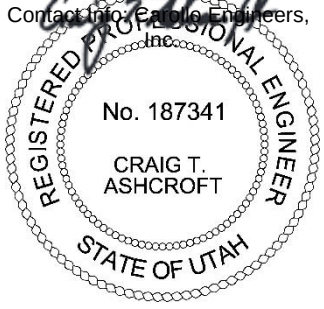
Digitally signed by Craig Ashcroft
Date: 2018.06.26 15:48:20 -06'00'
Contact Info: Carollo Engineers, Inc.



LOGAN CITY

LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

WASTEWATER TREATMENT MASTER PLAN ADDENDUM

FINAL
June 2018

1265 EAST FORT UNION BOULEVARD, SUITE 200 • SALT LAKE CITY, UTAH 84047 • P. 801.233.2500 • F. 801.233.2501

LOGAN CITY

LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

WASTEWATER TREATMENT MASTER PLAN ADDENDUM

TABLE OF CONTENTS

Page

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

CHAPTER 1 INTRODUCTION

Due to new phosphorus and effluent ammonia limits imposed by the Utah Division of Water Quality (DWQ), Logan City (City) is working to complete the design of the recommended wastewater treatment facility (WWTF) outlined in the Final Master Plan 2015 (Master Plan) by Carollo Engineers, Inc. (Carollo). The preferred alternative from this study recommended the three-stage Bardenpho Bioreactor treatment process, based on lowest lifecycle costs, process reliability, ease of operation and effluent quality. As stated in the Master Plan and before final design, the capital cost for the new facility was estimated to be $112 million with an Operations and Maintenance (O&M) cost of $5.02 million annually.

During the design phase, additional geotechnical investigations determined that piles used to support the structures would need to be driven deeper to withstand required gravity and seismic loads.

This Wastewater Treatment Master Plan Addendum amends the October 16, 2015 project Master Plan and includes an update on innovative technology to be included in the project.

1.1 Master Plan Update and Antidegradation Review

The purpose of this Wastewater Treatment Master Plan Addendum (Report) is to describe treatment alternatives evaluated to reduce the facility footprint and report on the innovative technology selected for inclusion in the design. This Report also updates the antidegradation review (ADR), which was included in the original Master Plan. The updated ADR form is included in Appendix A.

1.2 Alternatives

The following alternatives were evaluated to reduce the facility footprint and/or reduce the estimated cost of the project:

- Ballasted Activated Sludge (BioMag®).
- Membrane Bioreactors (MBR).
- Alternative Sites.
- Clearas.

Carollo had previously reviewed the Clearas technology in the past but due to further advancements in the technology and other Utah projects considering the technology, Carollo decided to revisit Clearas as an alternative to reduce the estimated construction cost.

All the alternatives will meet the new ammonia and phosphorus permit limits. Each of these alternatives will be discussed in the following sections.

1.2.1 Option 1 - Ballasted Activated Sludge Process (BioMag®)

BioMag® is a ballasted activated sludge process that increases plant capacity by achieving faster settling. The process infuses magnetite (oxidized iron ore) particles with a specific gravity of 5.2, into biological floc to make it heavier, enhancing clarification performance without addition tankage or infrastructure. The BioMag® system allows the mixed liquor suspended solids (MLSS) concentration to double from the previous conventional design of 3500 mg/L to 7000 mg/L or higher. Thus, wastewater treatment plants can achieve the same capacity but with reduced footprint.

Additional BioMag® equipment will be needed to recover the virgin magnetite back into the system. Shear mills and magnetic drums are used to separate magnetite from the solids in the waste activated sludge (WAS) and captured magnetite is brought back to the bioreactors through the return activated sludge (RAS). The design recovery rate for the BioMag® equipment is 90 to 95 percent. Any magnetite not captured by the drum is disposed of in the dewatered solids.

Figure 1.1 Magnetite Drum Separation Process

1.2.2 Option 2 - Membrane Bioreactors (MBR)

Membrane bioreactors are a suspended growth process that uses membrane filtration in lieu of secondary clarifiers and eliminates the need for tertiary treatment. Similar to the BioMag® process, MBRs can operate at higher solids concentrations since the membranes provide a better means of solids separation. MBRs also produce high enough effluent water quality to be reclaimed for reuse options and Class A biosolids.

MBRs are a proven technology and well known in the water industry with installations in more than 200 countries. However, MBRs are more complex and use significantly more power than conventional ditches. The membranes are also expensive and must be replaced every 10 years.

1.2.3 Option 3 - Alternative Site

Currently, the City owns 140 acres of land south and west of the current landfill at 200 South 1900 West. The City approved a geotechnical investigation of the soil to explore the possibility of improved soil conditions at these sites. A total of eight CPTs were completed across the site.

The geotechnical report found that soils at the alternative sites are comparable to those encountered at the original site, and there was not any advantage to pursuing an alternative site.

1.2.4 Option 4 - Clearas

Clearas technology is a tertiary treatment that uses algae to further remove nutrients such as nitrogen and phosphorus from secondary lagoon effluent. Algae are grown in a photo bioreactor environment that accelerates photosynthesis, and results in the consumption of carbon dioxide and excess nutrients. Advanced microfiltration is then used to filter out treated water from the algae and algae is returned back to the process or harvested via dewatering equipment. Figure 1.2 illustrates the main processes of Clearas. The main advantage of the system is that algae is harvested and separated from the system and sold to independent buyers to create a revenue stream to offset O&M costs.

Clearas is a very new technology with only 3 municipal installations worldwide. There are still many uncertainties about the technology such as performance of nutrient removal using algae under cold water conditions. Cold water conditions have never been piloted and the delay and cost of piloting only further impacts the schedule. The revenue stream created by the algae is also uncertain from year to year and is subject to market volatility, which undermines the only true advantage of the process. Due to these uncertain and high risk to the City, the Clearas technology will no longer be evaluated in this report.

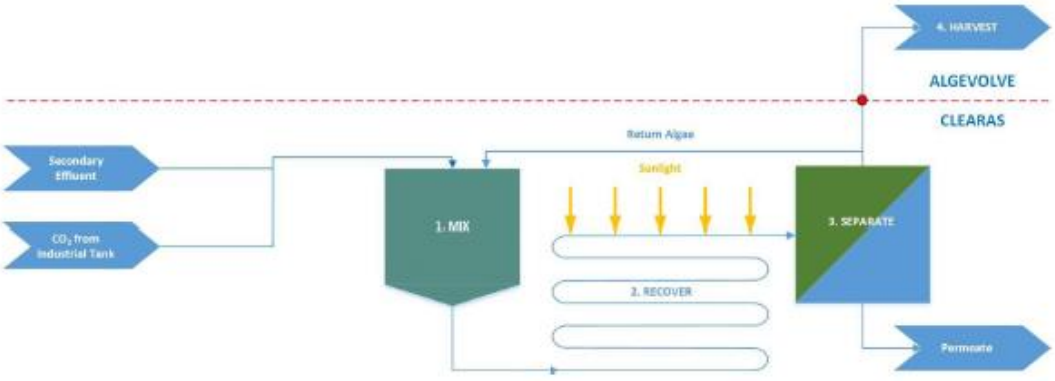


Figure 1.2 Clearas Process Flow Diagram

CHAPTER 2 ALTERNATIVE EVALUATION

2.1 Introduction

A comparison of the alternatives considered is included in Appendix B.

2.2 Description of Alternatives

2.2.1 Option 1 - Ballasted Activated Sludge Process (BioMag®)

- Three bioreactors, each with anoxic and aerobic zones for biological nitrogen removal.
- Four secondary clarifiers.
- UV disinfection building.
- Dewatering facility.
- BioMag® facility with RAS/WAS.

2.2.2 Option 2 - Membrane Bioreactors (MBR)

- Three bioreactors, each with anoxic and aerobic zones for biological nitrogen removal.
- Flash mix building for chemical phosphorus removal.
- MBR facility with membranes, permeate pumps, CIP equipment, UV and RAS/WAS pumps.
- Blower building.
- Dewatering facility.

2.2.3 Option 3 - Alternative Site

The alternative site option would consist of the conventional design WWTF on the new site. Due to results from the geotechnical investigation, this option will not be a recommended alternative but a detailed cost estimate for the conventional design will be provided to help contrast the cost of the original design with the suggested alternatives.

2.3 Cost Estimate Matrix

Table 2.1 provides a summary of the capital costs, annual O&M and annual lifecycle costs for each alternative. Lifecycle costs were calculated annualizing the capital cost using a rate of three percent over 20 years plus the annual O&M cost.

Table 2.1 Cost Evaluation Matrix(1)

Alternative	Capital Cost	O&M Cost	Annual-20 yr
BioMag®	$ 116,663,000	$ 4,457,000	$ 12,298,000
MBR	$ 138,331,000	$ 5,914,000	$ 15,212,000
Conventional	$ 161,224,000	$ 3,950,000	$ 14,787,000

(1) Costs based on 2016 dollars.

2.4 Recommendation

Based on the results of the evaluation of alternatives and site visits, the BioMag alternative is the recommended choice. This option has the lowest capital and annual lifecycle cost.

CHAPTER 3 INNOVATIVE PROCESS INFORMATION

3.1 Ballasted Activated Sludge Process (BioMag)

As part of the recommendation to implement the Bio Mag process, members of Carollo, the City, and the DWQ went to visit several full scale facilities. In addition to the site visits, Carollo completed settling tests on solids from a similar process at the Snyderville Basin Water Reclamation District's East Canyon Water Reclamation Facility. A letter from DWQ approving the BioMag concept, Evoqua BioMag information, and settling tests are included in Appendix C.

3.2 Design Criteria

Design Criteria for the project incorporating the BioMag process is included in Appendix C (see drawing G03).

Preliminary architectural, mechanical, and electrical drawings for the project including the BioMag process are also included in Appendix D.

3.3 Process Modeling

Process modeling results were also updated based on implementation of the BioMag process. Process modeling results are included in Appendix E.

APPENDIX A – ANTIDEGRADATION REVIEW

ANTIDEGRADATION REVIEW FORM
UTAH DIVISION OF WATER QUALITY

Instructions

The objective of antidegradation rules and policies is to protect existing high quality waters and set forth a process for determining where and how much degradation is allowable for socially and/or economically important reasons. In accordance with Utah Administrative Code (UAC R3l 7-2-3), an antidegradation review (ADR) is a permit requirement for any project that will increase the level of pollutants in waters of the state. The rule outlines requirements for both Level I and Level II ADRs, as well as public comment procedures. This review form is intended to assist the applicant and Division of Water Quality (DWQ) staff in complying with the rule but is not a substitute for the complete rule in R3 l 7-2-3.5. Additional details can be found in the *Utah Antidegradation Implementation Guidance* and relevant sections of the guidance are cited in this review form.

ADRs should be among the first steps of an application for a UPDES permit because the review helps establish treatment expectations. The level of effort and amount of information required for the ADR depends on the nature of the project and the characteristics of the receiving water. To avoid unnecessary delays in permit issuance, the Division of Water Quality (DWQ) recommends that the process be initiated at least one year prior to the date a fin al approved permit is required.

DWQ will determine if the project will impair beneficial uses (Level I ADR) using information provided by the applicant and whether a Level II ADR is required. The applicant is responsible for conducting the Level Il ADR. For the permit to be approved, the Level II ADR must document that all feasible measures have been undertaken to minimize pollution for socially, environmentally or economically beneficial projects resulting in an increase in pollution to waters of the state.

For permits requiring a Level II ADR, this antidegradation form must be completed and approved by DWQ before any UPDES permit can be issued. Typically, the ADR form is completed in an iterative manner in consultation with DWQ. The applicant should first complete the statement of social, environmental and economic importance (SEEI) in Part C and determine the parameters of concern (POC) in Part D. Once the POCs are agreed upon by DWQ, the alternatives analysis and selection of preferred alternative in Part E can be conducted based on minimizing degradation resulting from discharge of the POCs. Once the applicant and DWQ agree upon the preferred alternative, the review is considered complete, and the form must be signed, dated, and submitted to DWQ.

For additional clarification on the antidegradation review process and procedures, please contact Nicholas von Stackelberg (801-536-4374) or Jeff Ostermiller (801-536-4370).

Antidegradation Review Form

Part A: Applicant Information

Facility Name: Logan City Wastewater Treatment Facility

Facility Owner: Logan City

Facility Location: 450 North 1000 West, Logan, Utah 84321

Form Prepared By: Carollo Engineers, Inc., Inc.

Outfall Number: 001

Receiving Water: Swift Slough

What Are the Designated Uses of the Receiving Water (R317-2-6)?

Domestic Water Supply: None
Recreation: 2B - Secondary Contact
Aquatic Life: 3B - Warm Water Aquatic Life
Agricultural Water Supply: 4
Great Salt Lake: None

What is the application for? (check all that apply)

[ ]	A UPDES permit for a new facility, project, or outfall.
[X]	A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.
[X]	A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.
[ ]	A UPDES permit renewal with no changes in facili1ty operations.

Part B. Is a Level II ADR required?

This section of the form is intended to help applicants determine if a Level II ADR is required for specific permitted activities. In addition, the Executive Secretary may require a Level II ADR for an activity with the potential for major impact on the quality of waters of the state (R317-2-3.5a.1).

Bl. The receiving water or downstream water is a Class lC drinking water source.

[ ]	**Yes**	A Level II ADR is required (Proceed to Part C of the Form)
[X]	**No**	(Proceed to Part B2 of the Form)

B2. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

[ ]	**Yes**	(Proceed to Part B3 of the Form)
[X]	**No**	No Level JI ADR is required and there is no need to proceed further with review questions.

B3. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review. For a few pollutants such as dissolved oxygen, an antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Section 3.3.3 of Implementation Guidance)

[X]	**Yes**	(Proceed to Part B4 of the Form)
[ ]	**No**	No Level II ADR is required and there is no need to proceed further with review questions.

B4. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

[ ]	**Yes**	Identify the reasons used to justify this determination in Part B4.1 and proceed to Part G. No Level II ADR is required.
[X]	**No**	A Level II ADR is required (Proceed to Part C)

B4.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.S(b)(3) and R317-2-3.S(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

[ ] Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired.

Factors to be considered in determining whether water quality impacts will be temporary and limited:

a) The length of time during which water quality will be lowered: [ ]

b) The percent change in ambient concentrations of pollutants: [ ]

c) Pollutants affected: [ ]

d) Likelihood for long-term water quality benefits: [ ]

e) Potential for any residual long-term influences on existing uses: [ ]

f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts: [ ]

Additional justification, as needed: [ ]

Level II ADR

Part C, D, E, and F of the form constitute the Level II ADR Review. The applicant must provide as much detail as necessary for DWQ to perform the antidegradation review. Questions are provided for the convenience of applicants; however, for more complex permits it may be more effective to provide the required information in a separate report. Applicants that prefer a separate report should record the report name here and proceed to Part G of the form.

Optional Report Name: *City of Logan Wastewater Treatment Master Plan Update 2018*

Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

Cl. Describe the social and economic benefits that would be realized through the proposed project, including the number and nature of jobs created and anticipated tax revenues.

Logan City, USU, and the surrounding communities are a vital part of the State economy.

C2. Describe any environmental benefits to be realized through implementation of the proposed project.

The proposed project will meet the water quality standards established by the Cutler Reservoir TMDL for total phosphorus, and will meet the proposed limits for ammonia.

C3. Describe any social and economic losses that may result from the project, including impacts to recreation or commercial development.

The project will impose a heavy financial burden on local residents and will require monthly sewer rates higher than 1.4% MAGI.

C4. Summarize any supporting information from the affected communities on preserving assimilative capacity to support future growth and development.

C5. Please describe any structures or equipment associated with the project that will be placed within or adjacent to the receiving water.

Part D. Identify and rank (from increasing to decreasing potential threat to designated uses) the parameters of concern. *Parameters of concern are parameters in the effluent at concentrations greater than ambient concentrations in the receiving water. The applicant is responsible for identifying parameter concentrations in the effluent and DWQ will provide parameter concentrations for the receiving water. More information is available in Section 3.3.3 of the Implementation Guidance.*

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1	Ammonia		6 mg/L
2	TP		3 mg/L
3	TN		20-25 mg/L
4	BODS		6 mg/L
5	TSS		8 mg/L

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review.

Level II ADRs require the applicant to determine whether there are feasible less-degrading alternatives to the proposed project. More information is available in Section 5.5 and 5.6 of the Implementation Guidance.

E1. The UPDES permit is being renewed without any changes to flow or concentrations. Alternative treatment and discharge options including changes to operations and maintenance were considered and compared to the current processes. No economically feasible treatment or discharge alternatives were identified that were not previously considered for any previous antidegradation review(s).

[ ] **Yes** (Proceed to Part F)

[X] **No or Does Not Apply** (Proceed to E2)

E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options (see 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.

Report Name: *City of Logan Wastewater Treatment Master Plan Update 2018*

E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final waste load analysis (WLA) and any secondary or categorical effluent limits.

Ballasted Activated Sludge with 3-Stage Bardenpho

$116,663,000.00 (2016 dollars)

E4. Were any of the following alternatives feasible and affordable?

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	No	not feasible for magnitude of pollutants to be removed
Water Recycling/Reuse	No	Not affordable
Land Application	No	Not affordable
Connection to Other Facilities	No	No other facilities with 18 mgd of spare capacity
Upgrade to Existing Facility	No	not affordable - see Bio-Dome alternative
Total Containment	No	not feasible
Improved O&M of Existing Systems	No	not able to meet permit limits
Seasonal or Controlled Discharge	No	not affordable
New Construction	Yes	proposed for preferred alternative
No Discharge	No	not feasible

E5. From the applicant's perspective, what is the preferred treatment option?

Ballasted Activated Sludge with 3-Stage Bardenpho Bioreactor

E6. Is the preferred option also the least polluting feasible alternative?

[X] **Yes**

[ ] **No**

If no, what were less degrading feasible alternative(s)?

If no, provide a summary of the justification for not selecting the least polluting feasible alternative and if appropriate, provide a more detailed justification as an attachment.

Part F. Optional Information

F1. Does the applicant want to conduct optional public review(s) in addition to the mandatory public review? Level II ADRs are public noticed for a thirty day comment period. More information is available in Section 3.7.1 of the Implementation Guidance.

[X] **No**

[ ] **Yes**

F2. Does the project include an optional mitigation plan to compensate for the proposed water quality degradation?

[X] **No**

[ ] **Yes**

Report Name: [ ]

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The form should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this form and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Print Name: Craig Ashcroft

Signature: Craig Ashcroft

Date: 6/20/2018

G2. DWQ Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

Water Quality Management Section

Print Name: _____

Signature: _____

Date: _____

APPENDIX B – EVALUATION OF ALTERNATIVES

Logan City
Wastewater Treatment Facility

Cost Reduction Alternatives

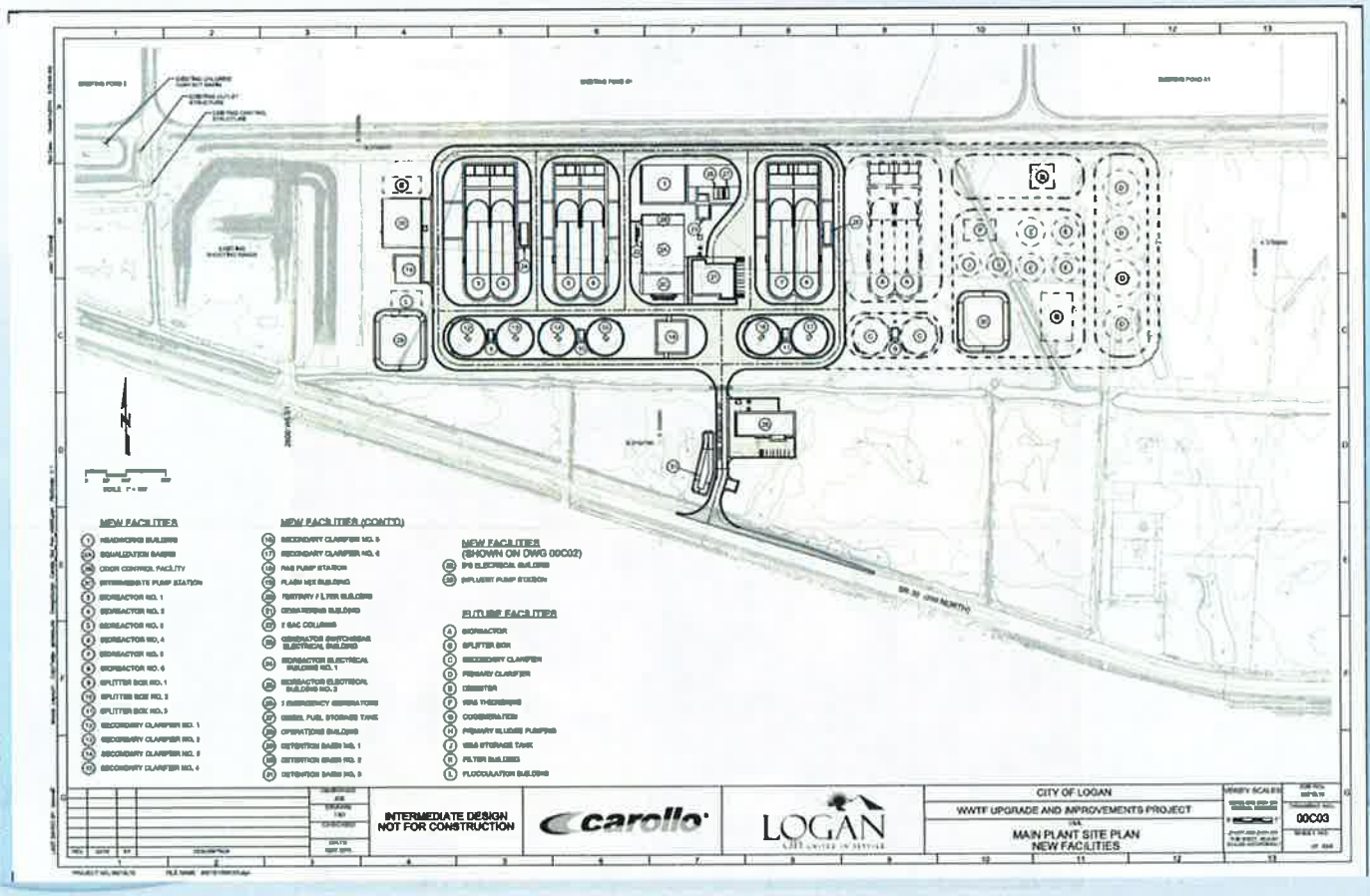
January 2017

Engineers...Working Wonders With Water®

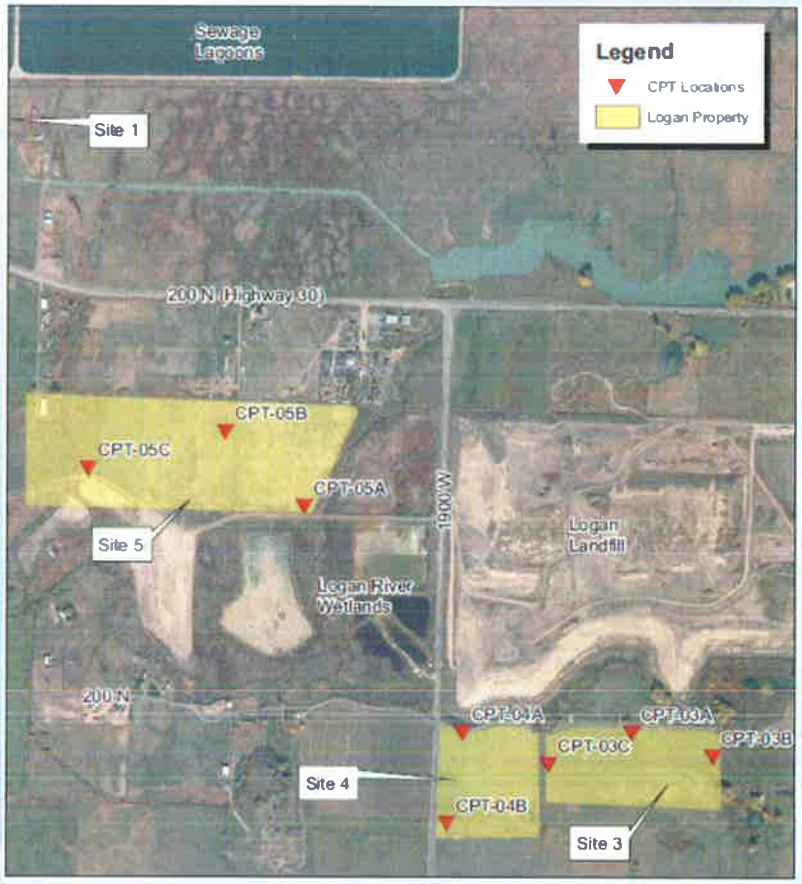
Terminology

- Activated Sludge – Biological process that uses bacteria to treat wastewater
- Mixed Liquor Suspended Solids - measure of the concentration of bacteria in a treatment system
- Return Activated Sludge (RAS) – bacteria recycled back to the treatment process
- Waste Activated Sludge (WAS) – Bacteria wasted from the treatment system, typically 5-7 percent of the total bacteria in the system each day

