00 SF										
		1,238.051 Labor hours										
		54.769 Equipment hours										
04.22.00.015		*(72) CMU Block 12" Wall - 12' High x 96 LF*										
04 22 00.212		*Concrete Masonry Unit (12" CMU) - Exterior*										
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	12.00	csf	2,110	-	-		-	-	175.80 /csf	2,110
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	12.00	csf	-	996	-		-	-	83.00 /csf	996
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	96.00	lf	155	153	-		19	-	3.402 /lf	327
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	1,152.00	sf	3,031	2,580	-		361	-	5.185 /sf	5,973
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	317.222	lb	182	232	-		-	-	1.305 /lb	414
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	1,427.501	lb	1,010	1,042	-		-	-	1.438 /lb	2,052
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	96.00	lf	471	586	-		-	-	11.001 /lf	1,056
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	1,152.00	SF	10,665	7,430	-		-	-	15.708 /SF	18,095
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	1,152.00	sf	-	1,002	-		-	-	0.87 /sf	1,002
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	1,152.00	sf	675	2,719	-		-	-	2.946 /sf	3,394
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*18,299*	*16,890*			*379*		*30.876/SF*	*35,569*
		1,152.00 SF										
		342.651 Labor hours										
		15.138 Equipment hours										
		04.22.00.015 (72) CMU Block 12" Wall - 12' High x 96 LF			*18,299*	*16,890*	*0*		*379*	*0*	*30.876/SF*	*35,569*
		1,152.00 SF										
		342.651 Labor hours										
		15.138 Equipment hours										

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04.22.00.020		*(72) CMU Block 12" Wall - 18' High x 24 LF*										
04 22 00.212		*Concrete Masonry Unit (12" CMU) - Exterior*										
n	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excl. planks	4.00	csf	703	-	-		-	-	175.80 /csf	703
n	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excl. planks	4.00	csf	-	332	-		-	-	83.00 /csf	332
n	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
n	0060	Grout, bond beams and lintels, 8" deep, 12" thick, 0.30 C.F. per L.F., pumped, excludes blockwork	24.00	lf	39	38	-		5	-	3.402 /lf	82
n	0350	Grout, concrete masonry unit (CMU) cores, 12" thick, 0.422 C.F./S.F., pumped, excludes blockwork	432.00	sf	1,137	968	-		135	-	5.184 /sf	2,240
n	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	79.306	lb	46	58	-		-	-	1.305 /lb	103
n	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	535.313	lb	379	391	-		-	-	1.438 /lb	770
n	0150	Concrete block,bond beam,normal weight,2000 psi,12"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	24.00	lf	118	146	-		-	-	11.001 /lf	264
n	6250	Concrete block, decorative, split face or scored split face, 2000 psi, 12" x 8" x 16", excludes scaffolding, grout and reinforcing	432.00	SF	3,999	2,786	-		-	-	15.708 /SF	6,786
n	6550	Concrete block, decorative, split face or scored split face, 12" thick, for special deeper colors, add	432.00	sf	-	376	-		-	-	0.87 /sf	376
	0600	Wall insulation, rigid, fiberglass, foil faced, 3" thick, R13, 3#/CF	432.00	sf	253	1,020	-		-	-	2.946 /sf	1,273
		04 22 00.212 Concrete Masonry Unit (12" CMU) - Exterior			*6,673*	*6,265*			*140*		*30.275/SF*	*13,079*
		432.00 SF										
		125.099 Labor hours										
		5.585 Equipment hours										
		04.22.00.020 (72) CMU Block 12" Wall - 18' High x 24 LF			*6,673*	*6,265*	*0*		*140*	*0*	*30.275/SF*	*13,079*
		432.00 SF										
		125.099 Labor hours										
		5.585 Equipment hours										
04.22.00.025		*(72) CMU Block 8" Wall - 20' High x 124 LF*										
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	25.00	csf	4,395	-	-		-	-	175.80 /csf	4,395

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	25.00	csf	-	2,075	-		-	-	83.00 /csf	2,075
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	124.00	lf	149	153	-		18	-	2.576 /lf	319
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	2,480.00	sf	6,142	3,398	-		731	-	4.141 /sf	10,270
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	409.746	lb	236	299	-		-	-	1.305 /lb	535
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	3,073.092	lb	2,175	2,243	-		-	-	1.438 /lb	4,418
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	124.00	lf	467	585	-		-	-	8.484 /lf	1,052
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	2,480.00	SF	14,649	11,358	-		-	-	10.487 /SF	26,007
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	248.00	sf	1,465	1,136	-		-	-	10.487 /sf	2,601
		04 22 00.080 Concrete Masonry Unit (08" CMU) - Interior			*29,676*	*21,398*			*749*		*20.896/SF*	*51,823*
		2,480.00 SF										
		548.350 Labor hours										
		29.885 Equipment hours										
		04.22.00.025 (72) CMU Block 8" Wall - 20' High x 124 LF			*29,676*	*21,398*	*0*		*749*	*0*	*20.896/SF*	*51,823*
		2,480.00 SF										
		548.350 Labor hours										
		29.885 Equipment hours										
04.22.00.030		*(72) CMU Block 8" Wall - 13' High x 22 LF*										
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0090	Scaffolding, steel tubular, regular, labor only to erect & dismantle, building exterior, wall face, 6'-4" x 5' frames, 1 to 5 stories, excludes planks	3.00	csf	527	-	-		-	-	175.80 /csf	527
	0906	Scaffolding, steel tubular, regular, rent/month only for complete system for face of walls, 6' -4" x 5' frames, excludes planks	3.00	csf	-	249	-		-	-	83.00 /csf	249
	2850	Scaffolding, steel tubular, regular, accessory, plank, rent/mo, 2" x 10" x 16' long	15.00	ea	-	151	-		-	-	10.05 /ea	151
	0020	Grout, bond beams and lintels, 8" deep, 8" thick, 0.20 CF per LF, pumped, excludes blockwork	22.00	lf	26	27	-		3	-	2.576 /lf	57
	0250	Grout, concrete masonry unit (CMU) cores, 8" thick, 0.258 CF/SF, pumped, excludes blockwork	286.00	sf	708	392	-		84	-	4.141 /sf	1,184

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
04 22 00.080		*Concrete Masonry Unit (08" CMU) - Interior*										
	0020	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed horizontally, ASTM A615	72.697	lb	42	53	-		-	-	1.305 /lb	95
	0060	Masonry reinforcing bars, #5 and #6 reinforcing steel bars, placed vertically, ASTM A615	354.397	lb	251	259	-		-	-	1.438 /lb	510
n	0130	Concrete block,bond beam,normal weight,2000 psi,8"x8"x16",includes mortar,excludes scaffolding,horizontal reinforcing,vertical reinforcing and grout	22.00	lf	83	104	-		-	-	8.484 /lf	187
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	286.00	SF	1,689	1,310	-		-	-	10.487 /SF	2,999
n	0200	Cncr blck,extrr,toold jnts both sides,norml wt,2000 psi,8"8"16",incld mortr and hrznt joint rnfrc every other cours,excld scffl,grout and vrtcl rnfrcn	29.00	sf	171	133	-		-	-	10.487 /sf	304
		04 22 00.080 Concrete Masonry Unit (08" CMU) - Interior			*3,498*	*2,677*			*87*		*21.897/SF*	*6,263*
		286.00 SF										
		64.608 Labor hours 3.490 Equipment hours										
		04.22.00.030 (72) CMU Block 8" Wall - 13' High x 22 LF			*3,498*	*2,677*	*0*		*87*	*0*	*21.897/SF*	*6,263*
		286.00 SF										
		64.608 Labor hours 3.490 Equipment hours										
		DIVISION 04 MASONRY			**124,245**	**107,535**	**0**		**2,728**	**0**	**27.199/SF**	**234,508**
		8,622.00 SF										
		2,318.759 Labor hours 108.868 Equipment hours										