Conventional Design – Site Plan



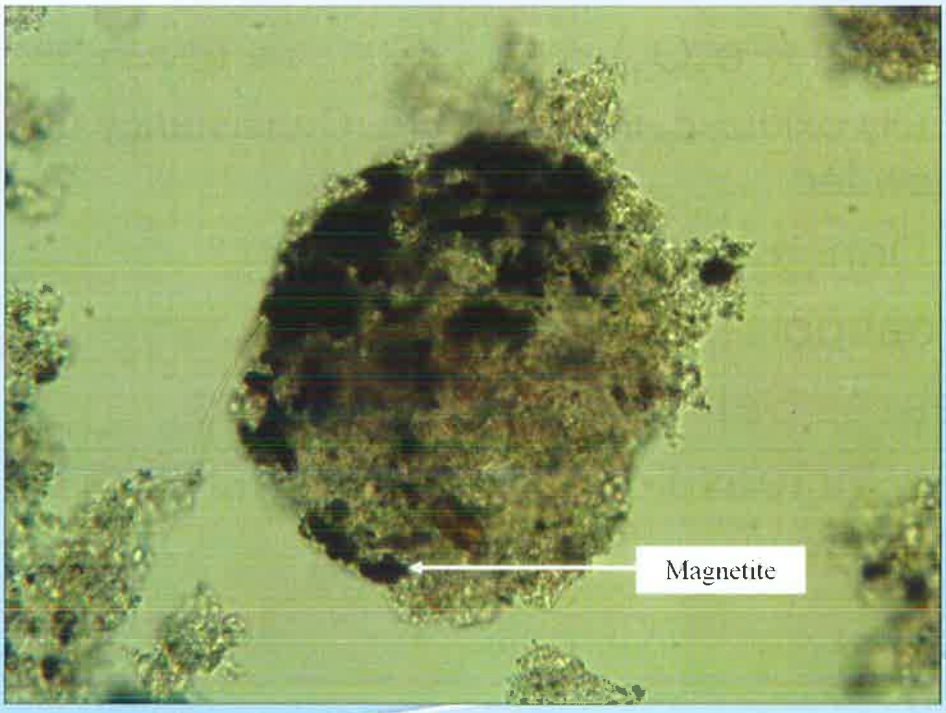
Alternative Site Locations



Option 1 - BioMag

- Magnetite (Fe_3O_4)
  - Fully oxidized, inert iron ore. Consistency of talcum powder.
- Very Dense – SG of 5.2
- Hydrophobic
- Increases Settling Rate in Clarifiers
- Allows Increase of MLSS Concentration

Magnetite Infused into Biological Floc

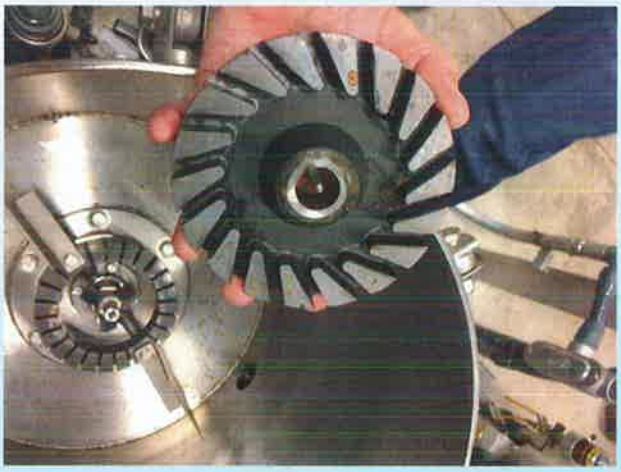


BioMag Equipment

Screening prior to Shear Mill

Shear Mill

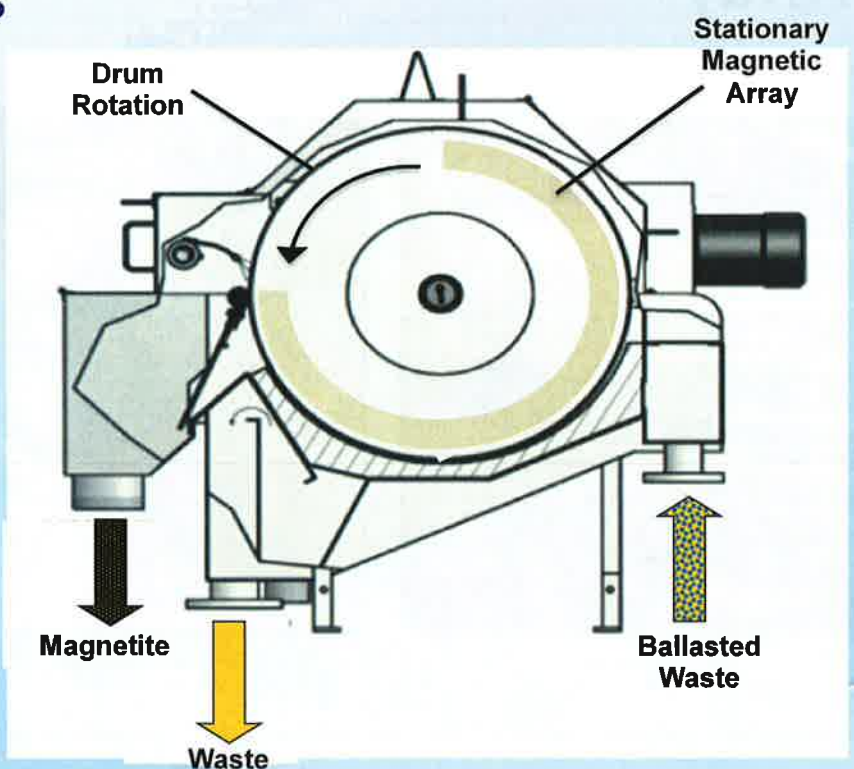
BioMag Equipment



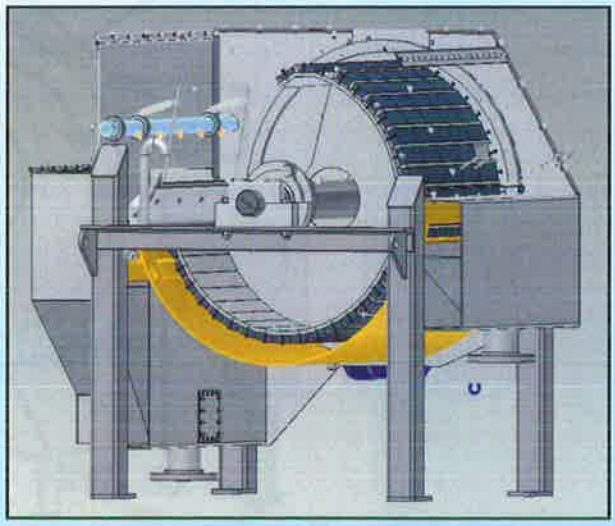
Inside of Shear Mill

Magnetite Recovery Drum

Magnetite Recovery Drum – How it Works



Magnetic Recovery Drum Magnet Array

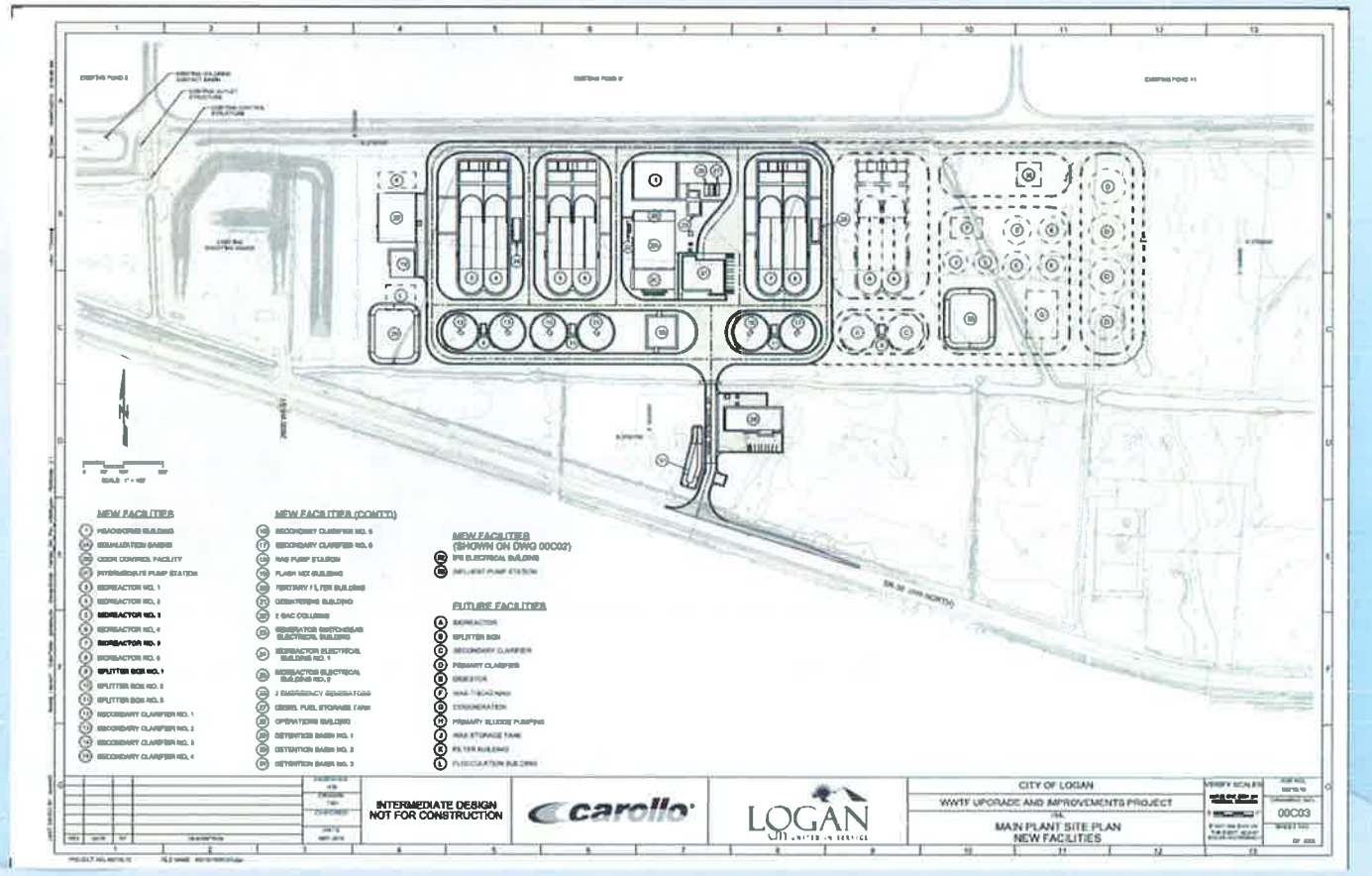


BioMag Equipment

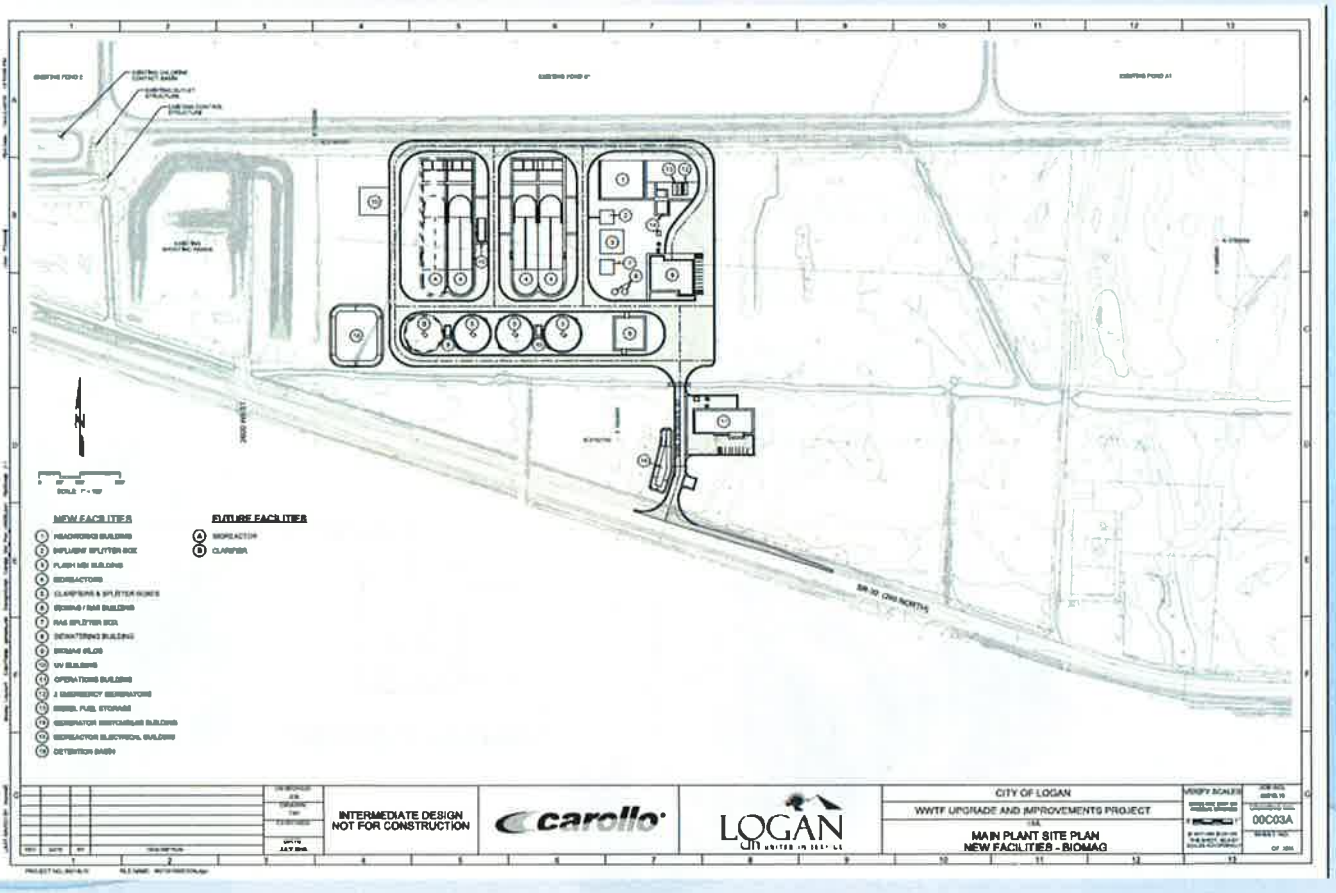
Magnetite Recovery Drums

Magnetite Storage Silo

Conventional Design – Site Plan

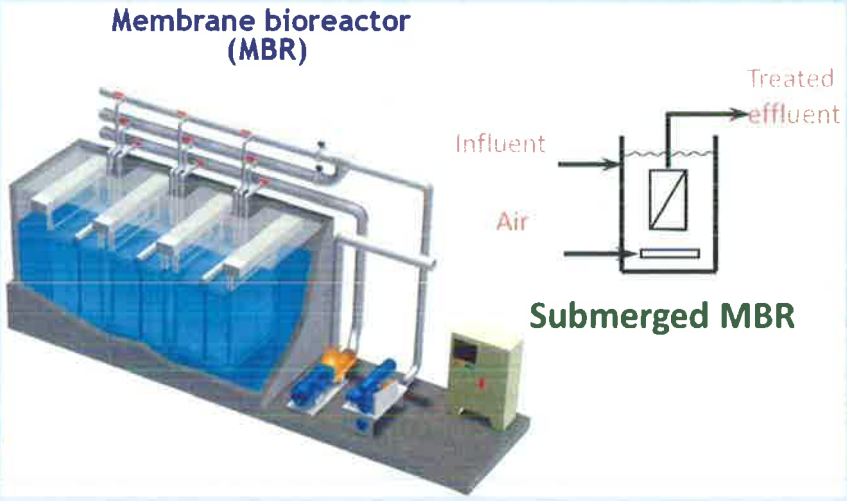


BioMag – Site Plan



Option 2 - MBR

- Membrane Filter Process Integrated with Suspended Growth Bioreactors
- Increases Mixed Liquor Concentrations
- No Clarifiers or Sand Filters



MBR

Increased Screening Requirements

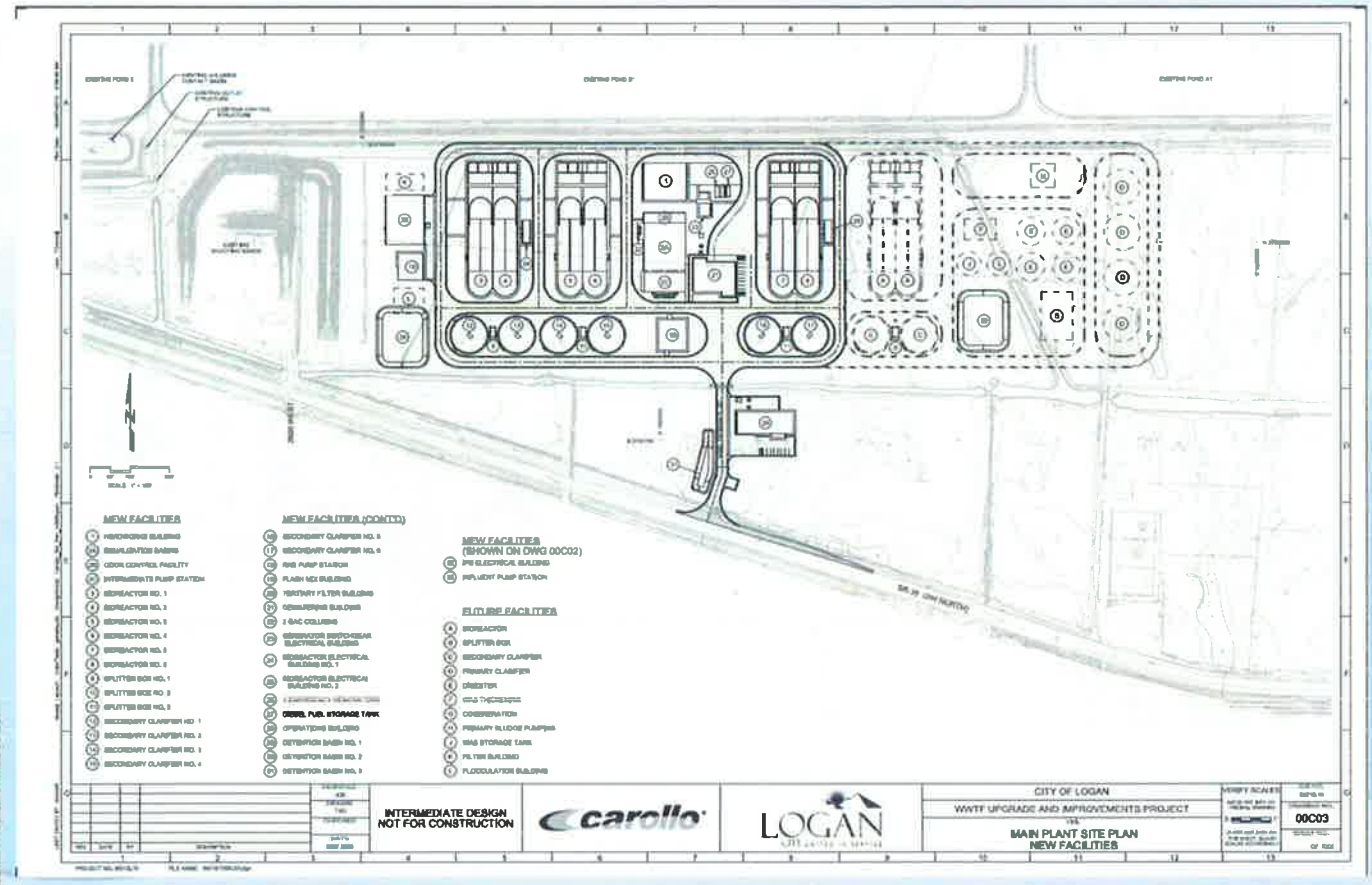
MBR

MBR

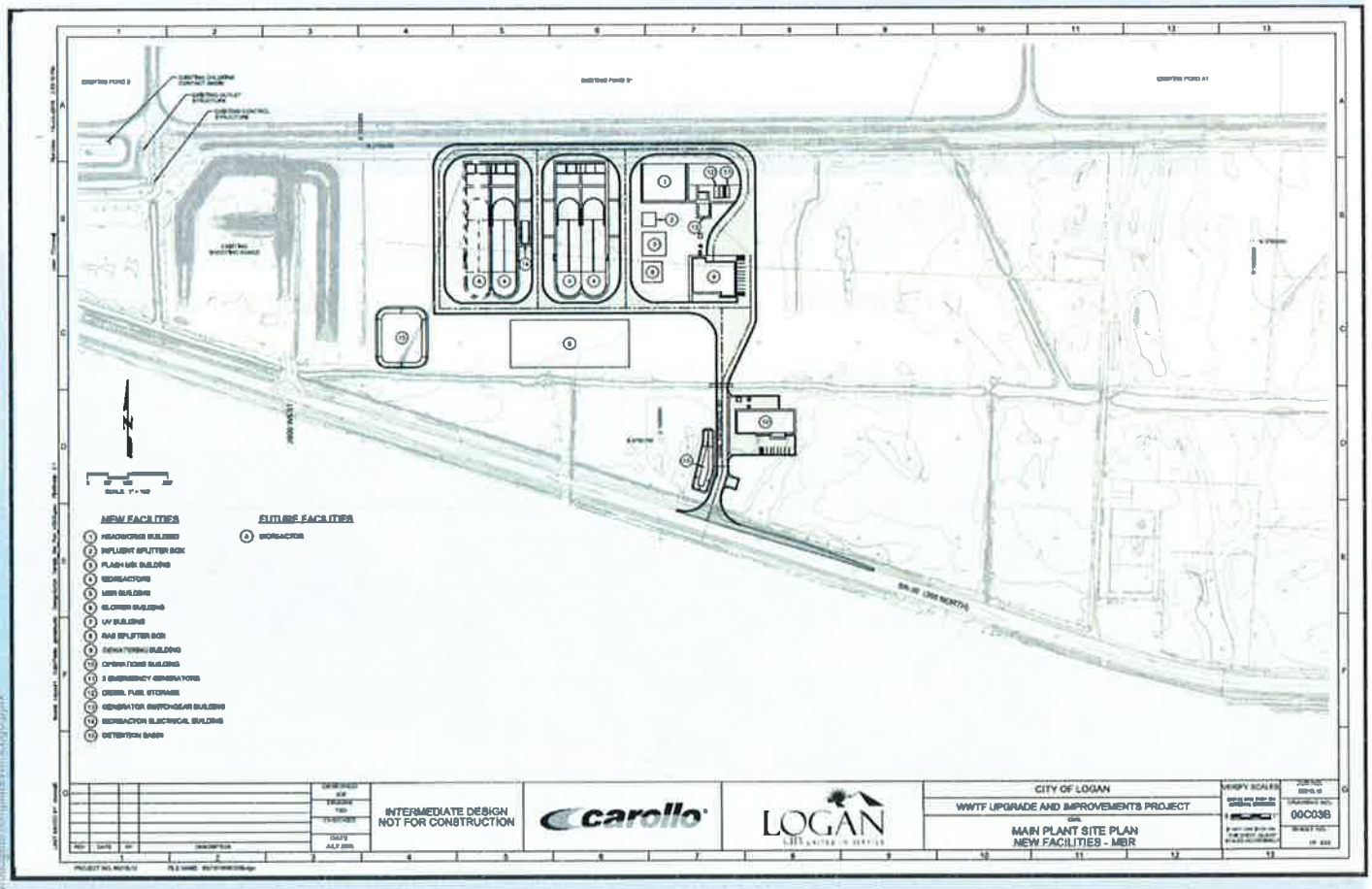
Blowers

Pumps

Conventional Design – Site Plan



MBR Site Plan



Alternative Cost Comparison Matrix

Alternative	Capital Cost	Annual O&M Cost	Annual-20 yr (3%)
Conventional	$161,224,000	$3,950,000	$14,787,000
BioMag	$116,663,000	$4,457,000	$12,298,000
MBR	$138,331,000	$5,914,000	$15,212,000

Mixed Liquor Density Comparison

- Conv. - 3,500 mg/L = 0.22 lbs/cf SG = 1.004
- MBR - 7,000 mg/L = 0.44 lbs/cf SG = 1.007
- BioMag (1:1) - 14,000 mg/L = 0.88 lbs/cf SG = 1.014

BioMag Advantages

- Simpler process with less equipment
- Lower power usage
- Lower O&M cost
- Lower Capital cost
- Requires fewer design changes

MBR Advantages

- Produces a higher quality effluent
- Allows Type 1 reuse water
  - Irrigation of parks, golf courses, etc
- Technology more mature, more widely adopted

Recommendation

Carollo recommends that the City proceed with the BioMag alternative

APPENDIX C – BIOMAG INFORMATION

State of Utah
GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of
Environmental Quality

Alan Matheson
Executive Director

DIVISION OF WATER QUALITY
Walter L. Baker, P.E.
Director

JAN - 4 2017

Issa Hamud, P.E.
Environmental Director
Logan City Corporation
450 North 1000 West
Logan City, UT 84321

Dear Mr. Hamud:

Subject: City of Logan Wastewater Treatment High Rate Treatment Alternative - Approval in Concept

The Division of Water Quality Engineering Section (Division) has reviewed the alternative wastewater treatment technology "Ballasted Activated Sludge" that is proposed for the new Logan City wastewater treatment facility. Our evaluation included a review of Carollo Engineers Project Memorandum and recommendations dated December 28, 2016, the technical literature, visits to three facilities with full scale application of the technology, and an assessment of the treatment performance by the technology. We found that the technology is robust, sustainable, and economical for the proposed application by Logan City.

The proposed ballasted activated sludge process is a relatively simple concept that seeks to overcome a fundamental limitation in the activated sludge process: separation by gravity sedimentation (settling) of the sludge part of the activated sludge from the water being treated and prior to its discharge. By making the density of the sludge greater, the separation is made faster. The result of faster separation of sludge from water is that both the treatment tanks and the settling tanks can be made smaller without compromising treatment performance. The amount of ballast substrate used in the process and the resulting net density of the ballasted activated sludge (plus a safety factor) will establish the new settling velocity limits and then, the design parameters that will be used to decrease tank sizes and overall facility footprint.

The three facilities visited, one in Maryland and two in Pennsylvania, had implemented the "BioMag" ballasted activated sludge process as an upgrade to their existing facilities. The technology was implemented to extend the capacities of these facilities without or with fewer major capital improvements. All of the facilities experience significant variations in their influent flow rates with peaking factors of around 3X relative to average daily flow rates. At two of the

plants, new nutrient removal requirements were major drivers for the need to expand capacities and cost savings was the principal reason that this technology was selected. In all cases the BioMag technology appeared to have been easily implemented and incorporated into the existing works. Plant personnel reported that they were satisfied with the performance of the technology supplier during construction and with the performance of the technology. No serious problems with the BioMag equipment or its operational requirements were identified.

The treatment performance achieved by the three facilities visited was excellent. Effluent qualities for conventional pollutants were less than 5 mg/L for 5-day biochemical oxygen demand and total suspended solids. Ammonia concentrations were less than 1.4 mg/L (lower when dictated by permit) and total phosphorus concentrations were 0.5 mg/L or lower. One facility reported consistently meeting an effluent total nitrogen limit of 4 mg/L. This level of treatment performance rivals the best performing treatment plants in Utah.

Based on our review of the proposed ballasted activated sludge process, the Division is issuing by this letter Approval in Concept of the technology for the proposed Logan City wastewater treatment. We anticipate that the design settling velocity (surface overflow rate) and activated sludge mixed liquor suspended solids (MLSS) concentrations will exceed the maximum values established for conventional activated sludge processes in Rule R317-3 Design Requirements for Wastewater Collection, Treatment and Disposal Systems and as such a variance to rule will be required. The Division will issue this variance in conjunction with its construction permit. Process design calculations that support the design surface overflow rate and MLSS must be included with the design calculations, plans, and specifications submittal that constitute the construction permit application.

Should you have any questions, please do not hesitate to contact John Mackey or Beth Wondimu at (801) 536-4300 for a prompt reply.

Yours truly,

John K. Mackey

John K. Mackey, P.E.
Engineering Manager

JKM/lg

DWQ-2017-000006

CITY OF LOGAN
WASTEWATER TREATMENT FACILITY UPGRADE

Quotation 46316, January 2018

Questions relative to this Quotation should be directed to Evoqua's area sales representative:

Cory Firzlaff
Wm. H. Reilly & Co.
801-201-3121 Cell
801-619-7178 Fax
801-619-8076 Office
cory@whreilly.com

To: City of Logan

1) SUMMARY:

Evoqua Water Technologies LLC (Evoqua) proposes to furnish the equipment specified in this Quotation, in accordance with the document titled *Specifications for Procurement of BioMag Equipment,* dated December 2017, to the extent technically applicable to the scope of supply described in this quotation and subject to the Clarifications/Exceptions stated herein.

All of the information set forth in this quotation (including drawings, designs and specifications) is confidential and/or proprietary and has been prepared solely for the recipient's use in considering the purchase of the equipment and/or services described herein. Transmission of all or any part of this information to others, or use by the recipient, for other purposes is expressly prohibited without Evoqua's prior written consent.

ITEM & DESCRIPTION:	PRICE
BioMag Feed and Recovery Equipment	$3,784,703

Evoqua's price includes only the specific items detailed in this quotation. Items not specifically identified herein are to be furnished by others. Please refer to the excluded items in Section 4 of this quotation for a list of items to be furnished by others.

Please provide tax exempt certificate and copy of payment bond, as applicable, with purchase order.

A) OPTIONS: The following items are quoted as an extra price, or as a deduct. An order for these items will be accepted only when included with the basic equipment order:

Optional Adder: performance bond	$ 53,350
Optional Adder: three (3) year extended mechanical warranty	$ 99,100
Optional Adder: 550 tons of magnetite, excluding freight	$ 300,850

B) FREIGHT: Except for the optional adder for magnetite, pricing is FOB shipping point with standard freight allowed to the job site. Our price does not include any costs for unloading, transporting on the site or storage.

C) INTENTIAONLLY LEFT BLANK

D) FIELD SERVICES: Evoqua's pricing includes the services of a factory field service technician for checking the installed equipment and instruction of Owner's personnel, all of which shall be performed over a total of eight (8) trips and twenty-eight (28) days. In addition, a total of four (4) trips, eight (8) days are included for the first 12 months of operation.

E) SERVICE MANUALS: Our pricing includes four (4) hard copy service manuals and an electronic copy in the form of a CD-ROM in unchangeable Adobe PDF file format only. Drawings will be supplied in the form of a CD-ROM with unchangeable TIFF or bitmap file

format only. The rights to the content of Evoqua O&M Manuals and drawings belong solely to Evoqua and Evoqua reserves the right to make changes to content at any time.

F) PAYMENT AND PRICE TERMS:

Evoqua's prices are exclusive of any taxes unless expressly stated in this quotation. If this project is subject to sales or use tax, the Purchaser shall be invoiced for taxes at the current rate of sales or use tax for the jobsite location, at the time of invoice issuance. If this project is not subject to sales or use tax, please send a Tax Exempt Certificate with the issuance of any ensuing P.O. to Evoqua. If applicable, please provide a copy of payment bond information with the P.O.

2) INTENTIONALLY LEFT BLANK

3) EQUIPMENT SCOPE:

Please see the attached equipment list and piping and instrumentation diagram (P&ID) for a detailed scope of supply.

4) EXCLUDED ITEMS:

Evoqua's price includes only those items listed in this Quotation. Therefore, the items listed below will not be supplied by Evoqua:

Hydraulic or pneumatic controls.
Wiring of motors or controls, control panels, or panel supports.
Piping, valves, wall sleeves, gates, drains, weirs, baffles, unless shown otherwise either in the attached equipment list or P&ID.
Floor grating, stairways, ladders, platforms, handrailing.
Concrete, grout, mastic, sealing compounds, shims.
Lubricants, grease piping, grease gun.
Machinery or bearing supports, shims.
Detail shop fabrication drawings.
Tools or spare parts.
Equipment offloading and installation of any kind.
Modifications to existing equipment or structures.
Supervisory services; laboratory, shop, or field testing.
Underwriters Laboratory inspection of electrical controls.

5) CLARIFICATIONS / EXCEPTIONS:

The equipment specified herein shall conform to the specification sections referenced in paragraph 1 of Evoqua's Quotation to the extent they are technically applicable to Evoqua's scope of supply as described in this Quotation and subject to the following clarifications:

a) The attached Process Performance Warranty dated 06/06/2017 is included in Evoqua's offering and is understood to set forth Evoqua sole obligations regarding the performance of the equipment. Evoqua takes exception to any other performance commitments, guarantees or obligations.

b) The optional adder price for magnetite is valid until October 2021.

The optional performance bond shall go into effect when Evoqua is given the notice to proceed and shall be returned to Evoqua at the earlier of (i) successful completion of the second process performance test or (ii) 12 months from successful completion of the first test.

6) PAINTING AND SURFACE PROTECTION:

Evoqua's price is based on the following surface protection, unless stated otherwise.

SUBMERGED and NONSUBMERGED CASTINGS, STEEL PLATES and SHAPES: Surfaces will be prepared by blast cleaning, then followed by one (1) shop coat of Sherwin-Williams Dura-Plate 235NSF Red Oxide.

FERROUS CHAIN: One (1) coat of slush oil.

SHAFTING and EXPOSED MACHINED SURFACES: Solvent wiping, followed by one (1) coat of Evoqua's standard shop preservative.

WOOD, NONFERROUS MATERIALS, and GALVANIZED SURFACES: Unpainted.

DRIVE UNITS and CONTROLS: Manufacturer's standard.

TOUCH-UP and ALL ADDITIONAL COATS shall be furnished and applied by others at the site.

PRICES ARE BASED ON PAINTS AND SURFACE PREPARATIONS AS OUTLINED IN THIS QUOTATION. IN THE EVENT AN ALTERNATE PAINT SYSTEM IS SELECTED, PURCHASER'S ORDER MUST ADVISE OF ITS SELECTION. EVOQUA WILL, AT ITS SOLE DISCRETION, EITHER ADJUST ITS PRICE AS NECESSARY TO COMPLY OR SHIP THE MATERIAL UNPAINTED IF COMPLIANCE IS NOT POSSIBLE DUE TO PRICE CONSIDERATIONS, APPLICATION PROBLEMS OR ENVIRONMENTAL CONTROLS.

EVOQUA DOES NOT GUARANTEE PRIMER'S COMPATIBILITY WITH PURCHASER'S COATING SYSTEM UNLESS APPROVED BY THE COATING SYSTEM MANUFACTURER. PRIMERS WILL ONLY PROTECT FOR A MINIMAL AMOUNT OF TIME, USUALLY THIRTY (30) DAYS. SPECIFIC INFORMATION SHOULD BE OBTAINED FROM COATING SYSTEM MANUFACTURER.

7) ADDITIONAL FIELD SERVICES:

Should the Purchaser feel that additional services will be required, they can be purchased from Evoqua. Additional services may be purchased at the per diem rate stated below.

Evoqua price does not include service of a factory field service technician during the time of installation of the equipment items.

In the event Purchaser wishes to videotape the Evoqua field service personnel during start-up and/or field service, Purchaser must execute Evoqua's standard "Videotape Agreement" in which the Purchaser shall expressly waive any claim against Evoqua, for injury or damage caused by inaccuracies or errors in such videotape(s), and acknowledge that such videotaping is done by Purchaser at its sole risk.

TERMS GOVERNING FIELD SERVICES: Services of a factory field service technician to inspect installation and/or first operation of the products specified in the quotation can be furnished by Evoqua at the following rates:

A. Supervision or consultation of a process service technician within the continental limits of the United States: $1,400 per eight (8) hour day, Monday through Friday inclusive.

B. Supervision or inspection of a field service technician within the continental limits of the United States: $1,200 per eight (8) hour day, Monday through Friday inclusive. Overtime Monday through Friday and Saturday work is charged at time and one-half. Time worked on Sunday will be charged double time; time worked on U.S. Holidays will be charged triple time.

C. Traveling, living and incidental expenses at cost, including shipping charges on tools and other equipment which the factory field service technician has shipped to the construction site.

D. Travel time will be charged to and from Purchaser's construction site, and weekend or holiday travel request or required by Purchaser will be charged at the overtime rates.

Rates shown above apply only to additional services performed within twelve (12) months from the date of Quotation. Additional services performed after twelve (12) months from the date of Quotation shall be subject to Evoqua's current rates at the time such service is provided. Except for the direct acts or omissions of the factory field service technician, the responsibility for the installation and/or first operation shall be Purchaser's. Evoqua will assume responsibility for workmen's compensation coverage of Evoqua employees only, and will provide umbrella liability coverage during installation. All other insurance coverage and necessary materials to accomplish installation shall be provided by Purchaser.

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EVOQUA WATER TECHNOLOGIES, LLC

PROCESS PERFORMANCE WARRANTY
For the Evoqua BioMag System
06/06/2017

This Process Performance Warranty is provided to the City of Logan, UT ("Owner") by Evoqua Water Technologies, LLC ("Manufacturer") for the BioMag System ("System") installed at the Logan, UT WWTP ("Plant") pursuant to that certain Agreement between Manufacturer and [Owner or _____ ("Contractor")] for the sale of the System.

Section 1. Process Performance Warranty

Section 1.1 Effluent Performance

Subject to the conditions, limitations, and exclusions set forth herein, the Manufacturer hereby warrants to the Owner that the System will meet the following effluent performance criteria below:

Parameter	Units	Value	Value Desc.	Sample Type
TSS	mg/l	10≤	30-d average	Composite
TP	mg/l	0.5≤	30-d average	Composite

Section 1.2 Influent Quality

The Manufacturer's Effluent Performance is conditioned upon the following influent flow rate and wastewater characteristics provided to the System:

Parameter	Units	Max. Month
Average Design Flow	MGD	≤18
Peak Hourly Flow (≤3 h/d)	MGD	≤21
BOD_5	mg/L	≤140
TSS	mg/L	≤132
TP	mg/L	≤6
Temperature	°C	10–25
pH	Std. Unit	6.5 to 8.0
BOD_5	lb/d	21,017
TSS	lb/d	≤19,816
TP	lb/d	≤901

Section 2. Warranty Conditions

The Process Performance Warranty is subject to the following conditions:

1. The System must be installed, started-up, operated, and maintained in accordance with the Manufacturer's drawings, manuals, and instructions (written and verbal). Owner must maintain adequate and accurate records showing all test data required to be taken under this Warranty. Manufacturer reserves the right to inspect the System prior to testing to ensure that the System meets Manufacturer's requirements for operation.
2. The Owner must provide all utilities, permits, and chemicals as required for normal operation of the System.
3. The influent shall not contain any substances which would interfere with System operation, nor shall System be subjected to limitations from other unit processes that would negatively impact or damage the System (such as, but not limited to, faulty screens, grit removal, other pretreatment equipment, or dewatering process side streams that are fed back to the influent to the System).
4. The influent to the System shall not contain any substance toxic or inhibitory to the biological treatment process. Should toxicity or inhibition be suspected, treatability testing using Method 209:OECD Guideline for Testing of Chemicals, July 22, 2010 and/or analytical testing for compounds listed in WPCF Manual of Practice No. 8, 1977 may be conducted. The cost of such testing shall be borne by the Owner.
5. In the event there is an effluent TN warranty, the effluent dissolved organic nitrogen (DON) shall not exceed 1 mg/l. Effluent DON concentration above 1 mg/l will be added to the effluent TN limit. Proper dosing of supplemental carbon, if required, shall be maintained by the Owner.
6. In the event there is an effluent TP limit, the non-reactive P, defined as total dissolved phosphorus minus dissolved orthophosphate, shall not exceed 0.01 mg/l. Effluent nonreactive P concentrations above 0.01 mg/l will be added to the effluent TP limit. Proper dosing of chemical for precipitation of phosphorus, if required, shall be maintained by the Owner.
7. The mixed liquor suspended solids (MLSS) concentration in the bioreactor shall not exceed 7,000 mg/L at maximum monthly flow condition.
8. Mixing requirements shall be as follows: (i) the minimum MLSS floor velocity in the aerated biological system shall not be less than 1.2 ft/s at any time; (ii) the minimum mixing energy shall be 60 HP/MG in zones with turbulent flow; and (iii) each aerated biological system must have both mechanical aerators running at all times. The aerated biological system shall also have the ability to scour the floor of the bioreactor at 2.0 ft/s. In the event the mixing requirements set forth in this item are not met, the Oxidation Ditch supplier shall provide supplemental mixing so as to achieve the stated mixing requirements.

Section 3. Performance Test

Performance Warranty testing shall be the means by which the System's ability to meet the Effluent Performance specified in Section 1.1 above is determined. The Owner shall provide all personnel, raw water, chemicals, laboratory testing equipment and services and all other incidentals necessary to operate the System to conduct the Performance Test. The Performance Test shall commence at a time that is mutually agreed upon by Owner and Manufacturer. At such time the System shall be functioning properly in a mechanical sense, with the effluent having achieved steady state. If the testing does not commence within six (6) months (Performance Test Commencement Date) from the date of shipment of the equipment, for any reason not wholly attributable to the Manufacturer, then the Performance Warranty shall be deemed satisfied in full.

Owner may accept the System without conducting a formal Performance Test. A written notification of acceptance shall be provided to the Manufacturer, and any contractual obligations and payments associated with passing the Performance Test shall be fulfilled. This Performance Warranty is only provided in the event of all contract payment obligations to the Manufacturer have been satisfied.

3.1 Test Methodology

a. All sampling and laboratory analysis methods shall conform to the most recent edition of Standard Methods for the Examination of Water and Wastewater, or a mutually agreed upon, similarly recognized standard. Owner shall provide evidence that its laboratory meets the standards of precision and accuracy as stated in Standard Methods, or the Owner may use an independent, certified laboratory for the analyses. A portion of each sample will be supplied to the Manufacturer for its own analysis on request.
b. Except when otherwise specified by Standard Methods, all samples shall be flow-weighted composite samples collected with an automatic sampler.
c. Prior to Test Commencement, a detailed sampling and analytical plan shall be prepared by the Manufacturer and approved by Owner. In general the sampling and analytical plan shall attempt to coincide with the Owner's sampling plan for permit compliance and/or normal plant operation. However, additional sampling and analysis may be required depending on the analyses specified in Sections 1.1 and 1.2.
d. The costs of sampling and laboratory analysis shall be borne by Owner.
e. Manufacturer shall be permitted to witness and/or participate in the collection and analysis of all samples collected during the Performance Test, and to independently collect and analyze additional samples at the Manufacturer's expense.
f. Flow measuring devices, power meters, and other instruments critical to System operation shall be properly installed and calibrated prior to the Performance Test period.
g. Owner shall promptly provide Manufacturer with written test results so that any modifications to operation that are required can be made in a timely fashion.
h. In the event, based on good faith determination, certain data appear spurious and/or invalid, this data may be rejected.

3.2 Performance Test Period

There will be two (2) Performance Test Periods, with each period consisting of thirty (30) consecutive days. The Influent Quality and Effluent Performance, as specified in Section 1.1, shall be determined based on the average of the samples taken during the Performance Test Period.

If the first Performance Test Period does not commence within two (2) months from the Performance Test Commencement Date, for any reason not wholly attributable to the Manufacturer, the Process Performance Warranty shall be deemed satisfied in full.

At any time during a twelve (12) month period after the end of the first successful Performance Test Period, the Owner can request a second test, which will follow the same procedure as the first test.

Section 4. Results and Remedies

4.1 Effluent Criteria Met

The Manufacturer's obligations under the Performance Warranty shall be deemed fully satisfied upon demonstration that all Effluent Performance values listed in Section 1.1 have been met during the Performance Test Periods. The Owner shall promptly provide the Manufacturer with written notice of compliance after successful completion of the Performance Test Period.

4.2 Effluent Performance Non-Compliant/Influent Quality Not Met

If during a Performance Test Period the Influent Quality values have not been satisfied and the System is not meeting the Section 1.1 Effluent Performance, then the Owner shall notify the Manufacturer in writing specifying the details of such deficiency and the Owner shall take corrective actions to ensure that all of the Influent Quality are satisfied. Once the influent water has satisfied each of the Influent Quality values (over a period of not less than seven (7) consecutive days), then the Owner may resume the Performance Test Period by commencing a new Performance Test Period. If the Owner fails to meet the Influent Quality values for two (2) consecutive Performance Test Periods, or fails to commence a Performance Test Period within twenty-one (21) days of ending a previous Performance Test Period, then the Manufacturer's obligations under this Performance Warranty Document shall be deemed fully satisfied and the Manufacturer shall have no further obligations or liability of any kind to the Owner pursuant to this Performance Warranty. The Owner shall provide the Manufacturer with written notice promptly after such event.

4.3 Effluent Performance Non-Compliant/Influent Quality Met

If during a Performance Test Period the Influent Quality Values have been satisfied and the Owner has complied with all conditions set forth in Section 2, and the System is not meeting the Effluent Performance, then the Owner shall notify the Manufacturer in writing specifying the details of such deficiency and promptly make available to the Manufacturer all testing and operational data, including operator logs, which the Manufacturer deems relevant so that the Manufacturer may evaluate the performance of the System. The Manufacturer may recommend operational changes to the Plant or the System. Once the Owner implements the operational changes recommended by the Manufacturer and the Manufacturer implements any modifications to the System the Manufacturer deems necessary the Manufacturer may resume the Performance Test Period by commencing a new Performance Test Period. If the Manufacturer fails to meet the Effluent Performance after two (2) consecutive Performance Test Periods in which the Influent Quality values have been satisfied and the Owner has otherwise complied with the requirements of this subsection and the Performance Conditions set forth in Section 2, then the Manufacturer shall be deemed to have breached the Performance Warranty.

4.4 Remedy for Non-Compliance

If the Manufacturer is in breach of the Effluent Warranty, as described in the preceding subsection, the Manufacturer shall, as its sole option and as the Owner's sole remedy, provide additional equipment and/or make modifications to the System to enable the System to achieve the Effluent Performance provided: (i) the Owner agrees in writing that it has the space to accommodate the additional equipment; and (ii) the Owner further agrees that any increased operating expenses required by the additional equipment are for the Owner's account.

4.5 Referee Test

Both Owner and Manufacturer recognize and acknowledge that the design and construction of the secondary clarifier equipment, mechanisms and inlet structures ("Clarifier Equipment") can have an impact on the performance of the System and its ability to meet the Process Performance Warranty. A referee test, as outlined in Appendix I, shall be allowed at any point during the Performance Test to determine if the Clarifier Equipment is impacting the ability of the System to meet the Process Performance Warranty. In the event that the Clarifier Equipment used in the System is supplied by the Manufacturer, Manufacturer shall take full responsibility for the proper design of the Clarifier Equipment as it relates to achieving the Process Performance Warranty requirements. In the event that the Clarifier Equipment is not supplied by the Manufacturer and the System is not able to achieve the Process Performance Warranty requirements, a referee test shall be conducted, as outlined in Appendix I, to determine if non-compliance is a result of the Clarifier Equipment. Should the referee test demonstrate that the Process Performance Warranty can be met in the lab, both parties shall agree that the failure to perform in the field is the result of the Clarifier Equipment, and since the Clarifier Equipment was not supplied by the Manufacturer and its design and performance are outside of the Manufacturer's control, then Manufacturer's obligations under this Process Performance Warranty shall be deemed fully satisfied and Manufacturer shall have no further obligations or liability of any kind to Owner under this Process Performance Warranty.

4.6 Performance Bond

It is understood that, if purchased the Manufacturer shall provide a performance bond equal to 100 percent of the contract price of this equipment supply contract and that the bond will be held and expire the earlier of the successful completion of the second Performance Test Period as provided for herein or twenty-four months from startup. Upon expiration of the bond the Owner will return the bond to Manufacturer upon request.

Section 5. Limitations of Warranty and Liability

THE REMEDIES PROVIDED TO OWNER IN SECTION 4.4 SHALL BE THE OWNER'S SOLE AND EXCLUSIVE REMEDIES FOR ANY FAILURE BY MANUFACTURER TO SATISFY THE PERFORMANCE WARRANTY. MANUFACTURER'S LIABILITY UNDER THIS WARRANTY DOCUMENT SHALL BE LIMITED TO DIRECT DAMAGES ONLY AND SHALL NOT EXCEED ONE HUNDRED PERCENT (100%) OF THE PRICE PAID TO MANUFACTURER UNDER THE EQUIPMENT CONTRACT. THIS LIMITATION ON LIABILITY PURSUANT TO THE PERFORMANCE WARRANTY IS A SUBSET OF THE TOTAL LIMITATION OF LIABILITY SET FORTH IN THE EQUIPMENT CONTRACT OR IN SELLERS QUOTATION.

OTHER THAN THE EXPRESS WARRANTIES PROVIDED IN THIS PERFORMANCE WARRANTY DOCUMENT, AND THE MECHANICAL WARRANTIES CONTAINED IN [INSERT ARTICLE AND SECTION NUMBER(S)] OF THE EQUIPMENT CONTRACT, MANUFACTURER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

APPENDIX I
Referee Testing

The following procedure will be used to determine the initial settling rate and predicted effluent concentrations of the System. The purpose of the test is to characterize the settling characteristics of the wastewater and determine the expected settling performance.

1. Collect a representative sample of mixed liquor from the inlet to the clarifier. Split the sample for analysis of effluent characteristics, described in Section 1.1.
2. Fill a 2-liter settleometer with the representative sample of mixed liquor.
3. Allow the sample to settle for 30 minutes.
4. At the end of the 30 minute time period, siphon a sample from the 1,500 mL mark of the 2L graduate for analysis. Do not include any surface scum. Clarifier performance shall be deemed acceptable if the clarifier effluent characteristics, described in Section 1.1, are no more that 10% greater than the bench-scale settling performance result.

Equipment List

Revision: 2
Date: 1/19/2018
Project: Logan, UT
Engineer: Carollo Engineers, Inc.