DIVISION 07 THERMAL, MOISTURE PROTECTION

07.53.25.005 (72) Dewatering Building - Membrane Roofing System - EPDM - 4,994 SF

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
07 53 25.000		*Adhered Elastomeric (EPDM) Sheet Roofing*										
n	0100	Elastomeric sheet waterproofing, EPDM, plain, 60 mils thick	5,200.00	SF	7,561	4,732	-		-	-	2.364 /SF	12,293
	0800	Aluminum coping, stock units, for 12" wall, excludes scaffolding	350.00	lf	3,645	809	-		-	-	12.725 /lf	4,454
	2780	2" x 8" miscellaneous wood blocking, to steel construction, per M.B.F.	3.146	mbf	7,023	3,382	-		-	-	3,307.38 /mbf	10,405
	2780	2" x 8" miscellaneous wood blocking, to steel construction, per M.B.F.	3.15	mbf	7,032	3,386	-		-	-	3,307.38 /mbf	10,418
	0200	Underlayment, plywood, underlayment grade, 5/8" thick	5,200.00	SF	3,483	14,612	-		-	-	3.480 /SF	18,095

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

					Labor	Material	Subcontract		Equipment	Other	Total	
Item		Description	Takeoff Qty		Amount	Amount	Amount	Name	Amount	Amount	Unit Cost	Amount
07 53 25.000		*Adhered Elastomeric (EPDM) Sheet Roofing*										
	1725	Polyisocyanurate insulation, for roof decks, 2" thick, 2#/CF density, fastening excluded	5,200.00	sf	1,507	3,900	-		-	-	1.040 /sf	5,407
	1745	Polyisocyanurate insulation, for roof decks, 3" thick, 2#/CF density, fastening excluded	5,200.00	sf	1,658	5,824	-		-	-	1.439 /sf	7,482
	0825	Asphalt shingles, #30 felt underlayment	52.00	sq	372	452	-		-	-	15.845 /sq	824
	0800	Aluminum roof panels, corrugated, on steel frame, painted, .024" thick	5,200.00	sf	8,140	11,752	-		-	-	3.825 /sf	19,892
	0100	Sheet metal flashing, aluminum, flexible, mill finish, .032" thick, including up to 4 bends	1,340.00	sf	3,830	5,682	-		-	-	7.098 /sf	9,511
		07 53 25.000 Adhered Elastomeric (EPDM) Sheet Roofing			*44,249*	*54,531*					*9.498/SF*	*98,780*
		10,400.00 SF										
		796.102 Labor hours										
		07.53.25.005 (72) Dewatering Building - Membrane Roofing System - EPDM - 4,994 SF			*44,249*	*54,531*	*0*		*0*	*0*	*9.498/SF*	*98,780*
		10,400.00 SF										
		796.102 Labor hours										
		DIVISION 07 THERMAL, MOISTURE PROTECTION			**44,249**	**54,531**	**0**		**0**	**0**	**18.178/SF**	**98,780**
		5,434.00 SF										
		796.102 Labor hours										

DIVISION 08 OPENINGS

08.11.00.005 (72) Dewatering Building - Interior Door - Steel 3'x7' - 3 EA

					Labor Amount	Material Amount	Subcontract Amount	Name	Equipment Amount	Other Amount	Unit Cost	Amount
08 11 00.061		*Metal Doors & Frames (6070)*										
	1000	Frames, steel, knock down, hollow metal, single, 16 ga., up to 4-7/8" deep, 3'-0" x 7'-0"	3.00	EA	176	585	-		-	-	253.60 /EA	761
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	3.00	ea	165	1,995	-		-	-	720.153 /ea	2,160
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	3.00	ea	352	1,800	-		-	-	717.20 /ea	2,152
	0011	Thresholds, aluminum, 3' long door saddles	9.00	lf	88	108	-		-	-	21.817 /lf	196
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	4.50	pr	-	272	-		-	-	60.50 /pr	272
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	3.00	ea	70	7	-		-	-	25.653 /ea	77
		08 11 00.061 Metal Doors & Frames (6070)			*851*	*4,768*					*1,872.807/EA*	*5,618*
		3.00 EA										
		14.735 Labor hours										

John F. Kime Water Treatment Plant Expansion
Piedmont Triad Regional Water Authority
Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		08.11.00.005 (72) Dewatering Building - Interior Door - Steel 3'x7' - 3 EA			*851*	*4,768*	*0*		*0*	*0*	*1,872.807/EA*	*5,618*
			3.00	*EA*								
			14.735	Labor hours								
08.11.00.010		*(72) Dewatering Building - Interior Door - Steel 6'x7' - 2 EA*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	2.00	EA	156	470	-		-	-	313.135 /EA	626
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	4.00	ea	221	2,660	-		-	-	720.153 /ea	2,881
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	4.00	ea	469	2,400	-		-	-	717.20 /ea	2,869
	0011	Thresholds, aluminum, 3' long door saddles	12.00	lf	117	145	-		-	-	21.817 /lf	262
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	6.00	pr	-	363	-		-	-	60.50 /pr	363
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	4.00	ea	93	9	-		-	-	25.655 /ea	103
		08 11 00.061 Metal Doors & Frames (6070)			*1,056*	*6,047*					*3,551.55 /EA*	*7,103*
			2.00	*EA*								
			18.314	Labor hours								
		08.11.00.010 (72) Dewatering Building - Interior Door - Steel 6'x7' - 2 EA			*1,056*	*6,047*	*0*		*0*	*0*	*3,551.55 /EA*	*7,103*
			2.00	*EA*								
			18.314	Labor hours								
08.11.19.005		*(72) Dewatering Building - Doors - Steel 3'x7'*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	1000	Frames, steel, knock down, hollow metal, single, 16 ga., up to 4-7/8" deep, 3'-0" x 7'-0"	6.00	EA	352	1,170	-		-	-	253.60 /EA	1,522
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	6.00	ea	331	3,990	-		-	-	720.153 /ea	4,321
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	6.00	ea	703	3,600	-		-	-	717.20 /ea	4,303
	0011	Thresholds, aluminum, 3' long door saddles	18.00	lf	176	217	-		-	-	21.817 /lf	393
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	9.00	pr	-	545	-		-	-	60.50 /pr	545
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	6.00	ea	140	14	-		-	-	25.655 /ea	154
		08 11 00.061 Metal Doors & Frames (6070)			*1,702*	*9,535*					*1,872.808/EA*	*11,237*
			6.00	*EA*								
			29.471	Labor hours								