Scope	P&ID	Qty	Description	P&ID Tag No.	Manufacturer	Manufacturer Part Number	Process Connection	Size/Capacity	HP	Comments
CLARIFIER AND RAS PUMPS										
Evoqua		4	Sludge Blanket Indicator	LSH-410/420/430/440	Hach	LXV431.99.00002 LZX414.00.73000 LZX414.00.72160				
Evoqua	104	1	WAS screen feed pump suction auto valve	FCV-70.100	DeZurik	PEC,X,F1,CI,NBR,NBR,GE*RCEL-XXX-LCUX-EP18127R-DCA120	6"			Flanged, Cast Iron (ASTM A126, Class B), Buna packing, Buna plug facing, RCEL 120/60/1 actuator sized for 50 psi direct and reverse pressure. Open/Close control. Added local control unit option
WAS SCREENING SYSTEM										
Evoqua	104	2	WAS screen feed pumps	PMP-70.101/70.102	Börger	PL300		150	5	
Evoqua	105	1	WAS screen feed flowmeter	FE/FIT-70.106	Siemens	07ME6580-3TJ14-2AA2	4"			
Evoqua	105	1	WAS screen feed valve	FCV-70.105	DeZurik	PEC,X,F1,CI,NBR,NBR,GE*RCEL-XXX-DHC-OTR-LCUX-EP18127R-DCA120	4"			Flanged, Cast Iron (ASTM A126, Class B), Buna packing, Buna plug facing, RCEL 120/60/1 actuator sized for 50 psi direct and reverse pressure. Modulating control. Added local control unit option
Evoqua	105	1	WAS Screen	SSC-70.110	Clean Tek	24		200 gpm	0.5	
Evoqua	105	1	WAS Screen Wash Water Solenoid	SV-70.125	ASCO	8210G022 MO-120/60,110/50	1 1/2"			
Evoqua	105	1	Screen sump high level switch	LSH-70.115	E&H	FTL51-AA82CB1E4AZ1				
Evoqua	105	1	Low Pressure Switch	PSL-70.128	Ashcroft	AC B424B-XFS-100#				
Evoqua	105	1	WAS Compactor	CPT-70.110	Clean Tek	SSP-220		70 ft³/h	2.5	
Evoqua	105	1	WAS Compactor Zero Speed Sensor	SS-600						
Evoqua	105	1	Compactor Wash Water Solenoid	SV-70.126	ASCO	8210G095 MO-120/60,110/50	3/4"			
MAGNITITE RECOVERY SYSTEM										
Evoqua	105	3	WAS pumps to shear mill/mag drum	PMP-70.140/70.150/70.160	Börger	PL200	6" × 6"	90 gpm	5	
Evoqua	107, 108	3	Shear mill	SM-70.210/70.220/70.230	Kady Mill	OCHF2-40			40	
Evoqua	107, 108	3	Shear mill feed flow switch	FSL-70.210/70.220/70.230	IFM					
Evoqua		3	Shear mill rupture disc							
Evoqua	107, 108	6	Magnetic drum separator	MD-70.310/70.320/70.330/70.340/70.350/70.360	Evoqua	36×72			7.5	

EVOQUA WATER TECHNOLOGIES

Equipment List

Revision: 2
Date: 1/19/2018
Project: Logan, UT
Engineer: Carollo Engineers, Inc

Scope	P&ID	Qty	Description	P&ID Tag No.	Manufacturer	Manufacturer Part Number	Process Connection	Size/Capacity	HP	Comments
Evoqua	107, 108	6	Mag drum wash solenoid	SV-70.310/70.320/70.330/70.340/70.350/70.360	ASCO	8210G054 MO-120/60		1"		
Evoqua	107, 108	6	Mag drum high level switch	LSH-70.310/70.320/70.330/70.340/70.350/70.360	E&H	LMT121				Price includes NPT pipe Adapter (E43313) and Power Cord (EVT001) per Price Master Data sheet.
Evoqua	107, 108	6	Mag drum proximity switch	SS-70.310/70.320/70.330/70.340/70.350/70.360	IFM	IGT249				Price includes Power Cord (EVT001) per Price Master Data sheet.
Evoqua	107, 108	6	Mag drum feed flowmeter	FE/FIT-70.310/70.320/70.330/70.340/70.350/70.360	Siemens	07ME6580-2YJ14-2AA2	2"			
Evoqua	107, 108	6	Mag drum feed valve	FCV-70.310/70.320/70.330/70.340/70.350/70.360	DeZurik	PEC,X,F1,CI,NBR,NBR,GE*RCEL-XXX-DHC-OTR-LCUX-EP18127R-DCA120	2"			Flanged, Cast Iron (ASTM A126, Class B), Buna packing, Buna plug facing, RCEL 120/60/1 actuator sized for 50 psi direct and reverse pressure. Modulating control. Added local control unit option
Evoqua	105	1	WAS sump level transmitter	LIT-70.115	Siemens	7ML5422-2AB30				Radar
MAGNITITE FEED SYSTEM										
Evoqua	108	2	Ballast mix tank discharge pump	P-70.420/70.430	Börger	CL390	6" × 6"	300 gpm	7.5	
Evoqua	108	1	Ballast tank mixer	M-70.410	UET	0			3	
Evoqua	104	1	Ballast tank feed valve	FCV-70.104	DeZurik	PEC,X,F1,CI,NBR,NBR,GE*RCEL-XXX-DHC-OTR-LCUX-EP18127R-DCA120	4"			Flanged, Cast Iron (ASTM A126, Class B), Buna packing, Buna plug facing, RCEL 120/60/1 actuator sized for 50 psi direct and reverse pressure. Modulating control. Added local control unit option
Evoqua	104	1	Ballast mix tank flowmeter	FE/FIT-70.103	Siemens	07ME6580-3TJ14-2AA2	4"			
Evoqua	108	1	Mixer support							
Evoqua	108	1	Ballast mix tank level transmitter	LIT-70.410	Siemens	7ML5422-2AB30				Radar
Evoqua	108	1	Ballast mix tank high level float switch	LSH-70.410	SJE Rhombus	30SGMPCNO				30' cable, pipe clamp mount, normally open
Evoqua	106	1	25 ton Outdoor Silo	TK-70.550	Evoqua					
Evoqua	106	1	Silo bin discharger (hopper)		Young Industries					
Evoqua	106	1	Magnahelic gauge	PI-70.550						
Evoqua	106	2	Couplings							
Evoqua	106	1	Silo ladder							

Equipment List

Revision: 2
Date: 1/19/2018
Project: Logan, UT
Engineer: Carollo Engineers, Inc.

Scope	P&ID	Qty	Description	P&ID Tag No.	Manufacturer	Manufacturer Part Number	Process Connection	Size/Capacity	HP	Comments
Evoqua	106	1	Silo discharge valve	V-750	DeZurik	KGN,8,MSU,F1,S1,MSP,S1-M*MN-HD12	6"			
Evoqua	106	1	Silo air filter		Young Industries					
Evoqua	106	1	Load cell package		Rice Lake					
Evoqua	106	1	10 ft Stinger		Young Industries					
Evoqua	108	1	Drop pipe		Evoqua					
Evoqua	106	1	Magnetite fill line		Evoqua					
AIR DELIVERY SYSTEM										
Evoqua	106	2	Compressor	CMP-70.510/70.520	Kaeser	SM 10		38 scfm @ 125 psi	10	Kaeser SM 10 screw compressor
Evoqua	106	1	Receiver	TK-70.530	Silvan	102-905		240 gal		Silvan, 240 gal reciever 102-905, w/ enamel ext. coating
Evoqua	106	1	Pressure relief valve	PRV-713	0	119CSS-4-150				Pressure relief valve, 1/2"
Evoqua	106	2	Pressure gauge	PI-714	0	45-1279AS-04L 160#				Pressure gauge, 4.5" dial, 0-160 psi
Evoqua	106	3	Auto drain	DV-716	Kaeser	ANECODRAIN30				Kaeser Eco-Drain 30
Evoqua	106	1	Air filter	F-732	Kaeser	USKAD90FPB				Mtd. Filter Package B KAD90/90PS
Evoqua	106	1	Pressure switch	PSL-70.546	Ashcroft	AC B424B-XFS-100# set at 50 psi				Pressure switch, Ashcroft
Evoqua	106	1	Desiccant dryer	D-70.540	Kaeser	USKAD90-S		80 scfm @ 100 psi		Dessicant dryer KAD-90
Evoqua	106	1	Ball valve	V-715	Flowtek					Ball valve - 1/2" NPT, brass, Flowtek
Evoqua	106	3	Ball valve	V-712/713/730	Flowtek					Ball valve - 1" NPT, brass, Flowtek
Evoqua	106	1	Dew point monitor	MIT-70.545	Beko	model XZ DPMS 081 – Material number 4014733				Beko Metpoint DPM S dewpoint monitor
Evoqua	106	2	Eco-Drain filter connect set #1	DV-717/718		AN8078301				Eco-Drain filter connect set #1
Evoqua	106	1	3-valve bypass option KAD90/90PS			USKAD903VB				3-valve bypass option KAD90/90PS
Evoqua	106	1	24-h lead lag option on SCB units			ANLDLG24HSC				24-h lead lag option on SCB units
CHEMICAL FEED										
Evoqua	109	2	Polymer feed system	PBU-70.710/70.720				10 gph	1/2 HP	Emulsion feed skid, progressive cavity neat pump
MISC INSTRUMENTS										
Evoqua		1	Magnetite concentration meter		Evoqua					
CONTROLS										
Evoqua		1	Control panel with PLC and HMI		Allen Bradley PLC and HMI					NEMA 12 enclosure
MISC.										
Evoqua	106, 108, 109	22	Mag drum/shear mill/SM feed pump iso. man. valve	V-620/670/680/690/630/640/635/645/685/695/810/820/811/821/813/823/833/843/910/920/930/940	DeZurik	PEC,X,F1,CI,NBR*GS-X-HDXX,BXX045	3"			CI, Buna-N facing, Handwheel gear

EVOQUA WATER TECHNOLOGIES

Equipment List

Revision: 2
Date: 1/19/2018
Project: Logan, UT
Engineer: Carollo Engineers, Inc.

Scope	P&ID	Qty	Description	P&ID Tag No.	Manufacturer	Manufacturer Part Number	Process Connection	Size/Capacity	HP	Comments
Evoqua	106	2	WAS screen isolation manual valves	V-600/605	DeZurik	PEC,X,F1,CI,NBR*GS-X-HDXX,BXX045	4"			CI, Buna-N facing, Handwheel gear
Evoqua	109	4	Ballast disch. pump isolation valves	V-970/975/980/985	DeZurik	PEC,X,F1,CI,NBR*GS-X-HDXX,BXX045	4"			CI, Buna-N facing, Handwheel gear
Evoqua		36	Ball valves	Multiple	Flowtek	S51-XX-B-T-T-L	1/2",3/4",1",1-1/2"			Manual, Series 51, Forged Brass Body, chrome plated brass ball, teflon packing, PTFE seat, lever, threaded ends
Evoqua	105	1	Ballast return check valve	CV-500	Tyco	120-703-YYY-813-515	4"			CI Body, 316 SS Disc, Stem & Spring, Buna-N Seat, Adjustable External Spring Hardware
Evoqua	104	4	WAS screen feed pump isolation valves	V-530/540/535/545	DeZurik	PEC,X,F1,CI,NBR*GS-X-HDXX,BXX045	6"			CI, Buna-N facing, Handwheel gear

PIPING AND INSTRUMENTATION DIAGRAM

FOR

LOGAN WWTF,
LOGAN, UT

DRAWING LIST

Sheet Number	Sheet Title
100	TITLE
101	LEGEND 1
102	LEGEND 2
103	STANDARD INSTRUMENT DETAIL
104	SLUDGE PUMPS
105	DRUM SCREEN & COMPACTOR
106	MAC STORAGE SILO
107	SHEAR MILL AND RECOVERY DRUMS
108	SHEAR MILL & RECOVERY DRUMS – STANDBY
109	POLYMER FEED

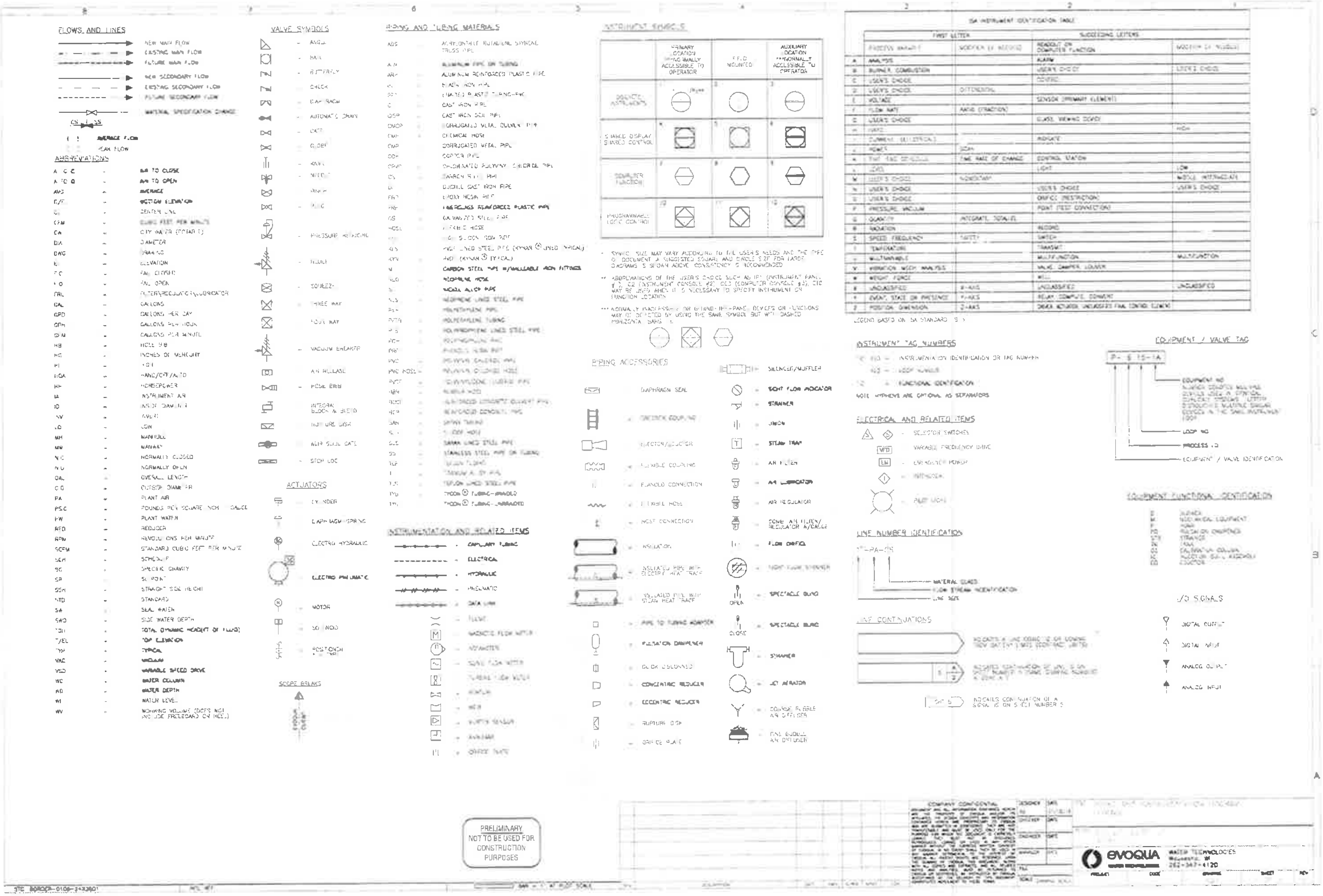
PRELIMINARY
NOT TO BE USED FOR
CONSTRUCTION
PURPOSES

COMPANY CONFIDENTIAL

PIPING AND INSTRUMENTATION DIAGRAM
TITLE PAGE

LOGAN WWTF
LOGAN, UT

evoqua WATER TECHNOLOGIES
BUSINESS CENTER – CITY, STATE
BUSINESS CENTER – TEL


FLOWS AND LINES
NEW MAIN FLOW
EXISTING MAIN FLOW
FUTURE MAIN FLOW
NEW SECONDARY FLOW
EXISTING SECONDARY FLOW
FUTURE SECONDARY FLOW
MATERIAL SPECIFICATION CHANGE
ABBREVIATIONS
AIR TO CLOSE
AIR TO OPEN
AVERAGE
BOTTOM ELEVATION
DIAMETER
ELEVATION
FAIL CLOSED
FAIL OPEN
GALLONS
GALLONS PER DAY
GALLONS PER HOUR
GALLONS PER MINUTE
INCHES OF MERCURY
HAND/OFF/AUTO
HORSEPOWER
INSTRUMENT AIR
INSIDE DIAMETER
LOW
MANUAL
NORMALLY CLOSED
NORMALLY OPEN
OVERALL LENGTH
OUTSIDE DIAMETER
PLANT AIR
POUNDS PER SQUARE INCH - GAUGE
PLANT WATER
REDUCER
REVOLUTIONS PER MINUTE
STANDARD CUBIC FEET PER MINUTE
SCHEDULE
SPECIFIC GRAVITY
SET POINT
STANDARD
SEAL WATER
SIDE WATER DEPTH
TOTAL DYNAMIC HEAD
TOP ELEVATION
TYPICAL
VACUUM
VARIABLE SPEED DRIVE
WATER COLUMN
WATER DEPTH
WATER LEVEL
VALVE SYMBOLS
ANGLE
BALL
BUTTERFLY
CHECK
GATE
GLOBE
PRESSURE RELIEVING
SQUEEZE
THREE WAY
FOUR WAY
VACUUM BREAKER
AIR RELEASE
HOSE BIBB
STOP LOG
ACTUATORS
CYLINDER
DIAPHRAGM-SPRING
ELECTRO HYDRAULIC
ELECTRO PNEUMATIC
MOTOR
SOLENOID
SCOPE BREAKS
PIPING AND TUBING MATERIALS
CAST IRON PIPE
CHEMICAL HOSE
COPPER PIPE
DUCTILE CAST IRON PIPE
EPOXY RESIN PIPE
FIBERGLASS REINFORCED PLASTIC PIPE
GALVANIZED STEEL PIPE
CARBON STEEL PIPE W/MALLEABLE IRON FITTINGS
STAINLESS STEEL PIPE OR TUBING
INSTRUMENTATION AND RELATED ITEMS
CAPILLARY TUBING
ELECTRICAL
HYDRAULIC
PNEUMATIC
DATA LINK
INSTRUMENT SYMBOLS
PRIMARY LOCATION
FIELD MOUNTED
AUXILIARY LOCATION
DISCRETE INSTRUMENTS
SHARED DISPLAY SHARED CONTROL
COMPUTER FUNCTION
PROGRAMMABLE LOGIC CONTROL
PIPING ACCESSORIES
DIAPHRAGM SEAL
INSULATION
CONCENTRIC REDUCER
ECCENTRIC REDUCER
RUPTURE DISK
ORIFICE PLATE
SILENCER/MUFFLER
SIGHT FLOW INDICATOR
STRAINER
UNION
STEAM TRAP
AIR FILTER
AIR LUBRICATOR
AIR REGULATOR
FLOW ORIFICE
SPECTACLE BLIND
JET AERATOR
COARSE BUBBLE AIR DIFFUSER
FINE BUBBLE AIR DIFFUSER
ISA INSTRUMENT IDENTIFICATION TABLE
FIRST LETTER
SUCCEEDING LETTERS
LEGEND BASED ON ISA STANDARD
INSTRUMENT TAG NUMBERS
ELECTRICAL AND RELATED ITEMS
SELECTOR SWITCHES
VARIABLE FREQUENCY DRIVE
LINE NUMBER IDENTIFICATION
LINE CONTINUATIONS
EQUIPMENT / VALVE TAG
LOOP NO
PROCESS I.D
EQUIPMENT / VALVE IDENTIFICATION
EQUIPMENT FUNCTIONAL IDENTIFICATION
I/O SIGNALS
DIGITAL OUTPUT
DIGITAL INPUT
ANALOG OUTPUT
ANALOG INPUT
PRELIMINARY
NOT TO BE USED FOR
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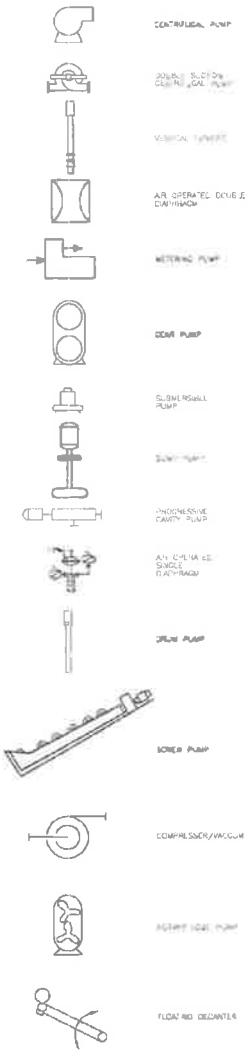
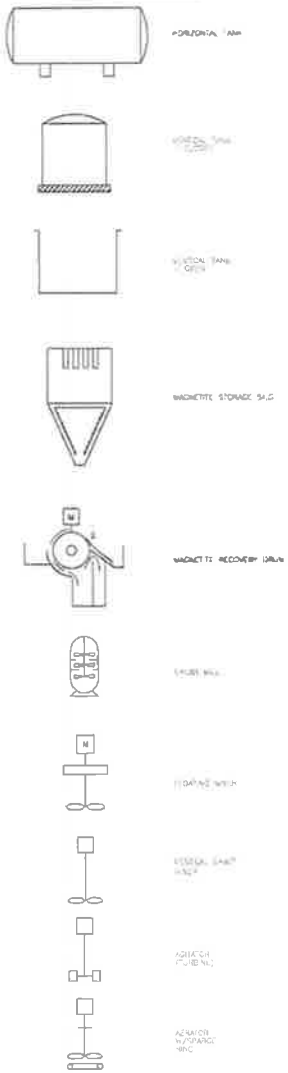
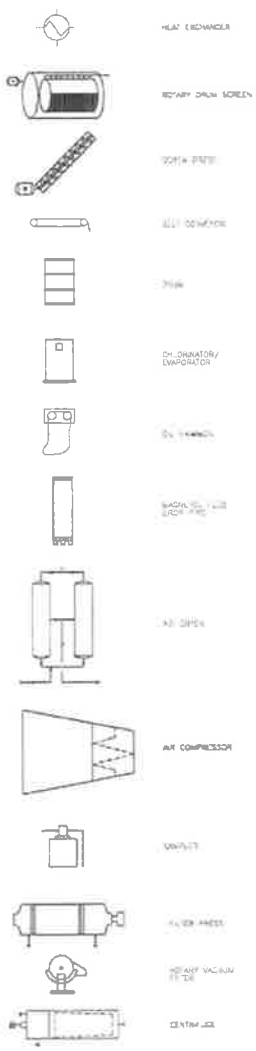
262-547-4120

PUMPS

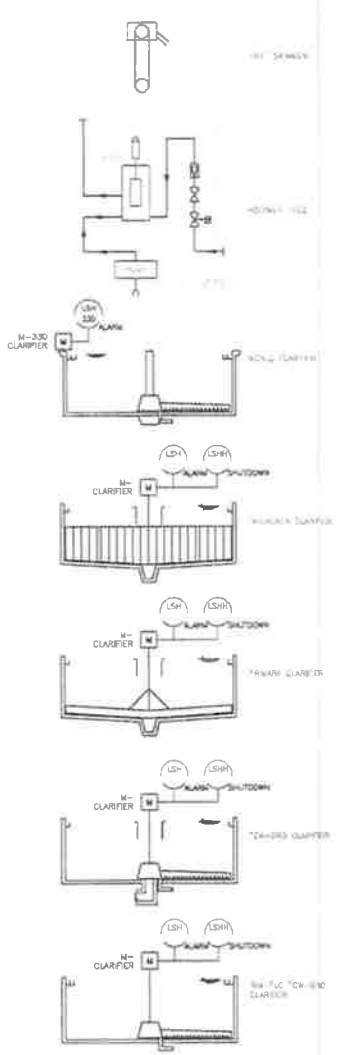


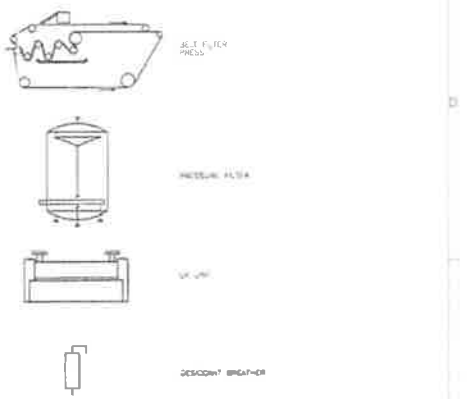
TANKS AND ACCESSORIES





MISCELLANEOUS EQUIPMENT





BLOWERS

EQUIPMENT TEXT

TK-

TOTAL CAPACITY XXX GALLONS
OPERATING CAPACITY XXX GALLONS
DIMENSIONS XX L X XX W X XX SWD
MATERIAL CONCRETE

P-

TYPE CENTRIFUGAL
DESIGN XXX GPM @ XX TDH
DRIVER XX HP
MATERIAL
DUTY (3) DUTY (0) STANDBY

B-

TYPE POSITIVE DISPLACEMENT
DESIGN XXX SCFM @ XX PSI
DRIVER XX HP
MATERIAL
DUTY (3) DUTY (0) STANDBY

M-

TYPE SUBMERSIBLE
DESIGN
DRIVER XX HP
MATERIAL POLYETHYLENE

TK-
MEMBRANE TANK

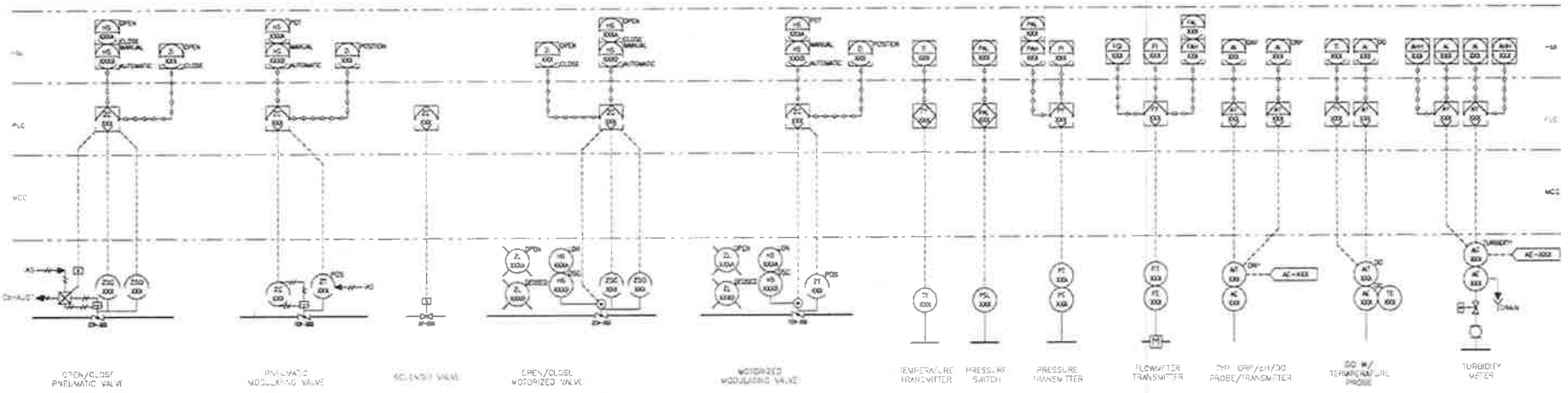
OP. VOLUME XXX GALLONS
INSTALLED MODULES
MAX MODULE CAPACITY
MODULES PER RACK 6
MATERIAL CONCRETE

P-
FILTRATE PUMP

TYPE CENTRIFUGAL
DESIGN XXX GPM @ XX TDH
OPTIMUM FLOW XXX GPM
DRIVER XX HP
MATERIAL
DUTY (1) DUTY (0) STANDBY

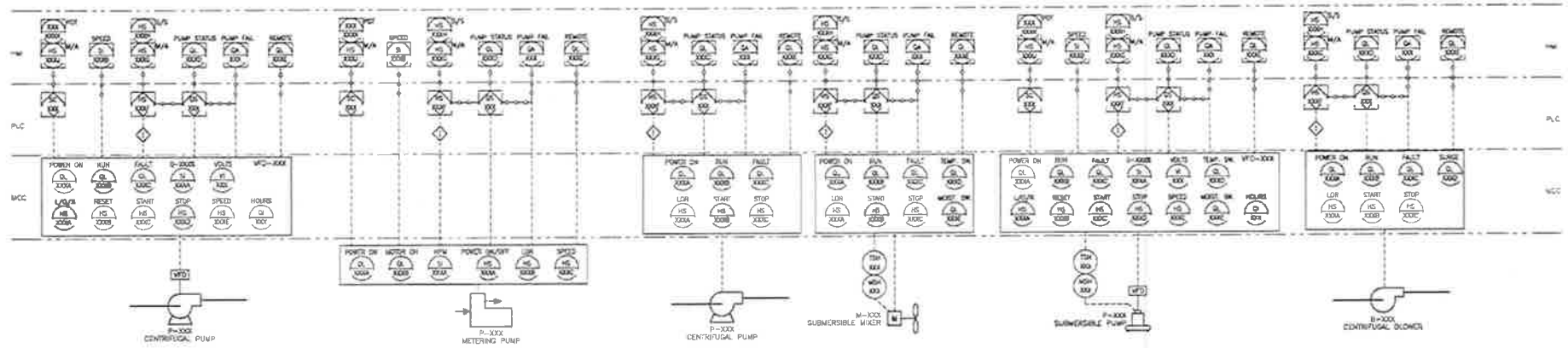
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

evoqua WATER TECHNOLOGIES



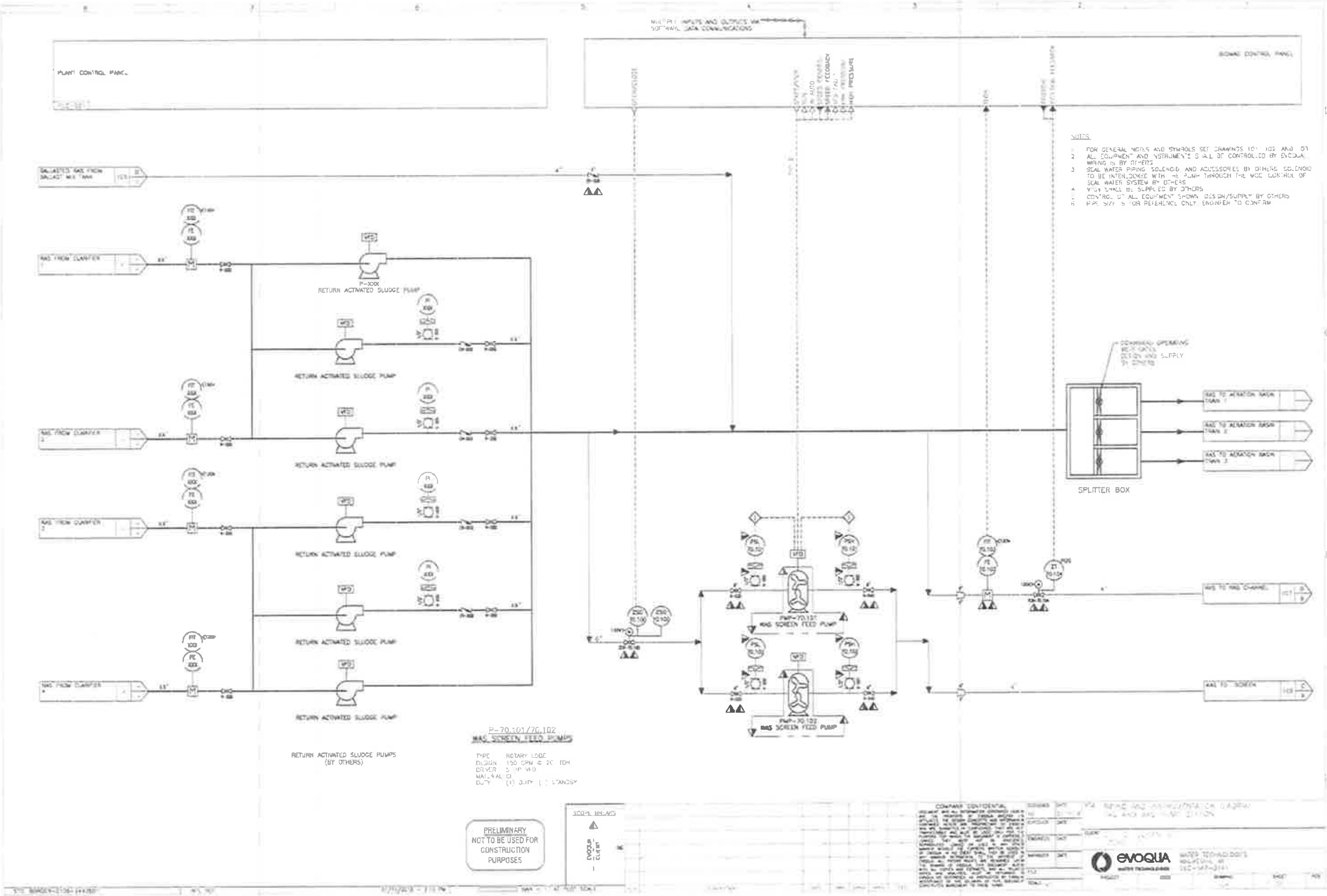
ACTUATORS

SENSORS

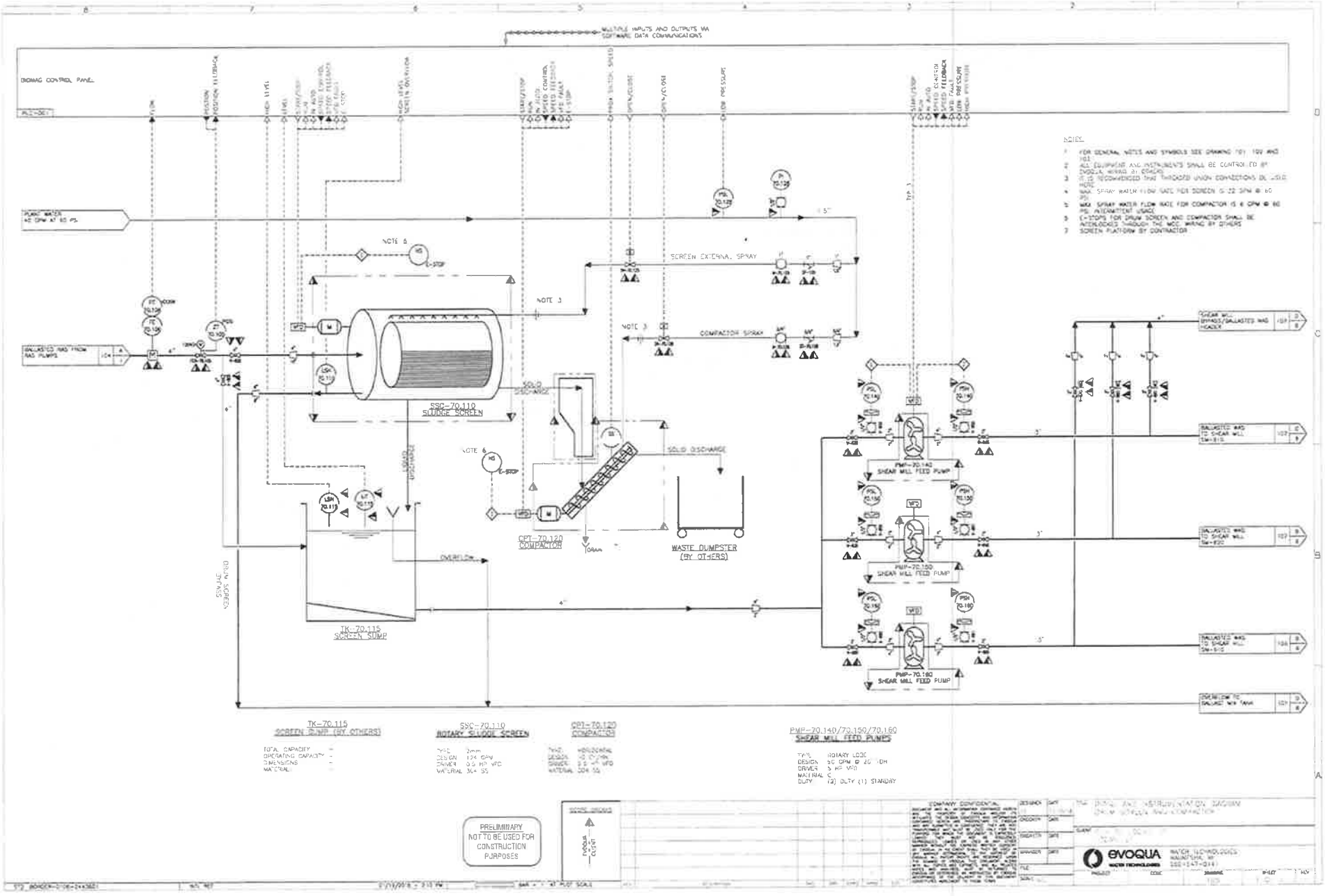


PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

evoqua WATER TECHNOLOGIES



MULTIPLE INPUTS AND OUTPUTS VIA SOFTWARE DATA COMMUNICATIONS
PLANT CONTROL PANEL
BIOMAG CONTROL PANEL
OPEN/CLOSE
START/STOP
RUN
IN AUTO
SPEED FEEDBACK
RUN FAIL
HIGH PRESSURE
POSITION FEEDBACK
NOTES
1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWINGS 101, 102 AND 103
2. ALL EQUIPMENT AND INSTRUMENTS SHALL BE CONTROLLED BY EVOQUA. WIRING IS BY OTHERS
3. SEAL WATER PIPING, SOLENOID AND ACCESSORIES BY OTHERS. SOLENOID TO BE INTERLOCKED WITH THE PUMP THROUGH THE MCC. CONTROL OF SEAL WATER SYSTEM BY OTHERS
4. VFDs SHALL BE SUPPLIED BY OTHERS
5. CONTROL OF ALL EQUIPMENT SHOWN. DESIGN/SUPPLY BY OTHERS
6. PIPE SIZE IS FOR REFERENCE ONLY. ENGINEER TO CONFIRM
BALLASTED RAS FROM BALLAST MIX TANK
RAS FROM CLARIFIER 1
RAS FROM CLARIFIER 2
RAS FROM CLARIFIER 3
RAS FROM CLARIFIER 4
P-XXX
RETURN ACTIVATED SLUDGE PUMP
RETURN ACTIVATED SLUDGE PUMPS (BY OTHERS)
VFD
PMP-70.101 WAS SCREEN FEED PUMP
PMP-70.102 WAS SCREEN FEED PUMP
P-70.101/70.102
WAS SCREEN FEED PUMPS
TYPE: ROTARY LOBE
DESIGN: 150 GPM @ 20 TDH
DRIVER: 5 HP VFD
MATERIAL: CI
DUTY: (1) DUTY (1) STANDBY
COMMAND OPERATING WEIR GATES DESIGN AND SUPPLY BY OTHERS
SPLITTER BOX
RAS TO AERATION BASIN TRAIN 1
RAS TO AERATION BASIN TRAIN 2
RAS TO AERATION BASIN TRAIN 3
WAS TO WAS CHANNEL
WAS TO SCREEN
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES
SCOPE BREAKS
COMPANY CONFIDENTIAL
EVOQUA WATER TECHNOLOGIES


MULTIPLE INPUTS AND OUTPUTS VIA SOFTWARE DATA COMMUNICATIONS
BIOMAG CONTROL PANEL
PLANT WATER
NOTE 6
SCREEN EXTERNAL SPRAY
NOTE 3
COMPACTION SPRAY
SSC-70.110
SLUDGE SCREEN
SOLID DISCHARGE
OPT-70.120
COMPACTOR
WASTE DUMPSTER
(BY OTHERS)
OVERFLOW
DRUM SCREEN SPRAY
TK-70.115
SCREEN SUMP
PMP-70.140
SHEAR MILL FEED PUMP
PMP-70.150
SHEAR MILL FEED PUMP
PMP-70.160
SHEAR MILL FEED PUMP
NOTES:
1 FOR GENERAL NOTES AND SYMBOLS SEE DRAWING 701-100 AND 101
2 ALL EQUIPMENT AND INSTRUMENTS SHALL BE CONTROLLED BY EVOQUA WORKS 21 (OWS2)
3 IT IS RECOMMENDED THAT THREADED UNION CONNECTIONS BE USED HERE
4 MAX SPRAY WATER FLOW RATE FOR SCREEN IS 22 GPM @ 60 PSI
5 MAX SPRAY WATER FLOW RATE FOR COMPACTOR IS 6 GPM @ 60 PSI, INTERMITTENT USAGE
6 E-STOPS FOR DRUM SCREEN AND COMPACTOR SHALL BE INTERLOCKED THROUGH THE MCC WIRING BY OTHERS
7 SCREEN PLATFORM BY CONTRACTOR
TK-70.115
SCREEN SUMP (BY OTHERS)
TOTAL CAPACITY -
OPERATING CAPACITY -
DIMENSIONS -
MATERIAL -
SSC-70.110
ROTARY SLUDGE SCREEN
TYPE 24"ø
DESIGN 125 GPM
DRIVES 0.5 HP VFD
MATERIAL 304 SS
OPT-70.120
COMPACTOR
TYPE HORIZONTAL
DESIGN 10 GPM
DRIVES 2.5 HP VFD
MATERIAL 304 SS
PMP-70.140/70.150/70.160
SHEAR MILL FEED PUMPS
TYPE ROTARY LOBE
DESIGN 50 GPM @ 20 TDH
DRIVES 5 HP VFD
MATERIAL C
DUTY (2) DUTY (1) STANDBY
PRELIMINARY
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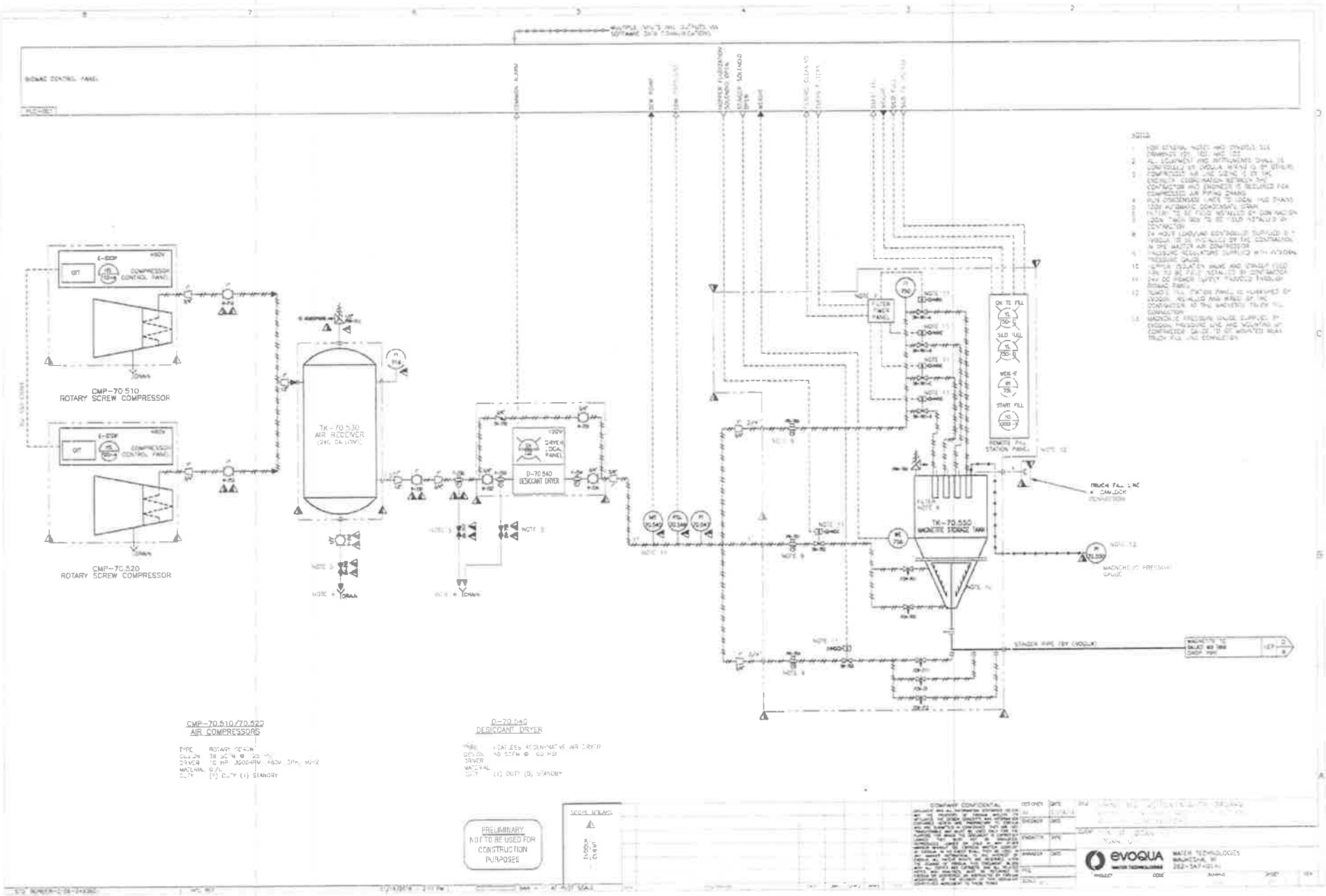
CONSTRUCTION
PURPOSES
COMPANY CONFIDENTIAL
evoqua
WATER TECHNOLOGIES

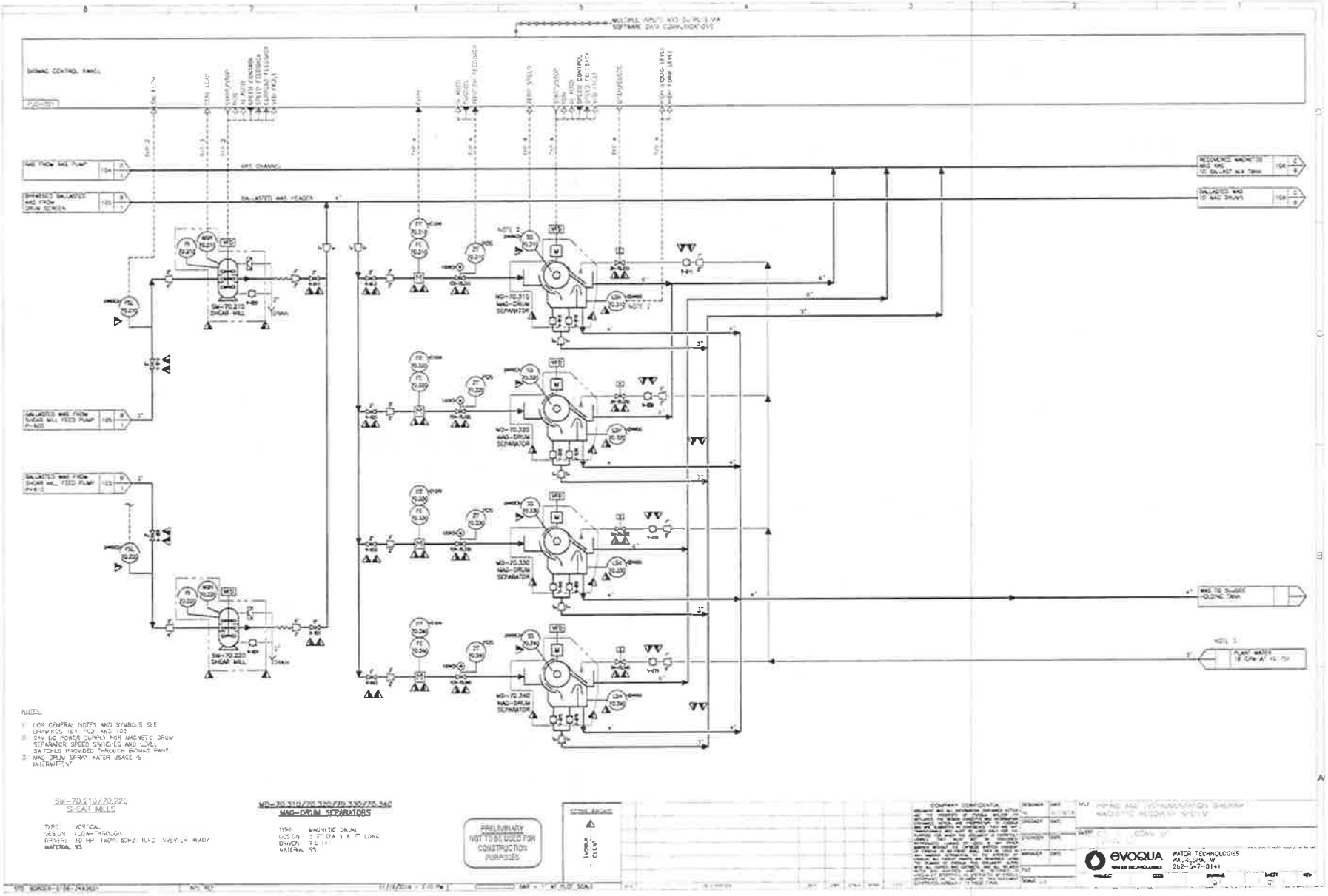


CMP-70.510/70.520
AIR COMPRESSORS

TYPE ROTARY SCREW
DESIGN 38 SCFM @ 25 PSI
DRIVER 10 HP 3600RPM 460V 3PH, 60HZ
MATERIAL S/S
DUTY (2) DUTY (1) STANDBY

D-70.540
DESICCANT DRYER

TYPE HEATLESS REGENERATIVE AIR DRYER
DESIGN 40 SCFM @ 60 PSI
DRYER
MATERIAL
DUTY (1) DUTY (0) STANDBY



NOTES:

1. FOR GENERAL NOTES AND SYMBOLS SEE DRAWINGS 101, 102, AND 103.
2. 24V DC POWER SUPPLY FOR MAGNETIC DRUM SEPARATOR SPEED SWITCHES AND LEVEL SWITCHES PROVIDED THROUGH BIOMAG PANEL.
3. MAG DRUM SPRAY WATER USAGE IS INTERMITTENT.