John F. Kime Water Treatment Plant Expansion
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Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		08 11 00.061 Metal Doors & Frames (6070)			*1,702*	*9,535*					*1,872.808/EA*	*11,237*
		6.00 EA										
		29.471 Labor hours										
		08.11.19.005 (72) Dewatering Building - Doors - Steel 3'x7'			*1,702*	*9,535*	*0*		*0*	*0*	*1,872.808/EA*	*11,237*
		6.00 EA										
		29.471 Labor hours										
08.11.19.010		*(72) Dewatering Building - Doors - Steel 6'x7'*										
08 11 00.061		*Metal Doors & Frames (6070)*										
	3620	Frames, steel, knock down, hollow metal, 14 gauge, up to 5-3/4" D, 7'-0" H, 6'-0" W, double	1.00	EA	78	235	-		-	-	313.13 /EA	313
	1120	Doors, commercial, steel, flush, full panel, hollow core, hollow metal, 18 ga., 3'-0" x 7'-0" x 1-3/4" thick	2.00	ea	110	1,330	-		-	-	720.155 /ea	1,440
	3000	Door hardware, panic device, narrow stile, mortise bar, exit only	2.00	ea	234	1,200	-		-	-	717.20 /ea	1,434
	0011	Thresholds, aluminum, 3' long door saddles	6.00	lf	59	72	-		-	-	21.817 /lf	131
	1430	Door hardware, hinges, full mortise, high frequency, brass base, US10, 4-1/2" x 4-1/2"	3.00	pr	-	182	-		-	-	60.50 /pr	182
	1200	Paints & coatings, exterior, door & frame, one side, flush, 1 coat, 3' x 7'	2.00	ea	47	5	-		-	-	25.655 /ea	51
		08 11 00.061 Metal Doors & Frames (6070)			*528*	*3,023*					*3,551.55 /EA*	*3,552*
		1.00 EA										
		9.157 Labor hours										
		08.11.19.010 (72) Dewatering Building - Doors - Steel 6'x7'			*528*	*3,023*	*0*		*0*	*0*	*3,551.55 /EA*	*3,552*
		1.00 EA										
		9.157 Labor hours										
08.36.15.005		*(72) Dewatering Building - Overhead Door - Steel 12' Wide x 12' High*										
08 36 15.000		*Overhead Door - Sectional Steel*										
	0300	Doors, rolling service, steel, manual, 20 gauge, 12' x 12' high, incl. hardware	1.00	EA	861	2,000	-		-	-	2,860.67 /EA	2,861
	3300	Doors, rolling service, steel, manual, for enamel finish, add	144.00	sf	-	317	-		-	-	2.20 /sf	317
	3700	Doors, rolling service, steel, manual, for safety edge bottom bar, electric, add	12.00	lf	-	540	-		-	-	45.00 /lf	540
	4000	Doors, rolling service, steel, manual, for weatherstripping, extruded rubber, jambs, add	36.00	lf	-	565	-		-	-	15.70 /lf	565
	4500	Doors, rolling service, steel, manual, motor operators for, to 14' x 14' opening	1.00	ea	207	1,200	-		-	-	1,406.56 /ea	1,407
	4700	Doors, rolling service, steel, manual, for fire door, additional fusible link, add	1.00	ea	-	31	-		-	-	31.00 /ea	31

Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	08 36 15.000 Overhead Door - Sectional Steel			*1,067*	*4,653*					*5,720.23 /EA*	*5,720*
	1.00 EA										
	16.533 Labor hours										
	08.36.15.005 (72) Dewatering Building - Overhead Door - Steel 12' Wide x 12' High			*1,067*	*4,653*	*0*		*0*	*0*	*5,720.23 /EA*	*5,720*
	1.00 EA										
	16.533 Labor hours										
08.36.15.010	*(72) Dewatering Building - Overhead Door - Steel 14' Wide x 12' High*										
08 36 15.000	*Overhead Door - Sectional Steel*										
0500	Doors, rolling service, steel, manual, 20 gauge, 14' x 14' high, incl. hardware	6.00	EA	7,746	19,350	-		-	-	4,516.00 /EA	27,096
3300	Doors, rolling service, steel, manual, for enamel finish, add	1,008.00	sf	-	2,218	-		-	-	2.20 /sf	2,218
3700	Doors, rolling service, steel, manual, for safety edge bottom bar, electric, add	72.00	lf	-	3,240	-		-	-	45.00 /lf	3,240
4000	Doors, rolling service, steel, manual, for weatherstripping, extruded rubber, jambs, add	240.00	lf	-	3,768	-		-	-	15.70 /lf	3,768
4500	Doors, rolling service, steel, manual, motor operators for, to 14' x 14' opening	6.00	ea	1,239	7,200	-		-	-	1,406.56 /ea	8,439
4700	Doors, rolling service, steel, manual, for fire door, additional fusible link, add	36.00	ea	-	1,116	-		-	-	31.00 /ea	1,116
	08 36 15.000 Overhead Door - Sectional Steel			*8,985*	*36,892*					*7,646.16 /EA*	*45,877*
	6.00 EA										
	139.200 Labor hours										
	08.36.15.010 (72) Dewatering Building - Overhead Door - Steel 14' Wide x 12' High			*8,985*	*36,892*	*0*		*0*	*0*	*7,646.16 /EA*	*45,877*
	6.00 EA										
	139.200 Labor hours										
08.51.13.005	*(72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA*										
08 51 13.000	*Aluminum Windows*										
2000	Windows, aluminum, commercial grade, stock units, awning, with screen, 4'-5" x 5'-3" opening, incl. frame and glazing	2.00	EA	258	820	-		-	-	539.10 /EA	1,078
	08 51 13.000 Aluminum Windows			*258*	*820*					*22.463/SF*	*1,078*
	48.00 SF										
	4.00 Labor hours										
	08.51.13.005 (72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA			*258*	*820*	*0*		*0*	*0*	*539.10 /EA*	*1,078*
	2.00 EA										

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	08.51.13.005 (72) Dewatering Building - Control Room Window - 12' Wide x 4'-4" High - 1 EA		*258*	*820*	*0*		*0*	*0*	*539.10 /EA*	*1,078*
	2.00 EA									
	4.00 Labor hours									
	DIVISION 08 OPENINGS		**14,448**	**65,737**	**0**		**0**	**0**	**3,818.348/EA**	**80,185**
	21.00 EA									
	231.410 Labor hours									

DIVISION 22 PLUMBING

22.20.00.005 (74) Plumbing Allowance

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
22 05 03.300	*Plumbing, Other*									
0100	Plumbing; includes fixtures, rough-in, drains and vents to 5' outside building - Conceptual Only based on building SF	5,200.00 SF	-	-	78,000		-	-	15.00 /SF	78,000
	22 05 03.300 Plumbing, Other				*78,000*				*78,000.00 /LS*	*78,000*
	1.00 LS									
	22.20.00.005 (74) Plumbing Allowance		*0*	*0*	*78,000*		*0*	*0*	*15.00 /SF*	*78,000*
	5,200.00 SF									
	DIVISION 22 PLUMBING		**0**	**0**	**78,000**		**0**	**0**	**15.00 /SF**	**78,000**
	5,200.00 SF									

DIVISION 23 HEATING, VENTILATING & AIR-CONDITIONING (HVAC)

23.00.00.005 (74) HVAC Allowance

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
23 00 00.000	*HVAC Basic Materials and Methods*									
n 0900	Project Allowance_HVAC Allowance	5,200.00 SF			208,000				40.00 /SF	208,000
	23 00 00.000 HVAC Basic Materials and Methods				*208,000*				*40.00 /SF*	*208,000*
	5,200.00 SF									
	23.00.00.005 (74) HVAC Allowance		*0*	*0*	*208,000*		*0*	*0*	*40.00 /SF*	*208,000*
	5,200.00 SF									

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 23 HEATING, VENTILATING & AIR-CONDITIONING (HVAC)			**0**	**0**	**208,000**		**0**	**0**	**40.00 /SF**	**208,000**
		5,200.00 SF										
DIVISION 31		**EARTHWORK**										
31.23.10.040		*(72) Dewatering Building, Excavation, Backfill and Haul Off-Site*										
31 23 10.000		*Excavation, Backfill, and Haul Off-Site*										
	0305	Excavating, bulk bank measure, 3-1/2 C.Y. capacity = 300 C.Y./hour, backhoe, hydraulic, crawler mounted, excluding truck loading	496.00	CY	188	-	-		474	-	1.335 /CY	662
	4210	Backfill, structural, sandy clay & loam, 200 H.P. dozer, 150' haul, from existing stockpile, excludes compaction	74.00	CY	43	-	-		99	-	1.911 /CY	141
n	0560	Hauling,excavated borrow material,loose cubic yards,20 mile round trip,0.4 load/hr,base wide rate,12 cy truck,highway haulers,excludes loading	526.00	CY	5,983	-	-		8,220	-	27.002 /CY	14,203
	0400	Compaction, structural, select fill, 8" lifts, sheepsfoot or wobbly wheel roller	74.00	CY	34	-	-		71	-	1.418 /CY	105
		31 23 10.000 Excavation, Backfill, and Haul Off-Site			*6,248*				*8,864*		*12.916/CY*	*15,112*
		1,170.00 CY										
		112.537 Labor hours										
		110.440 Equipment hours										
		31.23.10.040 (72) Dewatering Building, Excavation, Backfill and Haul Off-Site			*6,248*	*0*	*0*		*8,864*	*0*	*12.916/CY*	*15,112*
		1,170.00 CY										
		112.537 Labor hours										
		110.440 Equipment hours										
		DIVISION 31 EARTHWORK			**6,248**	**0**	**0**		**8,864**	**0**	**12.916/CY**	**15,112**
		1,170.00 CY										
		112.537 Labor hours										
		110.440 Equipment hours										
DIVISION 40		**PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)**										
40.05.19.055		*(72) Exposed Pipe - TS - 6" Dia - 260 LF*										
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	260.00	LF	642	20	-		58	-	2.767 /LF	719