SM-70.210/70.220
SHEAR MILLS

TYPE: VERTICAL
DESIGN: FLOW-THROUGH
DRIVEN: 10 HP, 460V, 60HZ, TEFC, INVERTER READY
MATERIAL: SS

MD-70.310/70.320/70.330/70.340
MAG-DRUM SEPARATORS

TYPE: MAGNETIC DRUM
DESIGN: 3'-7" DIA X 6'-7" LONG
DRIVEN: 7.5 HP
MATERIAL: SS

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

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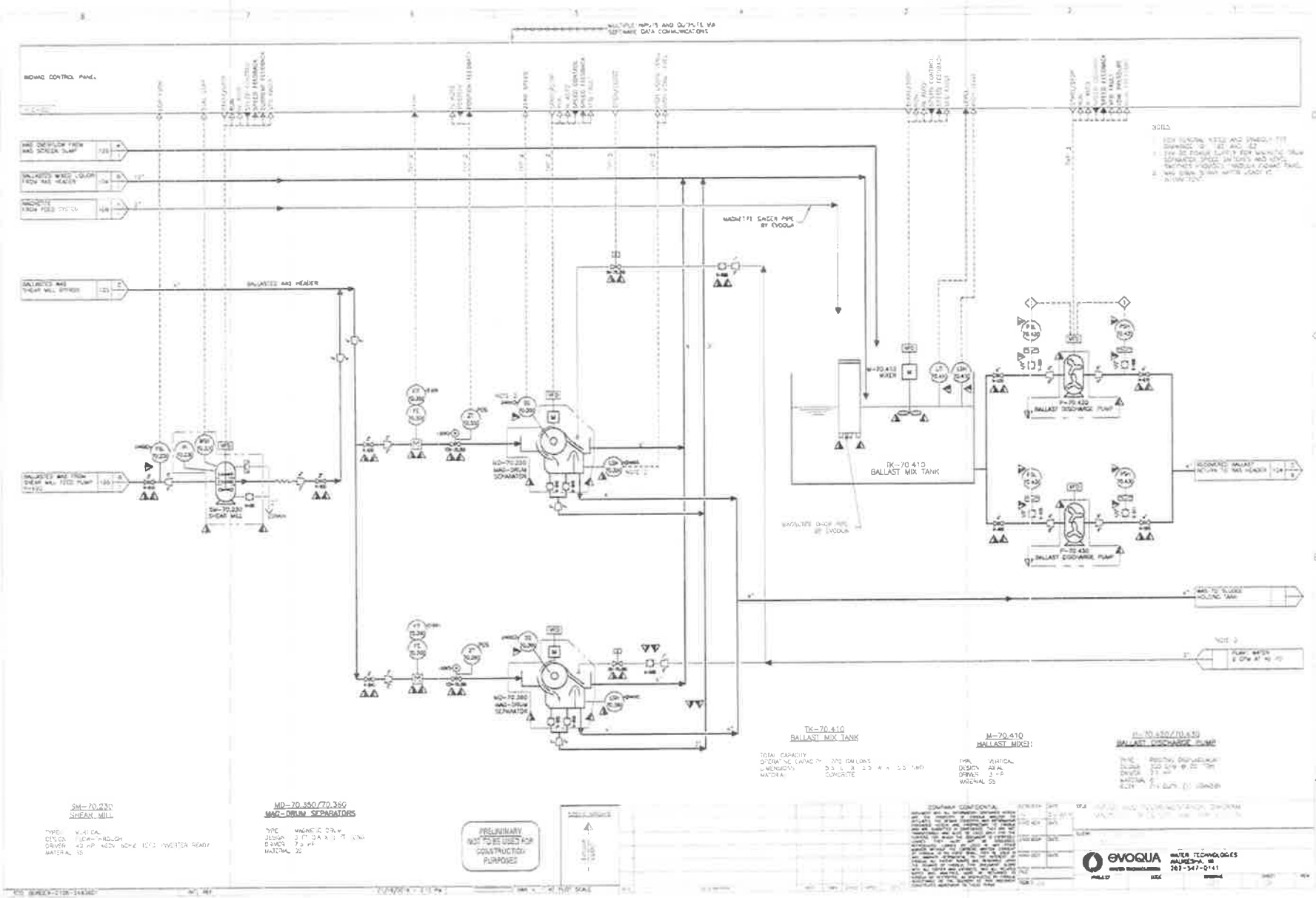
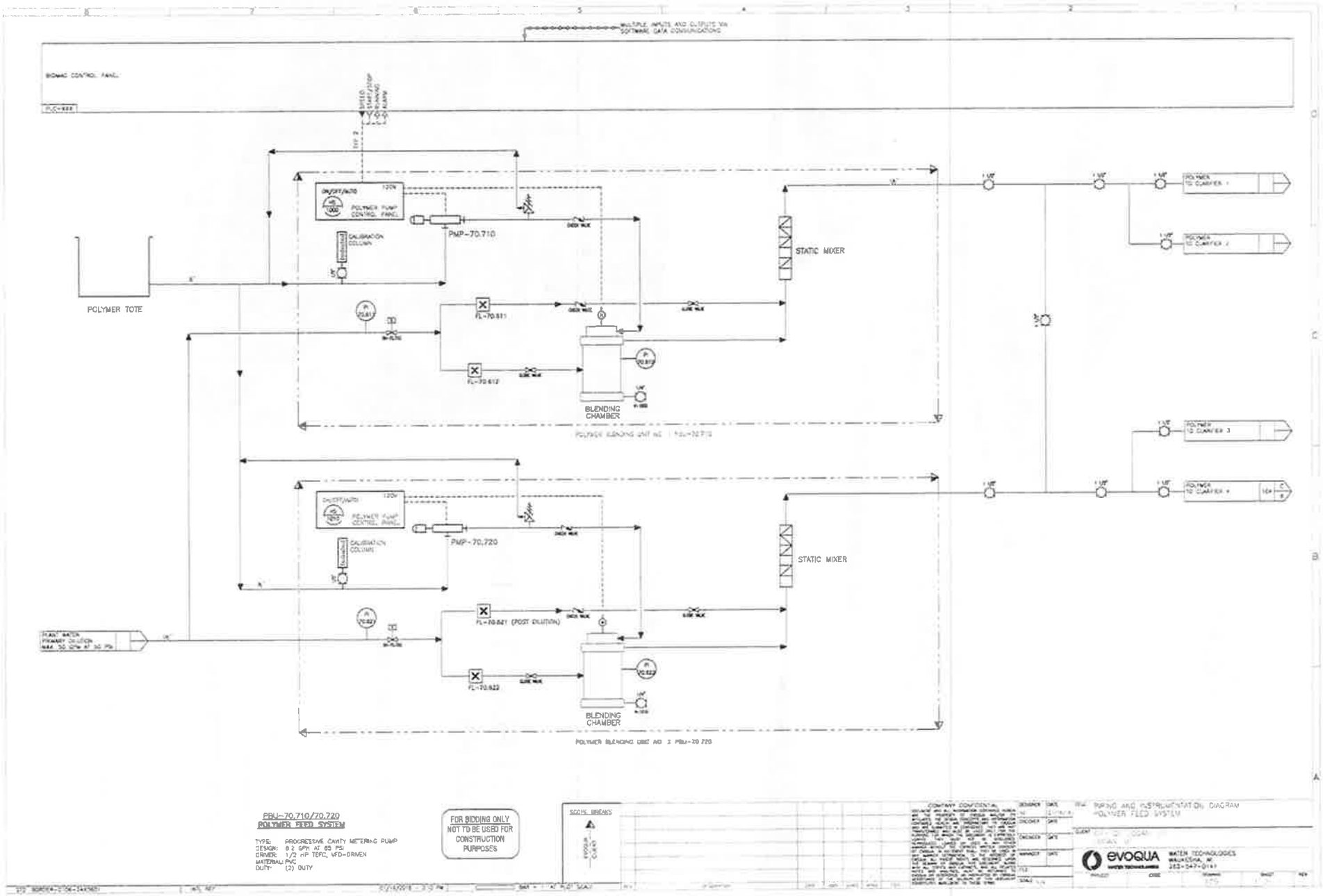
evoqua WATER TECHNOLOGIES
WATER TECHNOLOGIES
WATER TECHNOLOGIES
202-547-0141


BIOMAG CONTROL PANEL
MULTIPLE INPUTS AND OUTPUTS VIA SOFTWARE DATA COMMUNICATIONS
NOTES:
BALLASTED MIXED LIQUOR FROM MAG HEADER
MAGNETITE FROM FEED SYSTEM
MAGNETITE SHEAR MILL BY EVOQUA
BALLASTED MAG HEADER
BALLASTED MAG FROM SHEAR MILL FEED PUMP
SM-70.230 SHEAR MILL
MD-70.350 MAG-DRUM SEPARATOR
MD-70.360 MAG-DRUM SEPARATOR
M-70.410 MIXER
TK-70.410 BALLAST MIX TANK
MAGNETITE MAKE-UP PIPE BY EVOQUA
P-70.420 BALLAST DISCHARGE PUMP
P-70.430 BALLAST DISCHARGE PUMP
RECOVERED BALLAST RETURN TO MAG HEADER
MAG TO SLUDGE HOLDING TANK
PUMP WATER
TK-70.410
BALLAST MIX TANK
TOTAL CAPACITY 270 GALLONS
OPERATING CAPACITY 270 GALLONS
DIMENSIONS 3.5' L X 3.5' W X 3.5' H
MATERIAL CONCRETE
M-70.410
BALLAST MIXER:
TYPE VERTICAL
DESIGN AXIAL
DRIVES 3 HP
MATERIAL SS
P-70.420/70.430
BALLAST DISCHARGE PUMP
SM-70.230
SHEAR MILL
TYPE VERTICAL
DESIGN FLOW-THROUGH
DRIVES 40 HP, 460V, 60HZ, 1800 INVERTER READY
MATERIAL SS
MD-70.350/70.360
MAG-DRUM SEPARATORS
TYPE MAGNETIC DRUM
DESIGN 3.0' DIA X 3.0' LONG
DRIVES 7.5 HP
MATERIAL SS
PRELIMINARY NOT TO BE USED FOR CONSTRUCTION PURPOSES
EVOQUA
WATER TECHNOLOGIES



PBU-70.710/70.720
POLYMER FEED SYSTEM

TYPE: PROGRESSIVE CAVITY METERING PUMP
DESIGN: 8.2 GPH AT 65 PSI
DRIVER: 1/2 HP TEFC, VFD-DRIVEN
MATERIAL: PVC
DUTY: (2) DUTY

FOR BIDDING ONLY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

SCOPE BREAKS

DESIGNER DATE
DRAWN DATE
CHECKED DATE
MANAGER DATE
APPD DATE
SCALE

PIPING AND INSTRUMENTATION DIAGRAM
POLYMER FEED SYSTEM

CLIENT

evoQUA WATER TECHNOLOGIES
WAUKESHA, WI
262-547-0141

PROJECT CODE DRAWING SHEET REV

evoqua
WATER TECHNOLOGIES

EAST CANYON WRF

SNYDERVILLE BASIN WATER RECLAMATION DISTRICT, UT

SOLIDS FLUX TESTING SUMMARY

CAROLLO ENGINEERS

July 2017

Evoqua Sales Contact:
Nathan Antonneau
nathan.antonneau@evoqua.com

CONTENTS

1 SOLIDS FLUX TESTING FOR BIOMAG APPLICATION

Solids flux testing was performed the week of July 10th, 2017 to characterize the settling of the activated sludge system under various conditions at the East Canyon Water Reclamation Facility (ECWRF). Evoqua columns 11 & 12 were used in the course of this testing.

The test procedure followed a modified version of the procedure published by the American Society of Civil Engineers Clarifier Research Technical Committee (CRTC) and the Water Research Foundation. The test system, shown in Figure 1, utilized two 5-foot tall, clear 4" Schedule 40 PVC columns with internal stir bars rotating at 1 rpm to reduce side wall effects. Samples were obtained via the RAS sample tap and non-potable water tap located at the back sink in the RAS/WAS pump building. The samples, manipulated with ballast, were mixed for 3 minutes at a mixing intensity equivalent to the ballast mix tank while ballast was hand applied for the first 30 seconds of the mix cycle. Polymer samples were mixed for less than 30 seconds at half the energy level while the polymer was delivered. Ballast amounts were dosed to achieve consistent ballast to biological suspended solids ratios while polymer dosages were set to achieve a consistent mass (mg) of active polymer to mass (g) of total suspended solids.

Figure 1: Test Setup

Multiple settling tests of varying concentrations were performed for each scenario. With each test the linear region of settling was determined. For a given scenario, the determined velocities were plotted with the associated TSS concentrations and also the biological suspended solids

concentration (TSS minus magnetite) to determine a velocity V_o (ft/d) and thickening coefficient k (L/g). These values were used to create a solids flux curve using Equation 1.

Equation 1: Solids Flux (G).

$$G = V_o * X * e^{(-k*X)}$$

The solids flux curve can be implemented into a state point analysis to help determine the clarifier needs of a given facility.

At the ECWRF, five different scenarios were tested. Naming throughout this report utilizes the labeling convention of BxPx. This naming convention refers to a Ballast Ratio (Bx) and a Polymer Dose (Px) expressed as g ballast per g of biological suspended solids, and mg active polymer per g TSS, respectively. The report discusses the existing operating condition, identified as B0P0, and four manipulated tests: solids manipulated with ballast alone, B0.55P0, and B0.74P0; and solids manipulated with ballast and polymer, B0.55P0.17 and B0.73P0.18.

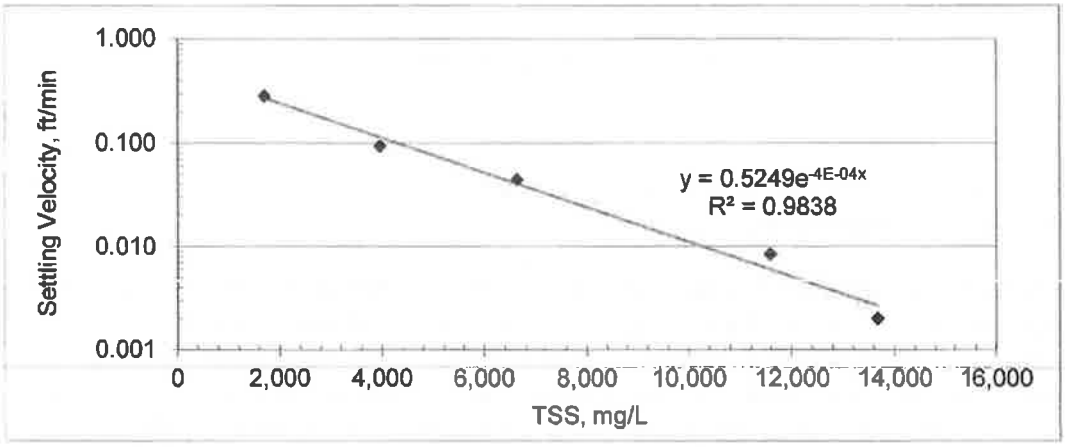
The following sections go through further details on each individual test and how the tests compare.

1.1 Conventional Scenario B0P0

Based on settlometer testing performed July 19, 2017, the SVI was anticipated to be around 90 mL/g. Evoqua performed five settling tests at TSS concentrations ranging from 1,684 to 13,669 mg/L. Gravity thickening limited the upper concentration range tested.

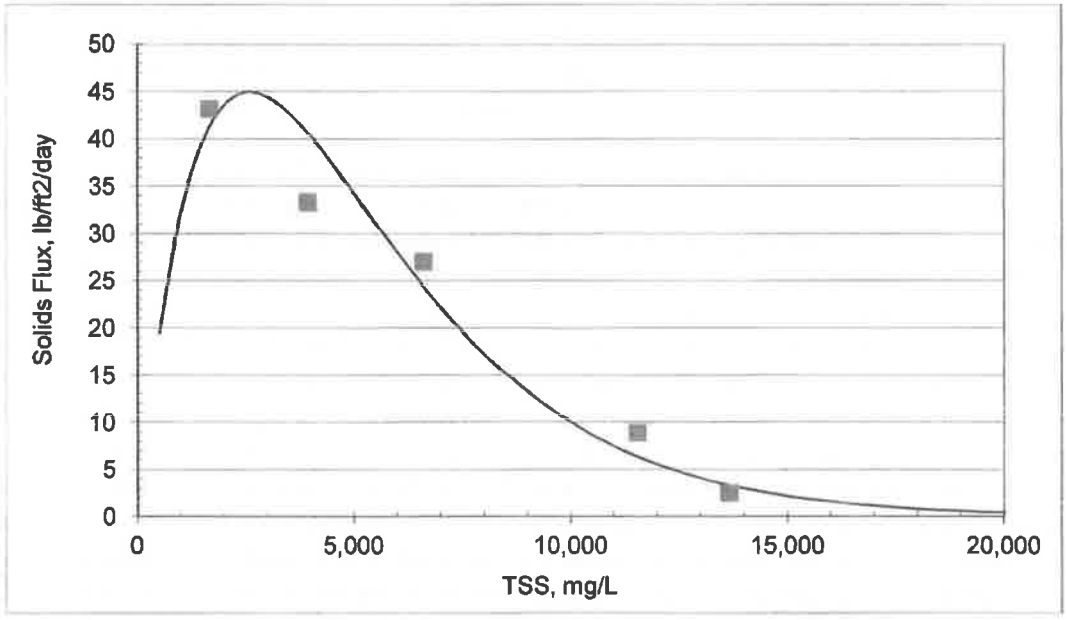
For each test condition the linear settling velocity was determined. Figure 2 depicts the summary of determined velocities related to the corresponding solids concentrations determined for B0P0. The observed data correlates well to the determined curve with a R^2 value of 0.984. The coefficient of determination, R^2, or R squared, is a number that denotes how well the data fits a model. R^2 will be a number is between 0, the model doesn't predict the dependent variable base on the independent variable chosen, and 1, where the model exactly predicts the dependent variable based on the independent variable. The sum of squared error for the equation compared to the observed values is 0.84 ft/d with normalized sum of squared error, based on 4 degrees of freedom, being 0.21 ft/d. Like the R^2 factor the sum of squared error, or residual sum of squares, is used to depict how well a model fits the observed data. In this case the smaller the value the better the fit, with 0 meaning there is no difference between the model and the observed data. The degrees of freedom is the number of independent pieces of information available to estimate another piece of information. In the below data set the degrees of freedom (Number of data points - 1) is used to normalize the sum of squared error.

Figure 2: Interface Settling Velocity B0P0



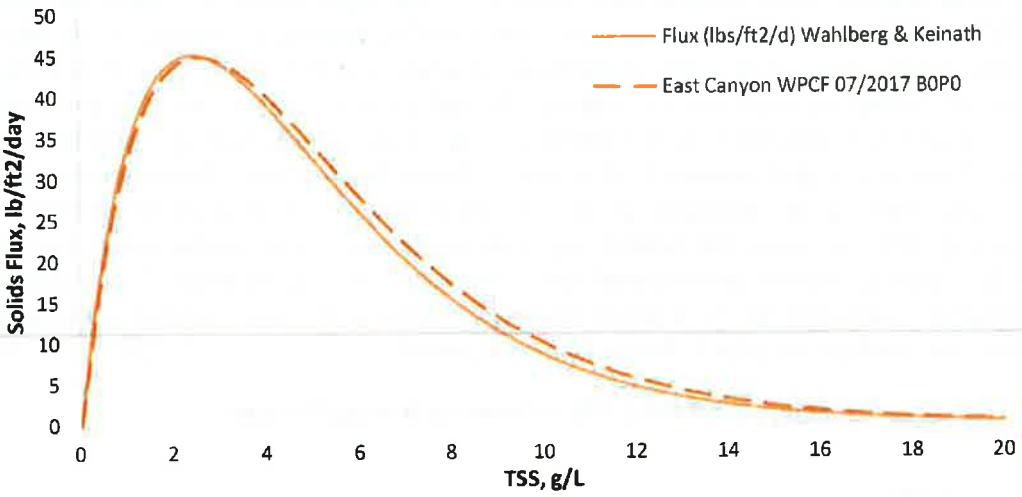
Based on the data, a V_o of 756 ft/d and k of 0.386 L/g was determined. Figure 3 shows a comparison of the determined solids curve vs the observed settling points. The observed settling data correlates fairly well to the determined curve.

Figure 3: B0P0 Flux Curve vs Observed Settling Points



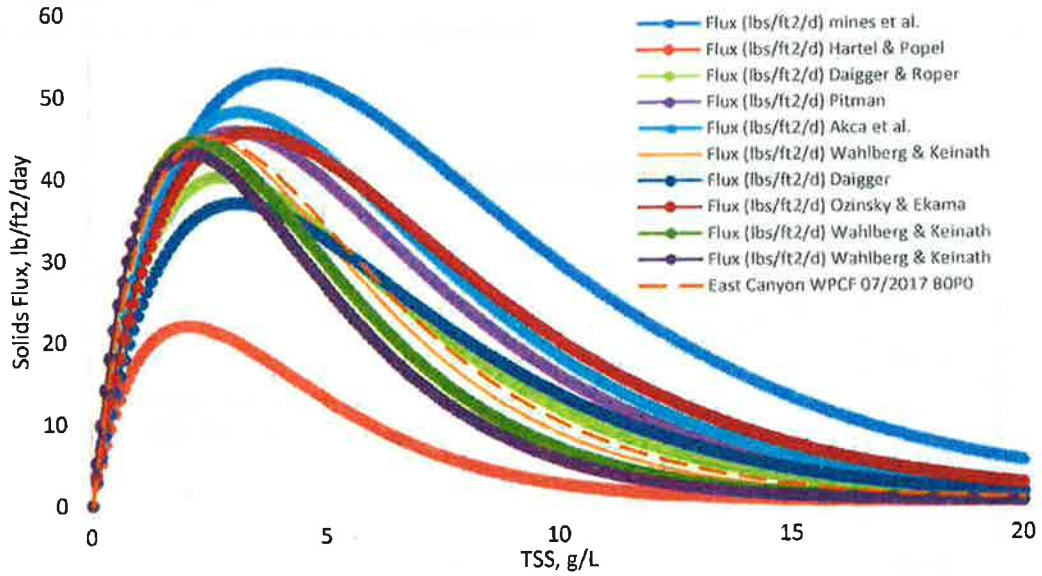
When comparing the determined curve to common curves based on settlometer and SVI testing, the observed curve has a solids flux curve much like a 97 SVI facility based on the relationship from Wahlberg & Keinath where $V\,(ft/d) = 1432.704 * e^{-0.00602*SVI}$ and k=0.351+0.00058*SVI. This comparison is shown in Figure 4 for reference.

Figure 4: B0P0 vs Wahlberg & Keinath Solids Flux Curves



It is important to understand this comparison is just one of many that could be made as many individuals have performed testing and developed empirical equations relating the stirred and unstirred settlometer test to the settling coefficients. A further example of this is shown Figure 5 which looks at an SVI of 97 for various equations and the resulting curves compared to the determined curve for the operating condition at the ECWRF.

Figure 5: B0P0 vs 97 SVI Curves



1.2 Ballasted Manipulated Scenario – B0.55P0

Five sample concentrations ranging from 1,684 to 16,662 mg/L biological suspended solids and 2,927 to 23,231 mg/L TSS were tested to document the settling enhancements by adding magnetite ballast. The actual solids concentrations were unknown at the time of ballasting. Volume ratio thickening were used to estimate the solids concentration and required ballast addition. Based on measured TSS concentrations before and after ballasting, the ballast ratio averaged 0.55 and ranged between 0.39 and 0.78. Figure 6 summarizes the observed velocities vs TSS. Similarly, the biological suspended solids may be used as shown in Figure 7. When using TSS flux curve, the added magnetite solids need to be subtracted to compare apples to apples against the conventional solids. When determining the solids flux curve using the biological suspended solids, a direct apples to apples comparison applies because the magnetite was backed out prior to the curve development.