	Item	Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
	7600	Paints & coatings, pipes, primer + 1 coat, brushwork, 6" to 8" diameter	286.00	lf	598	54	-		-	-	2.281 /lf	652
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	15.00	ea	144	54	-		-	-	13.237 /ea	199
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	30.00	ea	2,882	1,755	-		-	-	154.567 /ea	4,637
n	0050	DIP,FLGxFLG,6"dia,1'-0" long,class 53,excl excav, backfill	6.00	ea	400	3,408	-		-	-	634.623 /ea	3,808
n	0090	DIP,FLGxFLG,6"dia,19'-6" long,class 53,excl excav, backfill	14.00	ea	1,593	38,618	-		-	-	2,872.216 /ea	40,211
n	1006	Fitting,DIP,FLG,90 degree bend,6"dia,c 110 water piping	10.00	ea	666	3,008	-		-	-	367.424 /ea	3,674
n	1505	Fitting,DIP,FLG, Blind Flange,6"dia, water piping	2.00	ea	133	274	-		-	-	203.425 /ea	407
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*7,058*	*47,190*			*58*		*208.873/LF*	*54,307*
		260.00 LF										
		114.742 Labor hours										
		4.16 Equipment hours										
		40.05.19.055 (72) Exposed Pipe - TS - 6" Dia - 260 LF			*7,058*	*47,190*	*0*		*58*	*0*	*208.873/LF*	*54,307*
		260.00 LF										
		114.742 Labor hours										
		4.16 Equipment hours										
40.05.19.060		*(72) Exposed Pipe - TS - 6" Dia - Wall Pipe*										
40 05 19.006		*Pipe and Fittings - Ductile Iron, 06" Dia*										
n	7001	Pipeline Testing, Hydro (LF)	8.00	LF	20	1	-		2	-	2.766 /LF	22
	1122	Piping system identification labels, pipe markers, indicate contents and flow direction, self adhesive, 6" pipe	4.00	ea	38	15	-		-	-	13.238 /ea	53
	0690	Gasket and bolt set, for flanges, 150 lb., 6" pipe size	4.00	ea	384	234	-		-	-	154.568 /ea	618
n	0055	DIP,FLGxFLG,6"dia,2'-6" long,class 53,excl excav, backfill	4.00	ea	267	2,982	-		-	-	812.225 /ea	3,249
		40 05 19.006 Pipe and Fittings - Ductile Iron, 06" Dia			*709*	*3,232*			*2*		*492.781/LF*	*3,942*
		8.00 LF										
		10.987 Labor hours										
		0.128 Equipment hours										
		40.05.19.060 (72) Exposed Pipe - TS - 6" Dia - Wall Pipe			*709*	*3,232*	*0*		*2*	*0*	*492.781/LF*	*3,942*
		8.00 LF										
		10.987 Labor hours										
		0.128 Equipment hours										

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item		Description	Takeoff Qty		Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
		DIVISION 40 PROCESS INTEGRATION (EXPOSED PIPE, VALVES AND GATES)			**7,767**	**50,422**	**0**		**60**	**0**	**217.348/LF**	**58,249**
		268.00 LF										
		125.729 Labor hours										
		4.288 Equipment hours										
DIVISION 46		**WATER AND WASTEWATER EQUIPMENT**										
41.12.13.005		*(72) Shaftless Screw Conveyor (SCW-72-1, SCW-72-2, SCW-72-3), 100 CF/H*										
41 12 13.000		*Conveyors: Screw*										
	0100	Conveyor, Screw, Shaftless, SS	3.00	EA	885	423,000	-		-	18	141,300.857 /EA	423,903
		41 12 13.000 Conveyors: Screw			*885*	*423,000*				*18*	*141,300.857/EA*	*423,903*
		3.00 EA										
		15.69 Labor hours										
		41.12.13.005 (72) Shaftless Screw Conveyor (SCW-72-1, SCW-72-2, SCW-72-3), 100 CF/H			*885*	*423,000*	*0*		*0*	*18*	*141,300.857/EA*	*423,903*
		3.00 EA										
		15.69 Labor hours										
46.01.70.010		*(72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)*										
46 36 09.000		*Chemical Feed Equipment - Dry Systems (Polymer)*										
	1200	Polymer Equipment	1.00	LS	5,638	349,000	-		4,343	-	358,981.20 /LS	358,981
		46 36 09.000 Chemical Feed Equipment - Dry Systems (Polymer)			*5,638*	*349,000*			*4,343*		*358,981.20 /EA*	*358,981*
		1.00 EA										
		100.00 Labor hours										
		40.00 Equipment hours										
		46.01.70.010 (72) Polymer Equipment - (PFP-72-1, PFP-72-2, PFP-72-3, TK-72-1, TK-72-2)			*5,638*	*349,000*	*0*		*4,343*	*0*	*358,981.20 /LS*	*358,981*
		1.00 LS										
		100.00 Labor hours										
		40.00 Equipment hours										
46.76.21.005		*(72) Belt Filter Press (BF-72-1, BFP-72-2), 1,800 LB/H, 160 GPM @ 2% Solids*										
46 76 21.000		*Belt Filter Press*										
	0001	Belt Filter Press / VFD / Feed Box 0.5 hp; Gravity 2 hp; Pressure 3 hp / Dimension 1.5 m	2.00	EA	4,510	1,040,500	-		4,343	-	524,676.800 /EA	1,049,354

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Item	Description	Takeoff Qty	Labor Amount	Material Amount	Subcontract Amount	Subcontract Name	Equipment Amount	Other Amount	Total Unit Cost	Total Amount
	46 76 21.000 Belt Filter Press		*4,510*	*1,040,500*			*4,343*		*524,676.800/EA*	*1,049,354*
	2.00 EA 80.00 Labor hours 40.00 Equipment hours									
	46.76.21.005 (72) Belt Filter Press (BF-72-1, BFP-72-2), 1,800 LB/H, 160 GPM @ 2% Solids		*4,510*	*1,040,500*	*0*		*4,343*	*0*	*524,676.800/EA*	*1,049,354*
	2.00 EA 80.00 Labor hours 40.00 Equipment hours									
	DIVISION 46 WATER AND WASTEWATER EQUIPMENT		**11,033**	**1,812,500**	**0**		**8,686**	**18**	**366,447.474/EA**	**1,832,237**
	5.00 EA 195.69 Labor hours 80.00 Equipment hours									
	700 DEWATERING BUILDING		***257,063***	***2,238,412***	***286,000***		***28,052***	***18***	***2,809,545.23 /LS***	***2,809,545***
	1.00 LS 4,620.758 Labor hours 463.226 Equipment hours									

John F. Kime Water Treatment Plant Expansion

Piedmont Triad Regional Water Authority

Detail Report - Direct Costs

Estimate Totals

Description	Amount	Totals	Rate
Labor	2,459,705		
Labor Burden	983,882		40.000 %
Premium on Labor - Keep and Retain	337,074		8.000 $/hr
Material	9,784,990		
Build America, Buy America Act			
Equipment	581,288		
Discount RS Means Equip (-25%)			
Subcontract	5,289,050		
Other	516,937		
DIVISION 02	124,570		25.000 %
DIVISION 04	61,588		25.000 %
DIVISION 05	43,397		25.000 %
DIVISION 07	24,695		25.000 %
DIVISION 08	20,934		25.000 %
DIVISION 13	174,092		25.000 %
DIVISION 31	143,931		10.000 %
DIVISION 32	75,180		10.000 %
DIVISION 33	412,381		10.000 %
DIVISION 54	99,609		25.000 %
Subtotal Direct Project Costs	**1,180,377**	**21,133,303**	
Contractor's Mob	845,332		4.000 %
Contractor's Home Office Overhead	845,332		4.000 %
Contractor's General Condition	2,535,996		12.000 %
Subtotal Field Const Costs	**4,226,660**	**25,359,963**	
Sales Tax Estimate (Mat & Eq)			
Subtotal Field Const Costs		**25,359,963**	
Contractor's Fee	3,803,994		15.000 %
Subtotal Field Const Costs	**3,803,994**	**29,163,957**	
Design Contingency	8,749,187		30.000 %
Subtotal Field Const Costs	**8,749,187**	**37,913,144**	
Escalation Project (Year)	4,375,177		11.540 %
Subtotal	**4,375,177**	**42,288,321**	
Contractor's Bonds & Insurance	1,057,208		2.500 %
Construction Subtotal	**1,057,208**	**43,345,529**	
Market Volatility Adjustment Factor	2,167,276		5.000 %
Construction Subtotal	**2,167,276**	**45,512,805**	
I&C Allowance	3,330,205		6.000 %
Electrical Allowance	6,660,411		12.000 %
Factored Allowance	**9,990,616**	**55,503,421**	
Total		***55,503,421***	

AACE Classification Accuracy Range

Upper Range +50% **Lower Range -30%**

Project Name: Piedmont Triad Regional Water Authority
Facility: Water Treatment Plant Expansion
Design Stage: 30%
Date: 4/11/2023 **Prepared By: Matt Feuerhelm**

Escalation Adjustment - Calculation Worksheet

Escalation Rate per Year **5.00%** = Annual Escalation Rate to Apply (2)

ESCALATION ADJUSTMENT:

Target NTP for Design:	11-Apr-23		<= If design is in progress or completed, use Today's date and adjust input cells as needed
Design Period:	5-Apr-24	12	Mo Duration (or remaining design time duration)
Bid and Award:	4-Jul-24	3	Mo Duration
NTP Date:	11-Jul-24	7	Day Duration for NTP (7 days as default)
Construction Duration (calendar days):	720 Days	24	Mo Duration 111.54% Factor
Completion Date:	1-Jul-26		
Mid-Point Construction:	6-Jul-25		
Current Est Date:	11-Apr-23		
No. of Days to Mid-Point:	817		
No. of Years to Mid-Point:	2.2384		

11.54% Escalation Factor
Escalation to Apply to Opinion of Cost

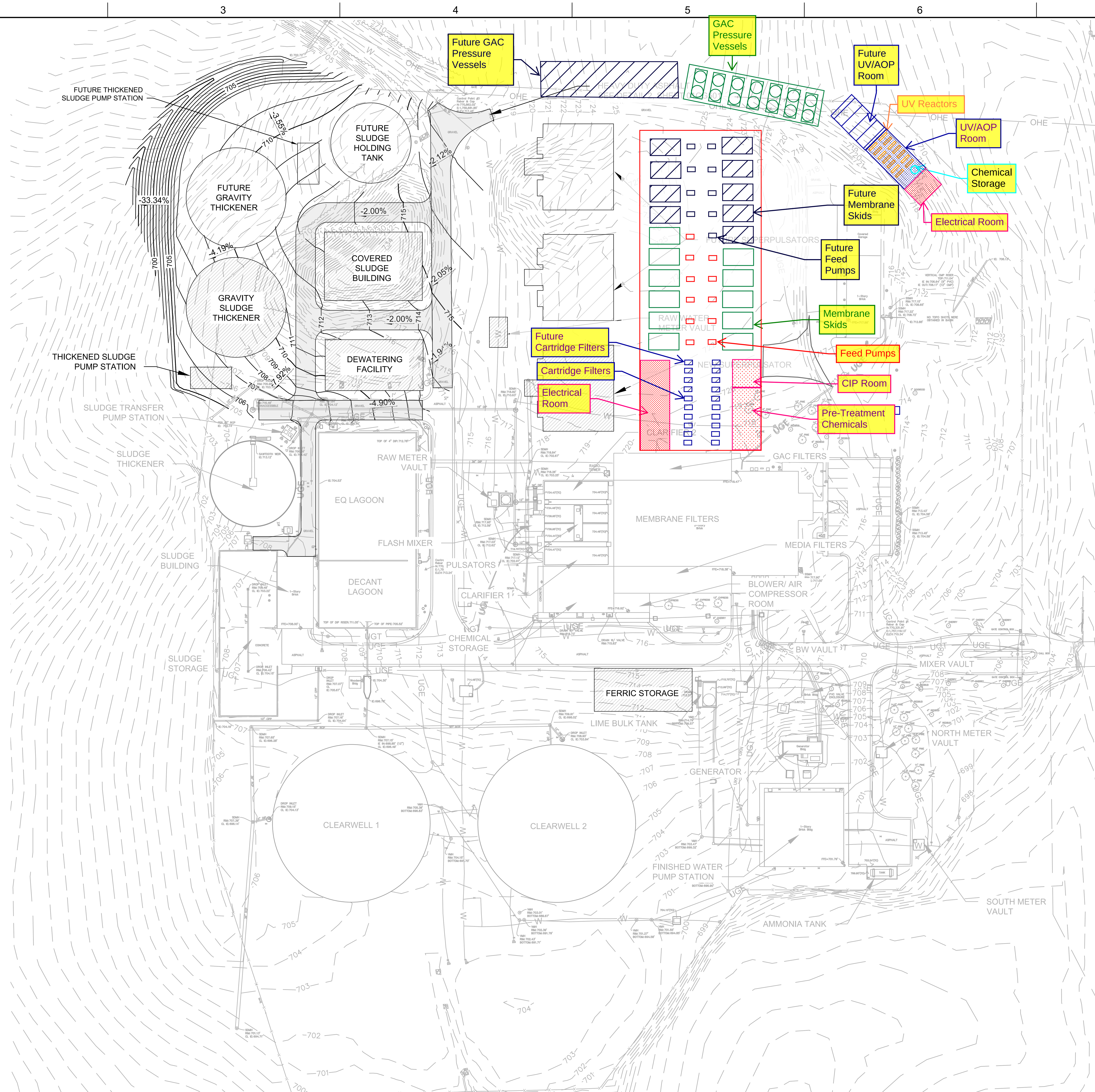
NOTES:
1. Green cells are input cells. Yellow cells are default values. 30 calendar days is used to equate to 1 month.
2. Escalation percentage does not inlcude any other Market Adjustment Factors that might apply.

The Escalation Rate and Calculations are for purposes of allowing for perceived increases in labor, material and equipment for the period indicated. This is only a projection and an approximation, and does not represent what the actual adjustment will utimately be since that will vary from what is calculated above.