Figure 6: B0.55P0 TSS vs Interface Settling Velocity

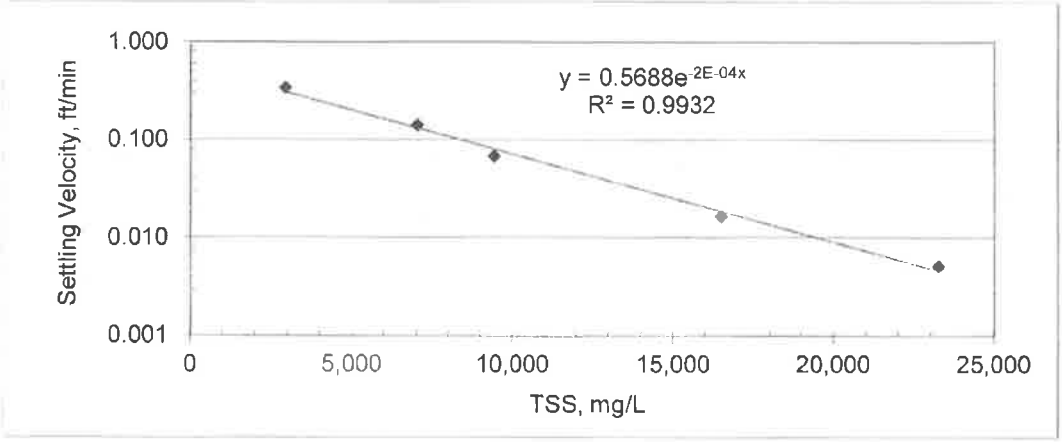
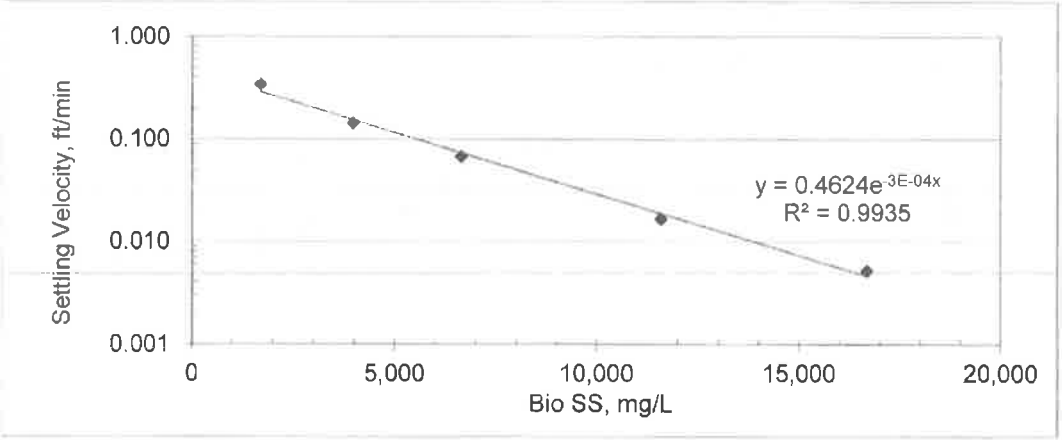


Figure 7: B0.55P0 Biological SS vs Interface Settling Velocity



Looking at TSS vs velocity, a Vo of 819 ft/d was determined with a k of 0.207 L/g. The determined curve equation utilizing these constants has a R^2 of 0.993 and a sum of squared error of 2.01 ft/d, normalized with 4 degrees of freedom to 0.501 ft/d. When looking at biological suspended solids vs observed settling velocity, a Vo of 666 ft/d was determined with a k of 0.276 L/g. This determined curve correlation has a R^2 of 0.994 and a sum of squared error of 4.32 ft/d, normalized with 4 degrees of freedom to 1.08 ft/d.

Figure 8 and Figure 9 show the calculated curves vs the observed settling points.

Figure 8: Observed vs Calculated TSS Solids Flux B0.55P0

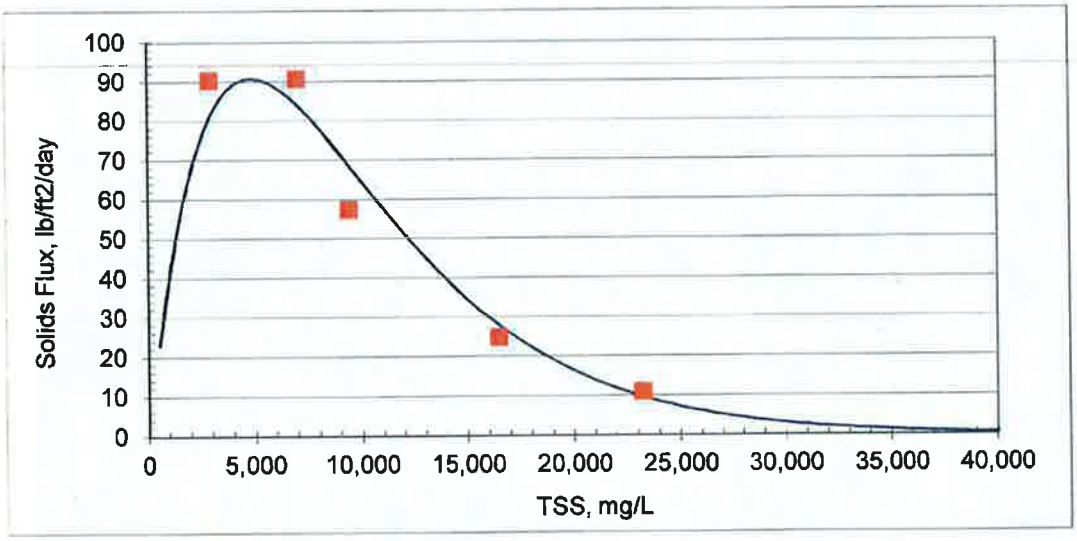


Figure 9: Observed vs Calculated Bio Suspended Solids Flux B0.55P0

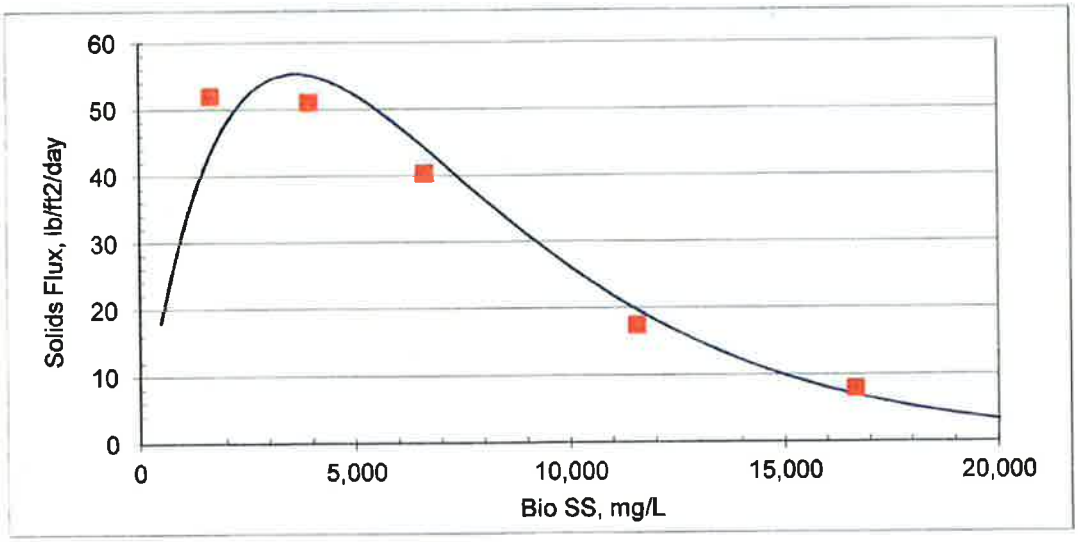


Figure 10 shows each of the two methods for determining the solids flux curve with ballasted sludge vs the conventional solids. Note in this chart all curves are based on biological suspended solids, i.e. the magnetite has been backed out either thru the initial analysis in the case of the biological suspended solids ballasted flux curve, or in the case of the TSS flux curve where the corresponding curve was "phased shifted" based on the average magnetite ratio.

Figure 10: Ballasted B0.55P0 vs Conventional

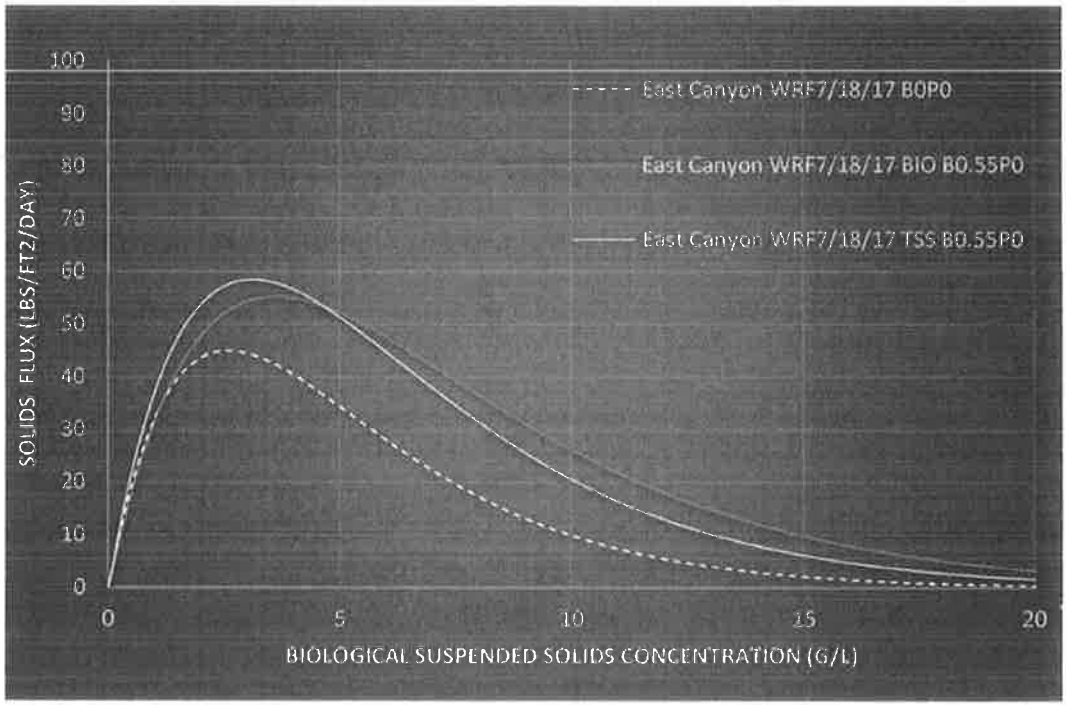


Figure 10 further depicts the faster settling of the ballasted solids when compared to the conventional sludge samples. Figure 10 also shows the two different approaches produce fairly similar curves.

1.3 Ballasted Manipulated Scenario – B0.74P0

Five sample concentrations ranging from 2,286 to 14,792 mg/L biological suspended solids and 3,474 to 26,555 mg/L TSS were tested to document the settling enhancements by adding magnetite ballast at an increased ratio. Similar to the previous ballast testing, the actual solids concentrations were unknown. Volume thickening and dilutions were used to estimate the solids concentration and required ballast addition. Based on the measured TSS concentrations before and after ballasting, the ballast ratio ranged between 0.52 and 0.82 with an average of 0.74. Figure 11 summarizes the observed velocities vs TSS. Similarly, the biological suspended solids may be used as shown in Figure 12. When using TSS, the added magnetite solids need to be subtracted to compare apples to apples against the conventional solids. When determining the solids flux curve using the biological suspended solids, a direct apples to apples comparison applies because the magnetite was backed out prior to the curve development.

Figure 11: B0.74P0 TSS vs Interface Settling Velocity

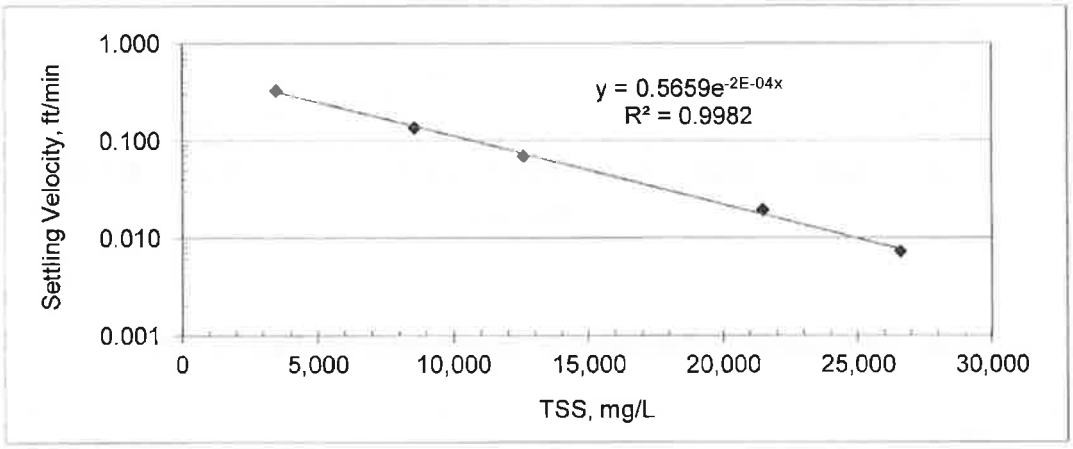
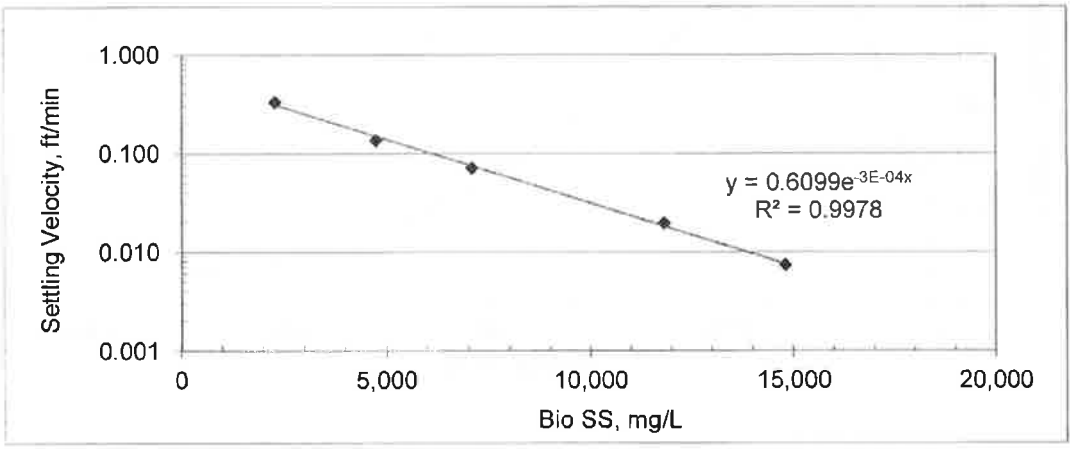


Figure 12: B0.74P0 Biological SS vs Interface Settling Velocity



Looking at TSS vs velocity, a Vo of 815 ft/d was determined with a k of 0.161 L/g. The determined curve equation utilizing these constants has a R^2 of 0.998 and a sum of squared error

of 0.26 ft/d, normalized with 4 degrees of freedom to 0.07 ft/d. When looking at biological suspended solids vs observed settling rates, a Vo of 878 ft/d was determined with a k of 0.297 L/g. This determined curve correlation has a R^2 of 0.998 and a sum of squared error of 1.16 ft/d, normalized with 4 degrees of freedom to 0.29 ft/d.Figure 13 and Figure 14 show the calculated curves vs the observed settling points.

Figure 13: Observed vs Calculated TSS Solids Flux B0.74P0

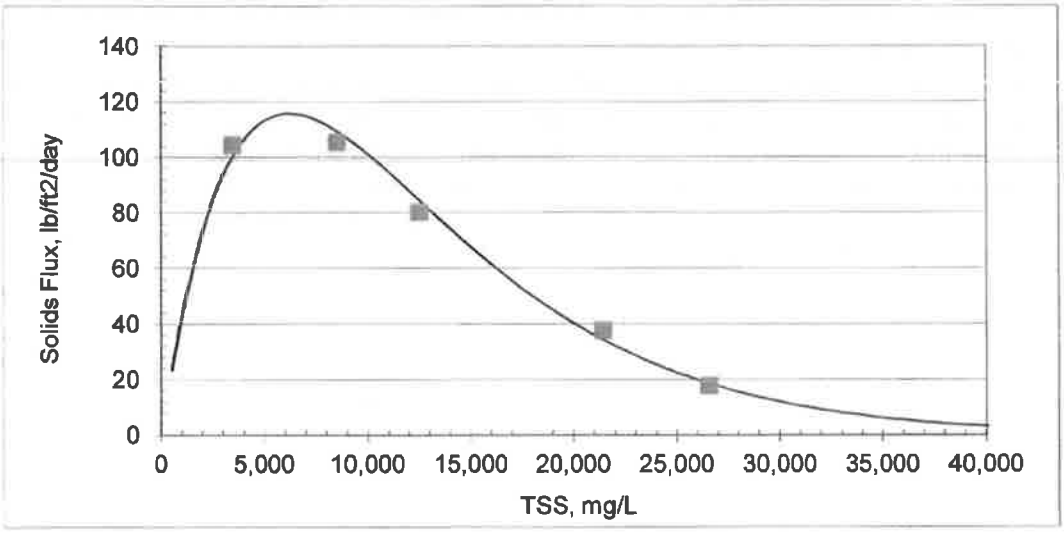


Figure 14: Observed vs Calculated Bio Suspended Solids Flux B0.74P0

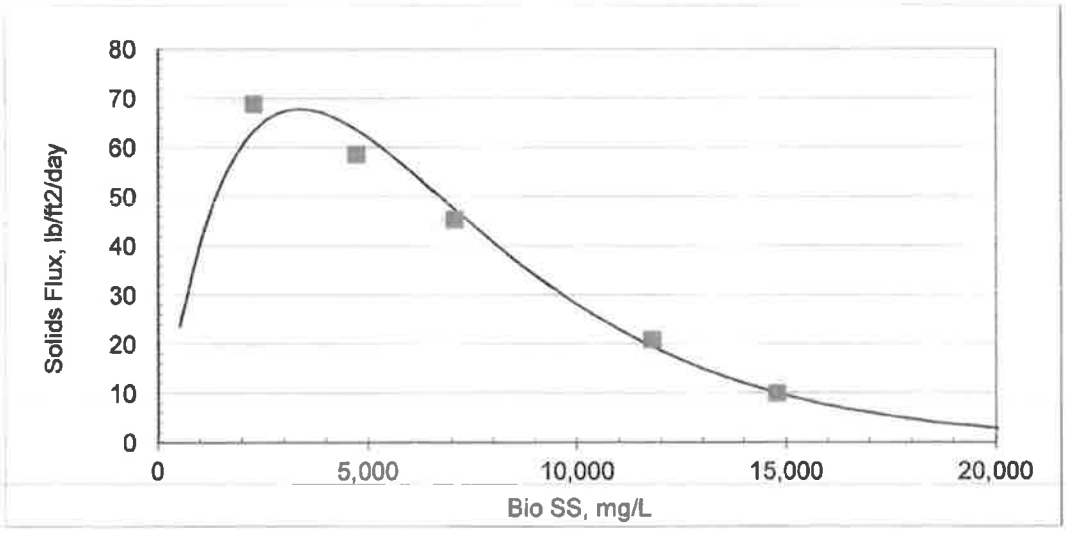
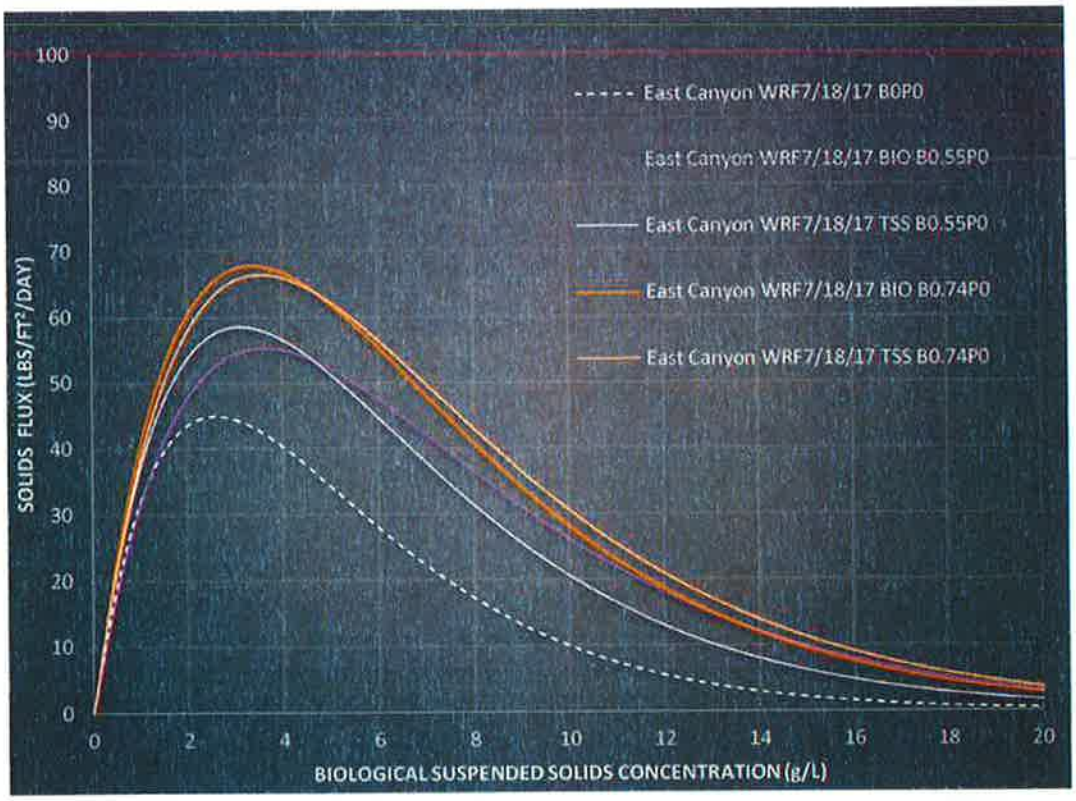


Figure 15 shows each of the two methods for determining the solids flux curve with ballasted solids for the two ratios. Note in this chart all curves are based on biological suspended solids, i.e. the magnetite has been backed out either thru the initial analysis in the case of the biological suspended solids ballasted flux curve, or in the case of the TSS flux curve the corresponding curve was "phased shifted" based on the average magnetite ratio.

Figure 15: Ballasted vs Current



Looking at the two ballast scenarios one may notice the two different approaches did not produce curves of exact shape. Due to the unknown concentrations when ballasting and thickening it is common to get some variability on ballast ratio of individual samples. As such the curve produced using the biological solids and associated velocities vs the curved produced by backing out the average ballast ratio from the curve created using the total suspended solids and associated velocities in most cases is slightly different. Both procedures are done as a check to ensure the data is representative of the given scenario. Therefore these two curves when normalized to represent the biological solids should be very similar and in an ideal situation identical.

1.4 Ballasted Manipulated Scenario – B0.55P0.17

The final two settling condition tests involved ballasting and dosing polymer (Polydyne WE1428) to the existing solids. Again the initial ballast ratio targets were 0.5 and 1.0. A 0.2 mg/g polymer target was chosen for both ballast scenarios. All ballast and polymer additions

were based on the estimated solids concentrations, with actual values confirmed after testing. Ultimately the end ballast ratio averaged 0.55 magnetite: 1 biological suspended solids with a range of 0.39 to 0.78. In similar fashion the calculated average polymer dose was 0.17 mg of active polymer per gram of TSS with a range of dosages from 0.09 to 0.22 mg/g. For comparison purposes, operating at 6,000 mg/L MLSS and 0.55:1 ratio for a TSS of 9,300 mg/L would yield a polymer dose of 1.86 mg/L.

The B0.55P0.17 scenario followed the same comparison analysis procedure as the previous ballast scenarios. Figure 16 and Figure 17 show the summary of the settling velocities vs solids concentrations.

Figure 16: B0.55P0.17 TSS vs Interface Settling Velocity

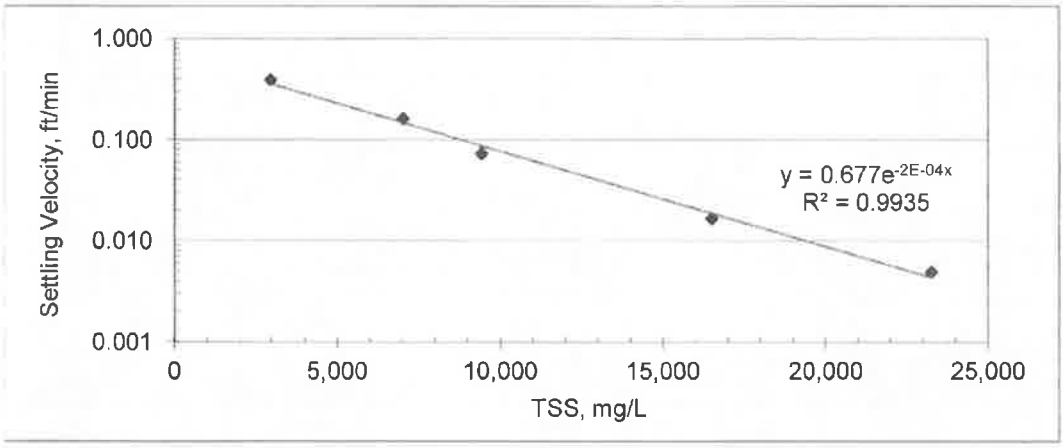
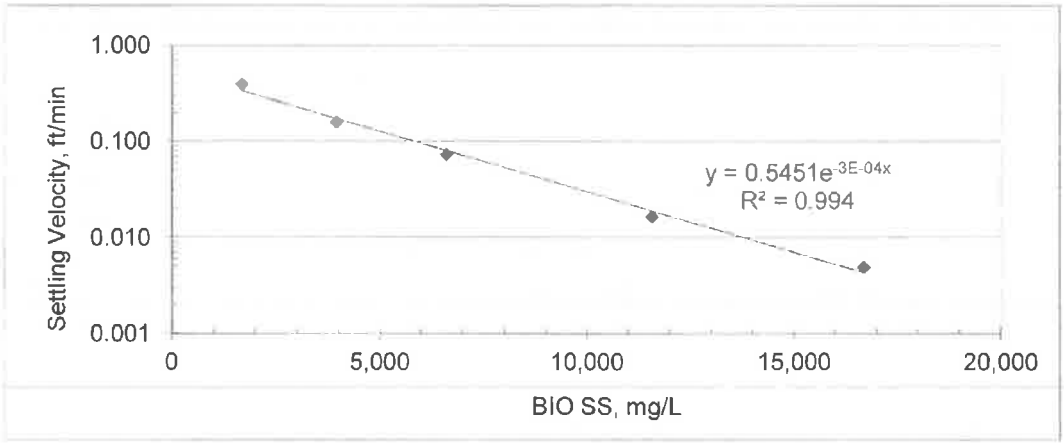


Figure 17: B0.55P0.17 Biological SS vs Interface Settling Velocity



Given Figure 16, the TSS determined curve equation has a R^2 of 0.994 and sum of squared error of 2.48 ft/d, normalized with 4 degrees of freedom to 0.619 ft/d. Vo and k were calculated to be 975 ft/d and 0.217 L/g, respectively. Given Figure 17, the biological suspended solids

determined curve correlation has a R^2 of 0.994 and a sum of squared error of 5.57 ft/d, normalized with 4 degrees of freedom to 1.39 ft/d. Figure 18 and Figure 19 show the determined curves vs the observed settling points.