F

Appendix F. Emerging Contaminant Treatment Alternatives – Site Layouts

Treatment Alternative 1A/1B - RO Membranes with
UV/AOP and GAC Concentrate Treatment



GENERAL NOTES:

1. SEE SHEET 01CS101 FOR PROJECT DATA.
2. THE TOPOGRAPHIC SURVEY WAS PREPARED BY: FRANCIS M. HARTER III, PROFESSIONAL LAND SURVEYOR, AND COMPLETED IN OCTOBER 2022. ALL COORDINATES ARE BASED ON NAD83/2011, AND ELEVATIONS BASED ON NAVD 88.
3. THE SURVEY WAS MAPPED FOR PIEDMONT TRIAD REGIONAL WATER AUTHORITY.
4. THIS PROPERTY MAY BE SUBJECT TO ANY EASEMENTS, RESTRICTIVE COVENANTS AND/OR RIGHT OF WAY RECORD.
5. THE PURPOSE OF THE SURVEY IS TO SHOW IMPROVEMENTS AND TOPOGRAPHICAL INFORMATION ONLY. A BOUNDARY SURVEY WAS NOT PERFORMED UNDER THE SCOPE OF THIS PROJECT.
6. CONTOUR INTERVALS ARE 1 FOOT.
7. AREA BY COORDINATE METHOD. ALL DISTANCES SHOWN ARE HORIZONTAL AND IN US FEET.
8. THE LOCATION OF UTILITIES AS SHOWN HEREON, WHETHER PUBLIC OR PRIVATE, ARE BASED ON THE LOCATION OF VISIBLE ABOVE GROUND APPURTENANCES AS WELL AS LEVEL B SUE DESIGNATION PERFORMED BY CES GROUP ENGINEERS, LLP. OTHER UTILITIES WHICH WERE NOT OBSERVED AND NOT SHOWN HEREON MAY EXIST. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
9. NO NCGS OR USGS MONUMENTS LOCATED WITHIN 2000' OF SUBJECT PARCEL.

LEGEND

	EX. CONTOUR (MAJOR)
	EX. CONTOUR (MINOR)
	FENCE
W	WATERLINE
UKN	UNKNOWN UTILITY
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND COMM
OHE	OVERHEAD ELECTRIC
	FLOODPLAIN
	TREELINE
	POWER POLE
	MAJOR CONTOUR
	MINOR CONTOUR

HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1200
Charlotte, NC 28202
704.338.6700
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
-	-	-

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

GRADING AND DRAINAGE PLAN 2

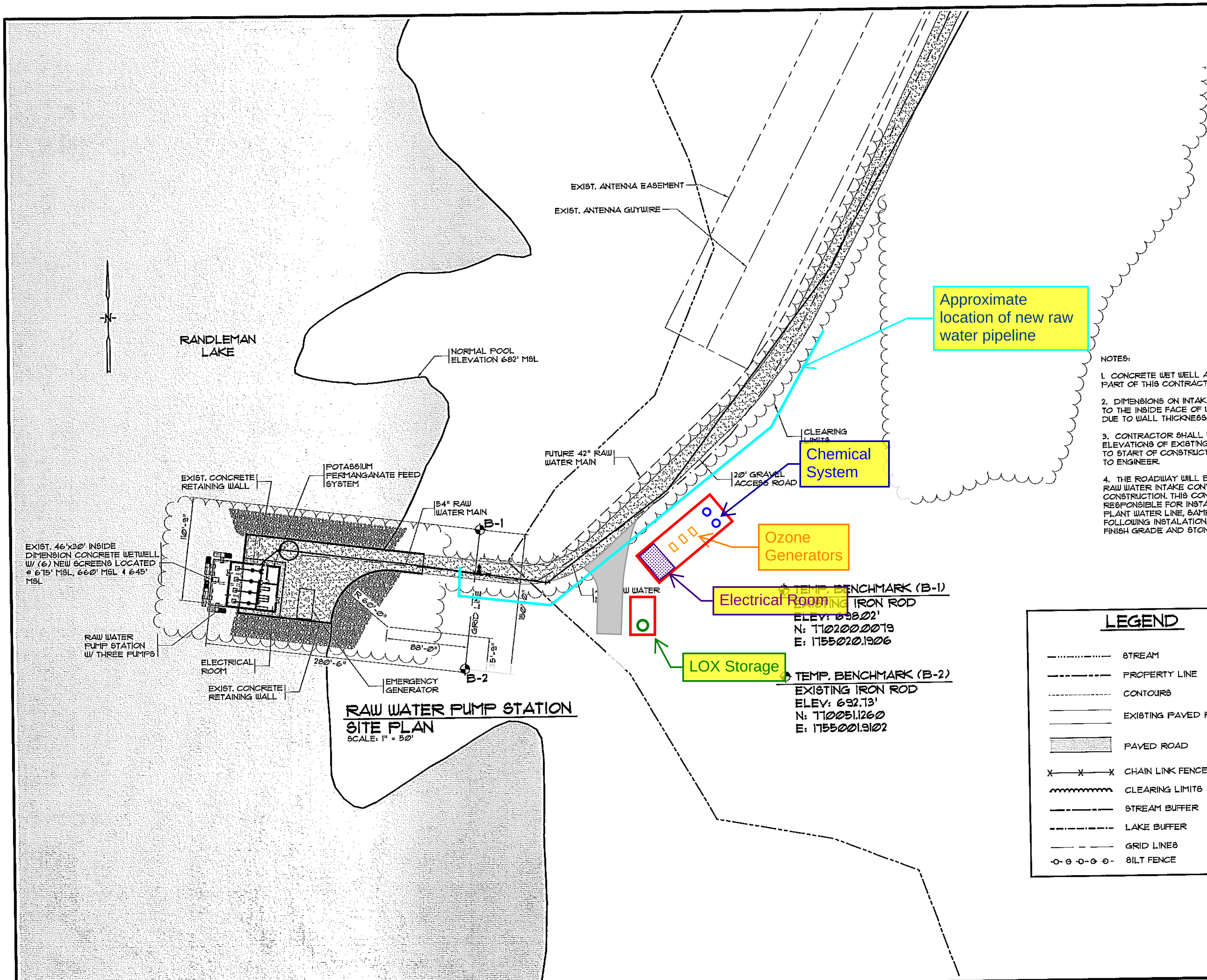
0 1" 2"

FILENAME 10343268-01CG102.dwg

SCALE 1" = 60'

SHEET **01CG102**

Treatment Alternative 2 - Ozone/AOP with GAC



NOTES:

1. CONCRETE WET WELL AND RETAINING WALL ARE NOT PART OF THIS CONTRACT.

2. DIMENSIONS ON INTAKE STRUCTURE ARE MEASURED TO THE INSIDE FACE OF WALL. OUTSIDE FACE VARIES DUE TO WALL THICKNESS.

3. CONTRACTOR SHALL FIELD VERIFY DIMENSIONS AND ELEVATIONS OF EXISTING CONCRETE STRUCTURE PRIOR TO START OF CONSTRUCTION. REPORT DISCREPANCIES TO ENGINEER.

4. THE ROADWAY WILL BE ROUGH GRADED BY THE RAW WATER INTAKE CONTRACTOR, THALLE CONSTRUCTION. THIS CONTRACT SHALL BE RESPONSIBLE FOR INSTALLATION OF RAW WATER MAIN, PLANT WATER LINE, SAMPLE LINES, ELECTRICAL, ETC. FOLLOWING INSTALATION, THE CONTRACTOR SHALL FINISH GRADE AND STONE THE ROAD.

LEGEND

STREAM
PROPERTY LINE
CONTOURS
EXISTING PAVED ROAD
PAVED ROAD
CHAIN LINK FENCE
CLEARING LIMITS
STREAM BUFFER
LAKE BUFFER
GRID LINES
SILT FENCE

AS-BUILT

RECORD DRAWING MAY 2011

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MARZIANO & McGOUGAN, P.A.
consulting engineers

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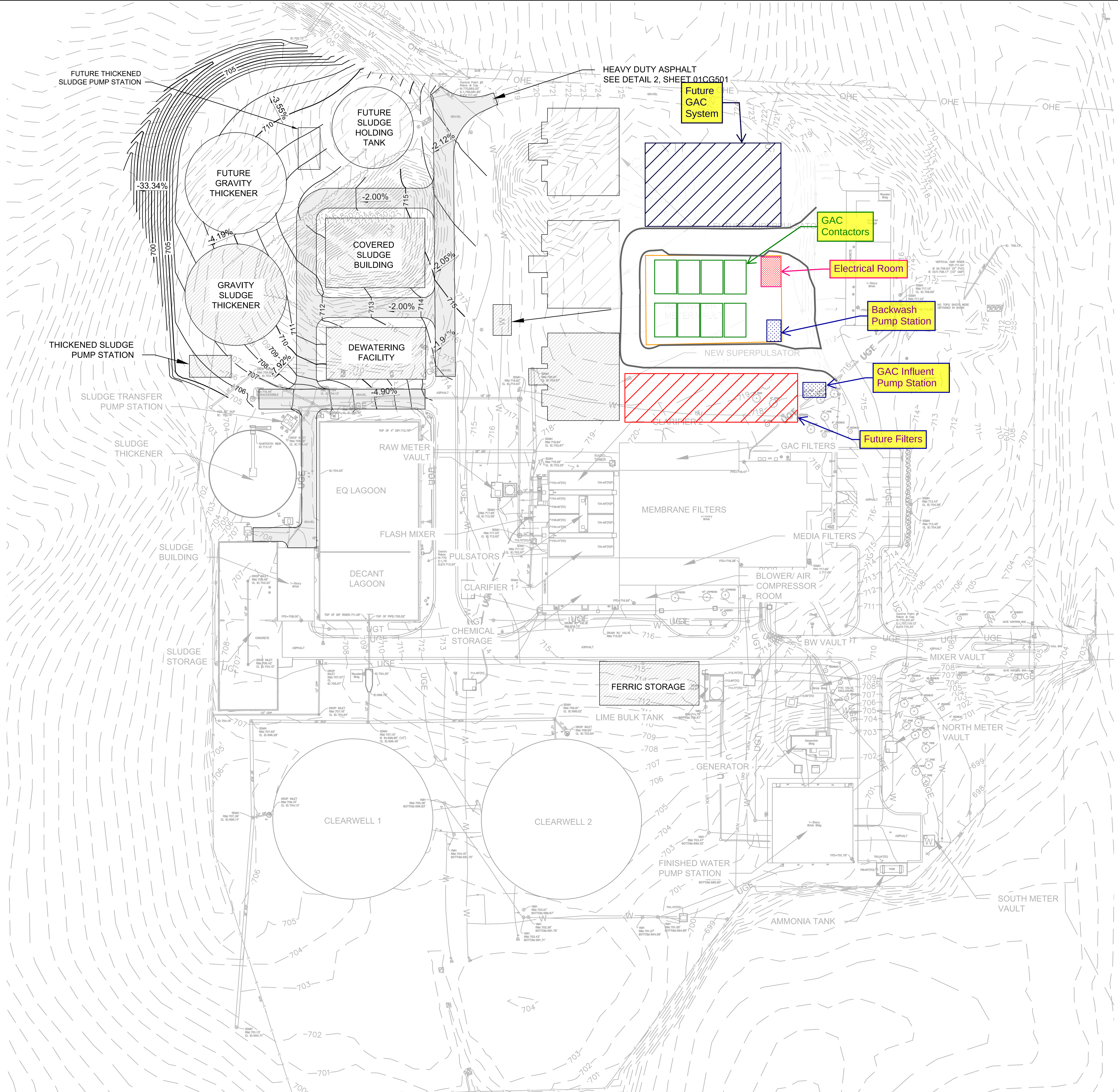
Consulting Engineers
Southern Pines, North Carolina 28387

RAW WATER PUMP STATION SITE PLAN

PIEDMONT TRIAD REGIONAL WATER AUTHORITY
RANDLEMAN WTP
RANDLEMAN, NORTH CAROLINA

DATE:	MAY 2011
DESIGNED:	JWM
DRAWN:	DC/ALR
CHECKED:	JWM
SCALE:	AS SHOWN

SHEET NO.
G-7
Of: ____ Version: 6



GENERAL NOTES:

1. SEE SHEET 01CS101 FOR PROJECT DATA.
2. THE TOPOGRAPHIC SURVEY WAS PREPARED BY: FRANCIS M. HARTER III, PROFESSIONAL LAND SURVEYOR, AND COMPLETED IN OCTOBER 2022. ALL COORDINATES ARE BASED ON NAD83/2011, AND ELEVATIONS BASED ON NAVD 88.
3. THE SURVEY WAS MAPPED FOR PIEDMONT TRIAD REGIONAL WATER AUTHORITY.
4. THIS PROPERTY MAY BE SUBJECT TO ANY EASEMENTS, RESTRICTIVE COVENANTS AND/OR RIGHT OF WAY RECORD.
5. THE PURPOSE OF THE SURVEY IS TO SHOW IMPROVEMENTS AND TOPOGRAPHICAL INFORMATION ONLY. A BOUNDARY SURVEY WAS NOT PERFORMED UNDER THE SCOPE OF THIS PROJECT.
6. CONTOUR INTERVALS ARE 1 FOOT.
7. AREA BY COORDINATE METHOD. ALL DISTANCES SHOWN ARE HORIZONTAL AND IN US FEET.
8. THE LOCATION OF UTILITIES AS SHOWN HEREON, WHETHER PUBLIC OR PRIVATE, ARE BASED ON THE LOCATION OF VISIBLE ABOVE GROUND APPURTENANCES AS WELL AS LEVEL B SUE DESIGNATION PERFORMED BY CES GROUP ENGINEERS, LLC. OTHER UTILITIES WHICH WERE NOT OBSERVED AND NOT SHOWN HEREON MAY EXIST. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE LOCATION PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION.
9. NO NCGS OR USGS MONUMENTS LOCATED WITHIN 2000' OF SUBJECT PARCEL.

LEGEND

	EX. CONTOUR (MAJOR)
	EX. CONTOUR (MINOR)
	FENCE
W	WATERLINE
UKN	UNKNOWN UTILITY
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND COMM
OHE	OVERHEAD ELECTRIC
	FLOODPLAIN
	TREELINE
	POWER POLE
	MAJOR CONTOUR
	MINOR CONTOUR

HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1200
Charlotte, NC 28202
704.338.6700
N.C.B.E.L.S. License Number F-0116

ISSUE	DATE	DESCRIPTION
-	-	-

PROJECT MANAGER	KATIE WALKER
DESIGNED BY	CADEN GIGLIOTTI
CHECKED BY	MICHAEL LITTLE
DRAWN BY	NATHAN CROUSE
PROJECT NUMBER	10343268

PRELIMINARY NOT FOR CONSTRUCTION OR RECORDING

PIEDMONT TRIAD REGIONAL WATER AUTHORITY WTP EXPANSION

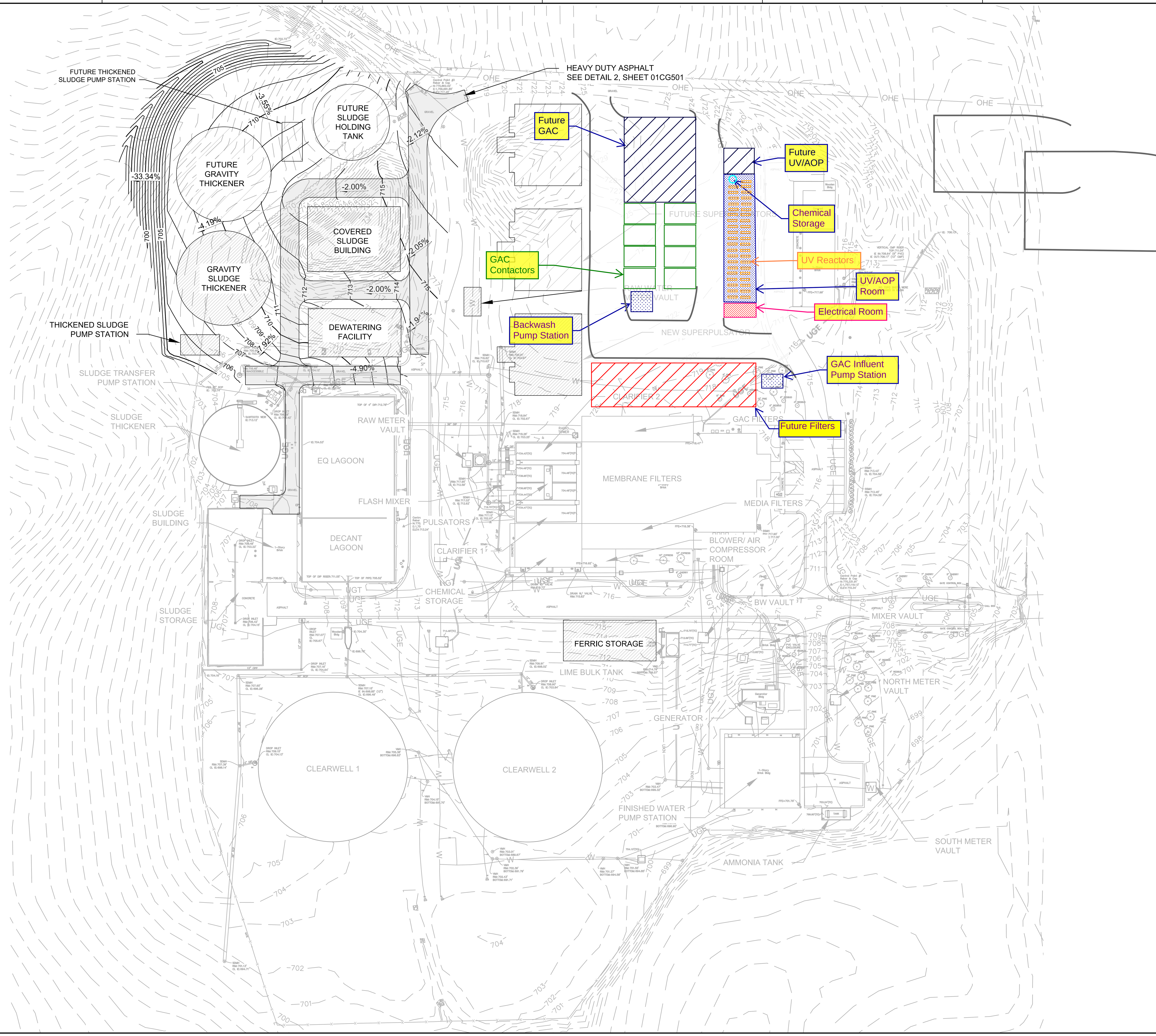
GRADING AND DRAINAGE PLAN 2

0 1" 2"

FILENAME	10343268-01CG102.dwg
SCALE	1" = 60'

SHEET 01CG102

Treatment Alternative 3 - Ozone/AOP with GAC



N

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LEGEND

- EX. CONTOUR (MAJOR)
- EX. CONTOUR (MINOR)
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- UKN — UNKNOWN UTILITY
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- TREELINE
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Appendix G. Emerging Contaminant Treatment Alternatives – OPCCs

Randleman, NC
PTRWA
Treatment Alternative Cost Analysis

Train 1A - RO + UV/AOP + GAC Concentrate Treatment (26.7 MGD Production)

Description	CAPEX	OPEX
Process Equipment		
RO System	$ 32,710,000	$ 3,457,000
UV/AOP System	$ 7,003,000	$ 361,000
GAC System	$ 15,004,000	$ 290,000
Building and Site Services		
General Site Work and Restoration	$ 1,095,000	
Electrical, Instrumentation, and SCADA	$ 10,944,000	
Soil / Geotechnical Specialty Conditions	$ 548,000	
HVAC / Mechanical	$ 1,095,000	
Contractor Costs and Fees		
Contractor Mobilization / Demobilization	$ 2,736,000	
Contractor OH, Supervision, and Support Staff	$ 8,208,000	
Contractor Insurance and Bonds	$ 2,052,000	
Miscellaneous Construction Elements	$ 4,104,000	
Contractor Profit	$ 6,156,000	
Construction Subtotal	**$ 91,655,000**	
Escalation / Volatility Factor	$ 13,749,000	
Engineering Services	$ 13,749,000	
Contingency	$ 27,497,000	$ 411,000
Total Costs	**$ 146,650,000**	**$ 4,519,000**
Cost per MGD	**$ 5.49**	**$ 0.25**

Randleman, NC
PTRWA
Treatment Alternative Cost Analysis

Train 1B - RO + UV/AOP + GAC Concentrate Treatment (21.4 MGD Production)

Description	CAPEX		OPEX	
Process Equipment				
RO System	$	26,057,000	$	3,457,000
UV/AOP System	$	5,852,000	$	361,000
GAC System	$	12,932,000	$	290,000
Building and Site Services				
General Site Work and Restoration	$	897,000		
Electrical, Instrumentation, and SCADA	$	8,969,000		
Soil / Geotechnical Specialty Conditions	$	449,000		
HVAC / Mechanical	$	897,000		
Contractor Costs and Fees				
Contractor Mobilization / Demobilization	$	2,243,000		
Contractor OH, Supervision, and Support Staff	$	6,727,000		
Contractor Insurance and Bonds	$	1,682,000		
Miscellaneous Construction Elements	$	3,364,000		
Contractor Profit	$	5,045,000		
Construction Subtotal	**$**	**75,114,000**		
Escalation / Volatility Factor	$	11,268,000		
Engineering Services	$	11,268,000		
Contingency	$	22,535,000	$	411,000
Total Costs	**$**	**120,185,000**	**$**	**4,519,000**
Cost per MGD	**$**	**5.62**	**$**	**0.25**

Randleman, NC
PTRWA
Treatment Alternative Cost Analysis

Train 2 - Ozone/AOP + GAC Treatment

Description	CAPEX		OPEX	
Process Equipment				
GAC System	$	26,523,000	$	2,660,000
Ozone/AOP	$	13,306,000	$	2,796,000
Conversion to BAF	$	2,505,000		-
Building and Site Services				
General Site Work and Restoration	$	847,000		
Electrical, Instrumentation, and SCADA	$	8,467,000		
Soil / Geotechnical Specialty Conditions	$	424,000		
HVAC / Mechanical	$	847,000		
Contractor Costs and Fees				
Contractor Mobilization / Demobilization	$	2,117,000		
Contractor OH, Supervision, and Support Staff	$	6,351,000		
Contractor Insurance and Bonds	$	1,588,000		
Miscellaneous Construction Elements	$	3,176,000		
Contractor Profit	$	4,763,000		
Construction Subtotal	**$**	**70,914,000**		
Escalation / Volatility Factor	$	10,638,000		
Engineering Services	$	10,638,000		
Contingency	$	21,275,000	$	546,000
Total Costs	**$**	**113,465,000**	**$**	**6,002,000**
Cost per MGD	**$**	**4.25**	**$**	**0.33**

Randleman, NC
PTRWA
Treatment Alternative Cost Analysis

Train 3 - UV/AOP + GAC Treatment

Description	CAPEX		OPEX	
Process Equipment				
GAC System	$	26,530,000	$	2,660,000
UV/AOP	$	13,499,000	$	1,332,000
Building and Site Services				
General Site Work and Restoration	$	801,000		
Electrical, Instrumentation, and SCADA	$	8,006,000		
Soil / Geotechnical Specialty Conditions	$	401,000		
HVAC / Mechanical	$	801,000		
Contractor Costs and Fees				
Contractor Mobilization / Demobilization	$	2,002,000		
Contractor OH, Supervision, and Support Staff	$	6,005,000		
Contractor Insurance and Bonds	$	1,502,000		
Miscellaneous Construction Elements	$	3,003,000		
Contractor Profit	$	4,504,000		
Construction Subtotal	**$**	**67,054,000**		
Escalation / Volatility Factor	$	10,059,000		
Engineering Services	$	10,059,000		
Contingency	$	20,117,000	$	400,000
Total Costs	**$**	**107,289,000**	**$**	**4,392,000**
Cost per MGD	**$**	**4.02**	**$**	**0.24**

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