Figure 18: Observed vs Calculated TSS Solids Flux B0.55P0.17

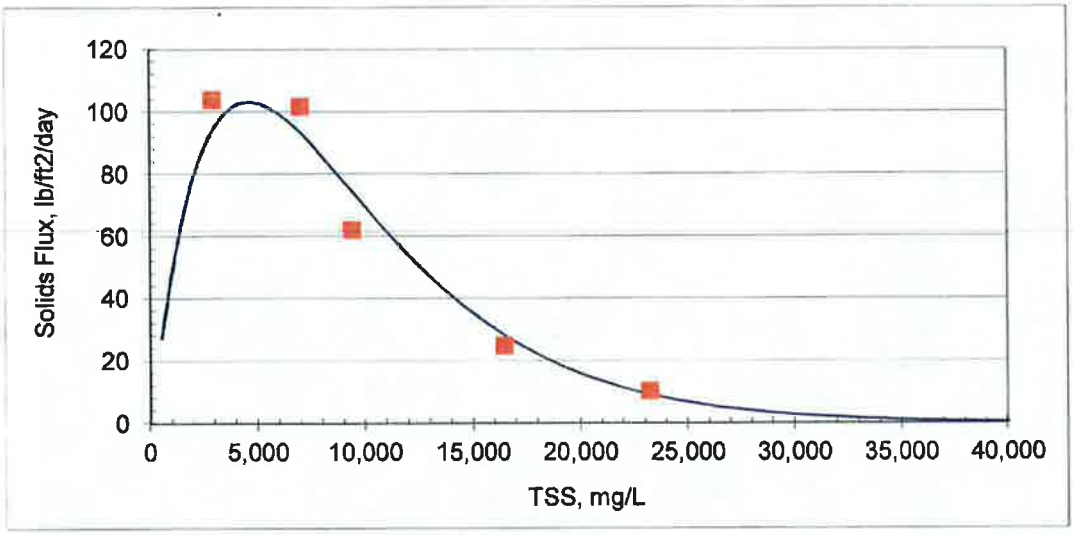
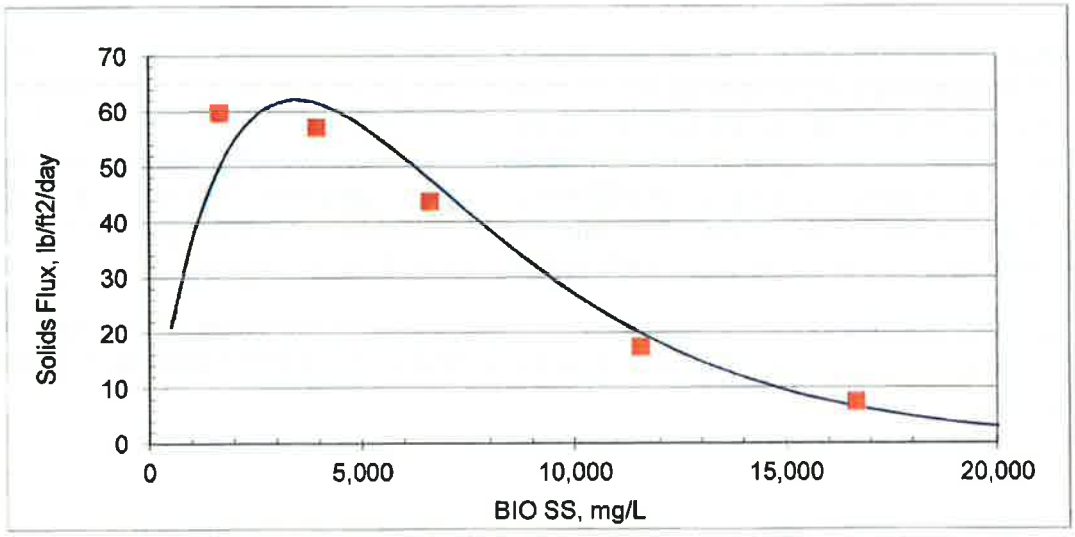
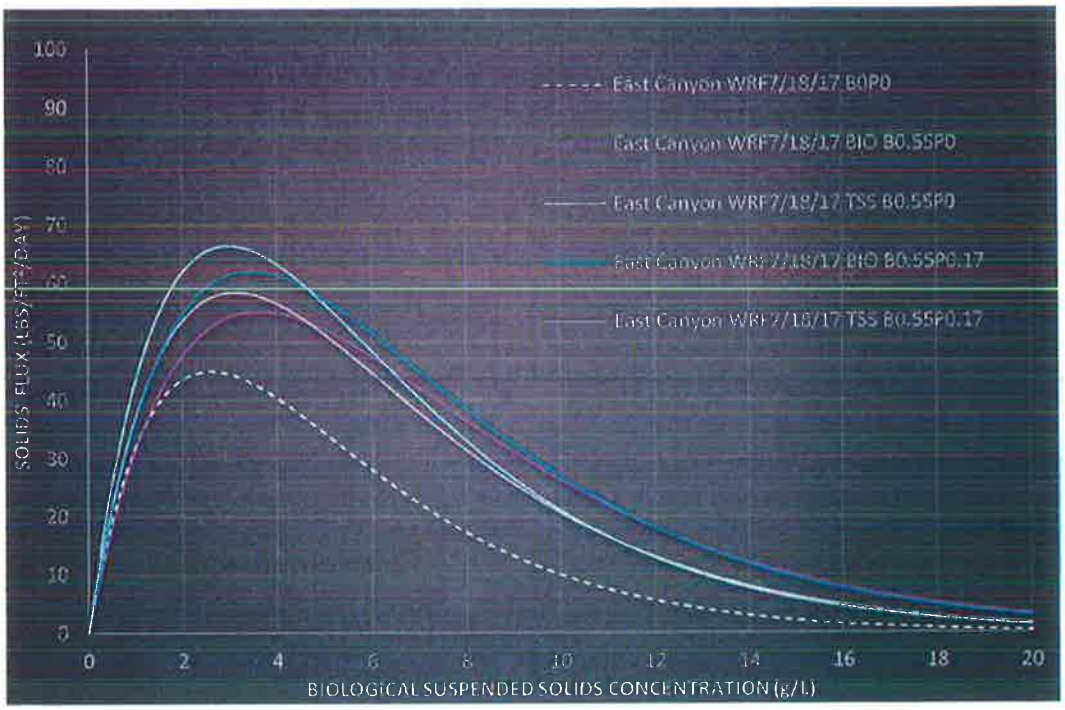


Figure 19: Observed vs Calculated Bio SS Solids Flux B0.55P0.17



As shown in Figure 20 the addition of polymer to the ballasted solids at the 0.17 mg/g dose shows a slight improvement in settling over the ballasted solids alone at the 0.55:1 ratio. Different polymer or increased dose with the chosen polymer could further improve the settling effect due to the polymer addition.

Figure 20: Ballasted with Polymer vs Ballast and Conventional



1.5 Ballasted Manipulated Scenario – B0.74P0.18

As with the lower ballast ratio, polymer was added to higher ballasted solids to depict how the settling characteristics would change due to an increased polymer dose at a higher ballast ratio. Again ballasting and polymer additions were based on the estimated concentrations. The B0.74P0.18 samples were taken from the B0.74P0. The calculated average polymer dose was 0.18 mg of active polymer per gram of TSS with dosages ranging from roughly 0.16 to 0.20 mg/g. Based on the average values from this data set, operating at 6,000 mg/L MLSS and 0.74:1 ratio for a TSS of 10,440 mg/L would yield a polymer dose of 1.88 mg/L.

The B0.74P0.18 scenario followed the same comparison analysis procedure as the previous ballast scenarios. Figure 21 and Figure 22 show the summary of the settling velocities vs solids concentrations.

Figure 21: B0.74P0.18 TSS vs Interface Settling Velocity

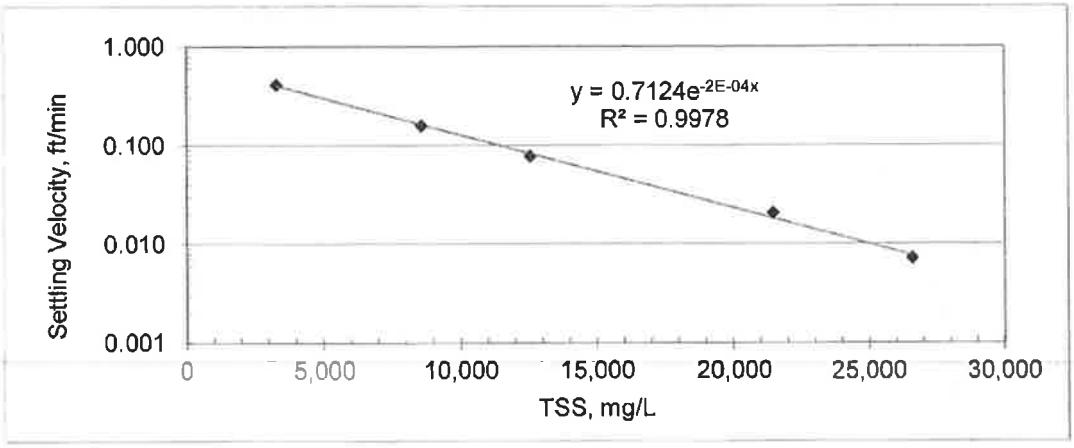
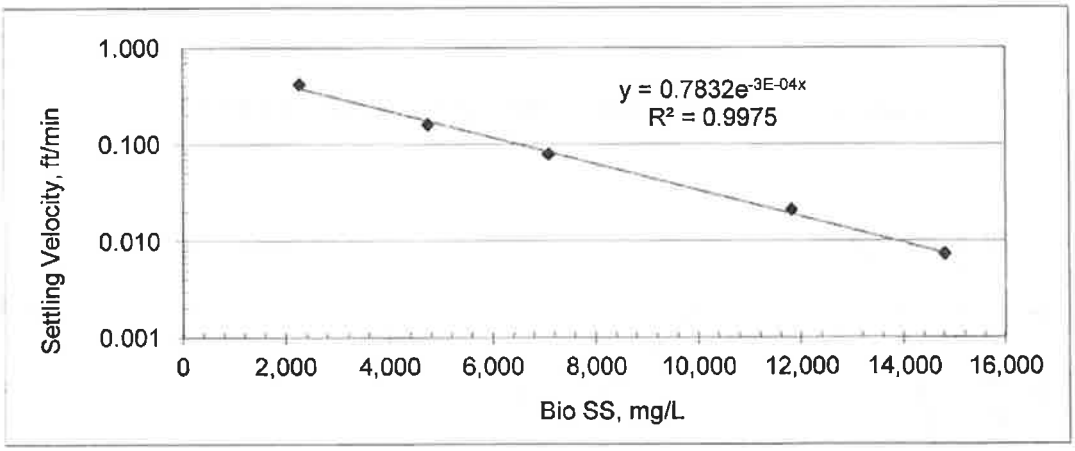


Figure 22: B0.74P0.18 Biological SS vs Interface Settling Velocity



Given Figure 21, the TSS determined curve equation has a R^2 of 0.998 and sum of squared error of 0.25 ft/d, normalized with 4 degrees of freedom to 0.064 ft/d. Vo of 1,026 ft/d and k of 0.17 L/g were determined for the data set.

Given Figure 22, the biological suspended solids determined curve correlation has a R^2 of 0.998 and a sum of squared error of 1.97 ft/d, normalized with 4 degrees of freedom to 0.49 ft/d. Vo of 1,128 ft/d and k of 0.315 L/g were determined for the data set.

Figure 23 and Figure 24 show the determined curves vs the observed settling points.

Figure 23: Observed vs Calculated TSS Solids Flux B0.74P0.18

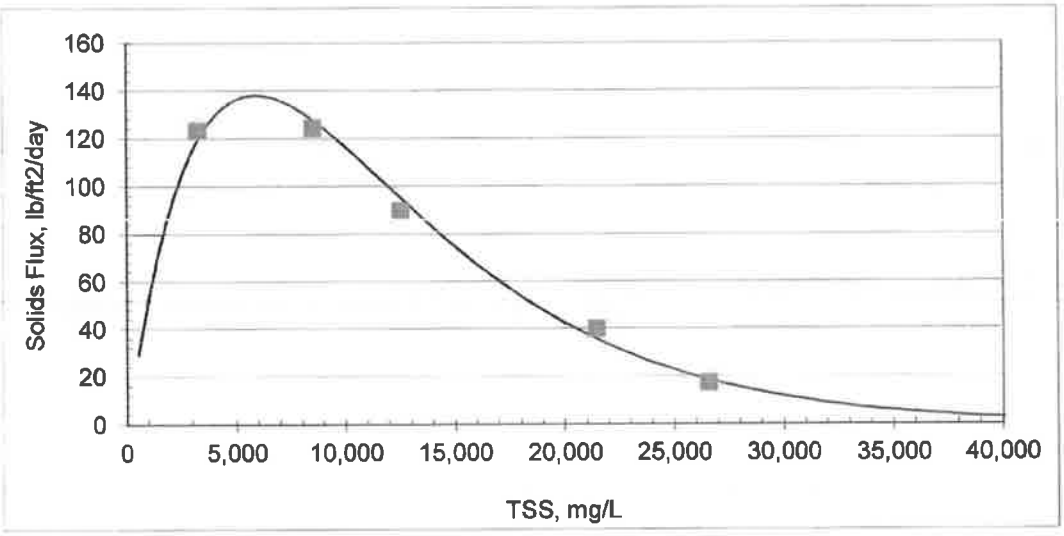


Figure 24: Observed vs Calculated Bio SS Solids Flux B0.74P0.18

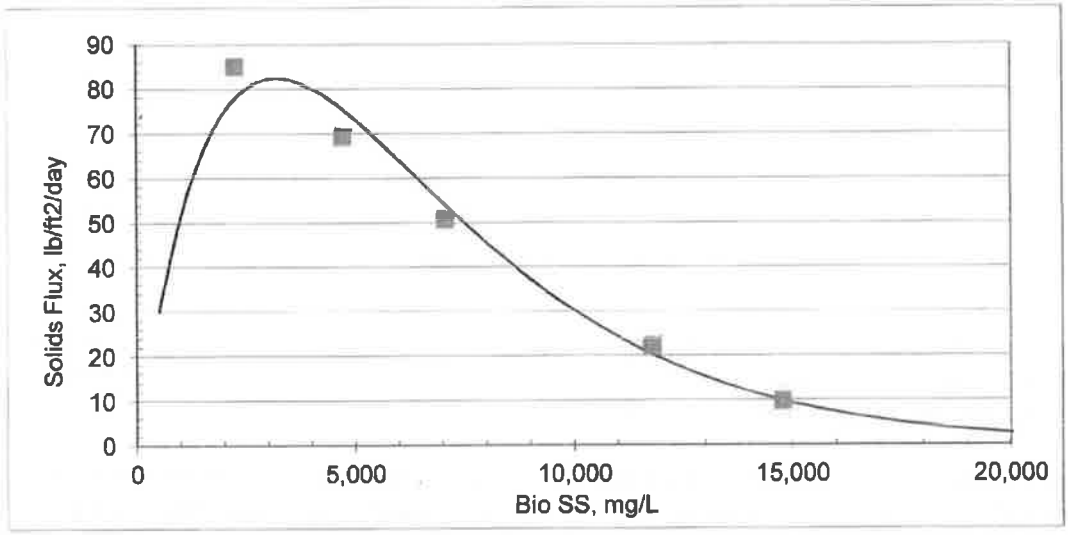
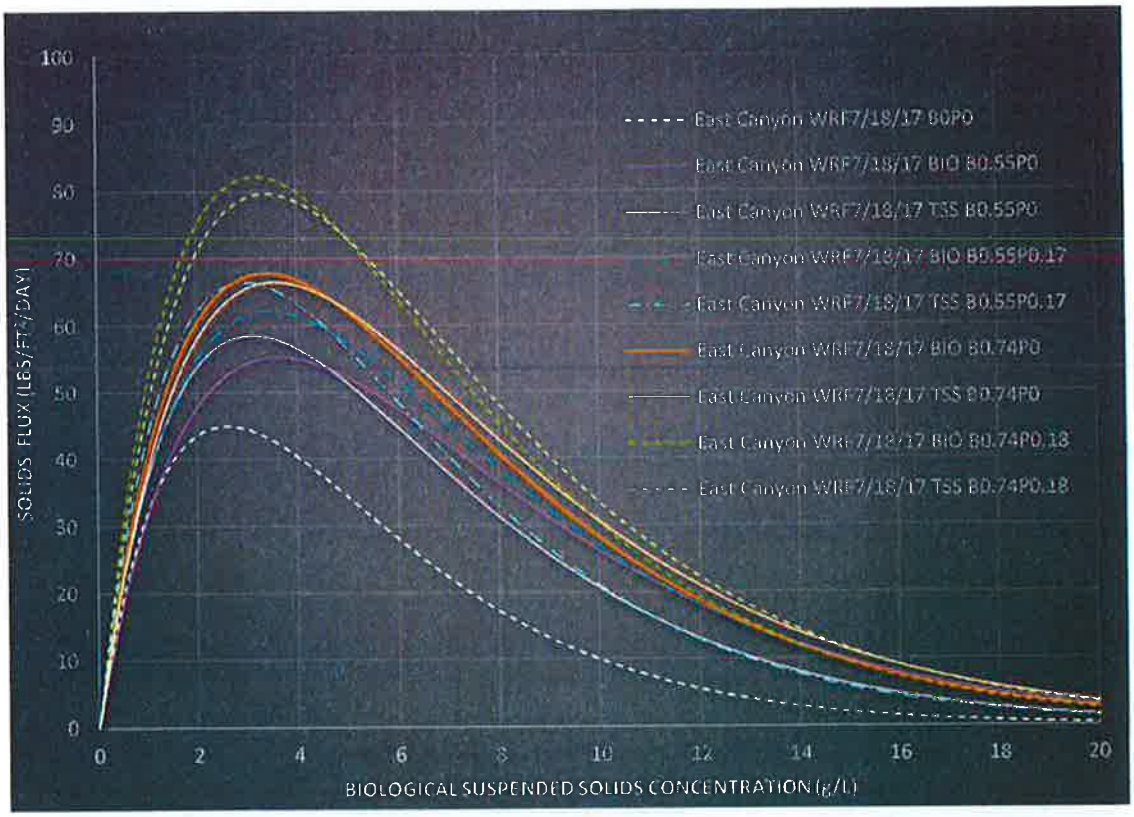


Figure 25 shows each of the two methods for determining the solids flux curve when ballasting and adding polymer vs the previous discussed scenarios. Note in this chart all curves are based on biological suspended solids, i.e. the magnetite has been backed out either thru the initial analysis in the case of the biological suspended solids ballasted flux curve, or in the case of the TSS flux curve where the corresponding curve was "phased shifted" based on the average magnetite ratio.

Figure 25: All Curves Ballasted & Polymer vs Ballast and Current.



Again the settling enhancement through the addition ballast and then the incorporation of polymer to the ballasted solids is depicted. Incremental increase in ballast addition showed to have an incremental affect to the settlability of solids. Further increase in settling was shown with the addition of polymer to the ballasted solids indicating a polymer system could be implemented on an as needed basis to boast the settling characteristics in times of high flows. A summary of these curves based on the approach is also shown Figure 26 and Figure 27. The summary of the raw TSS curves and associated ballast ratios as well as the biological curves is also consolidated in Table 1.

Figure 26: Summary of Biological SS Determined Curves

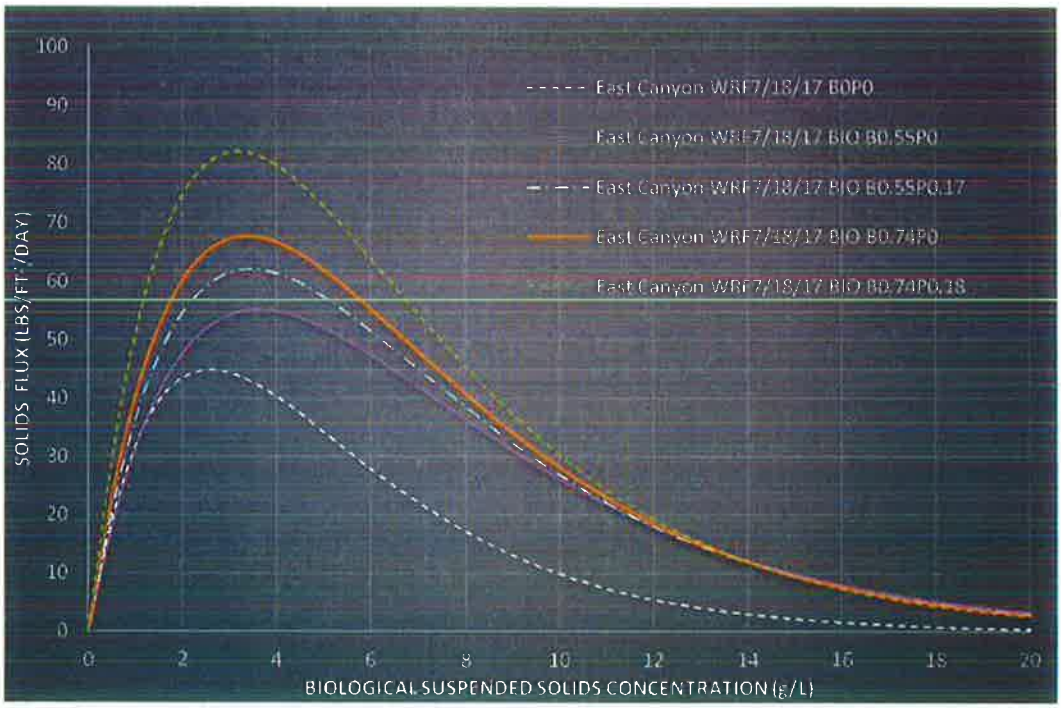
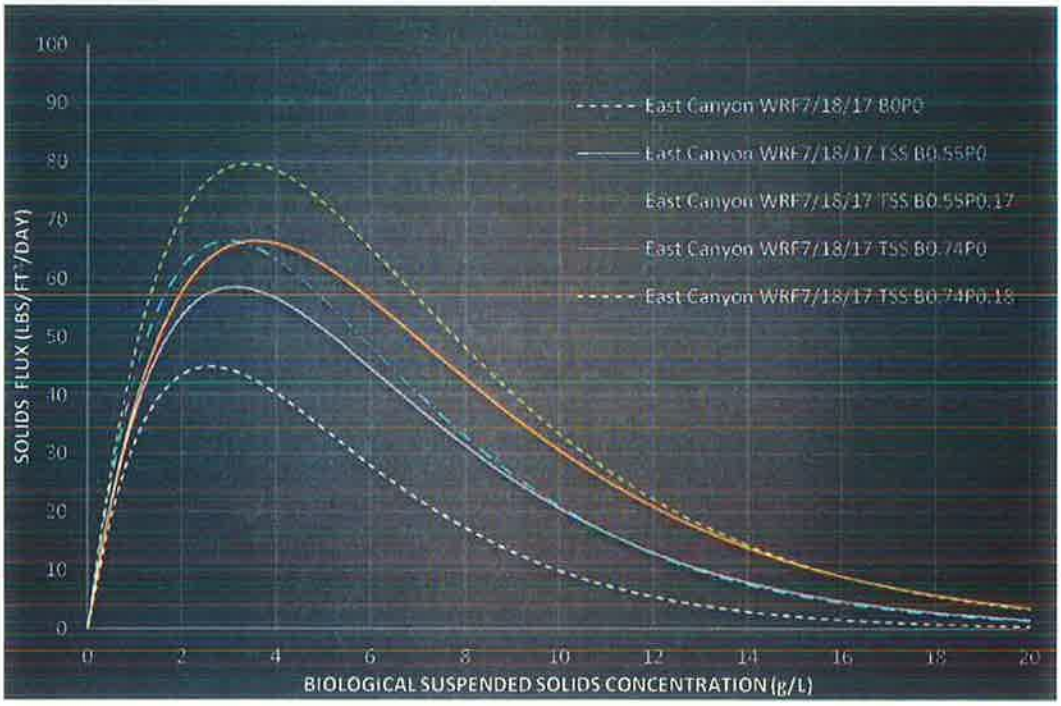


Figure 27: Summary of TSS Determined Curves



		RAW TSS	NORMALIZED BIO
B0P0	R^2	0.984	
	Avg Ballast Ratio	0.00	
	Avg Polymer Amt, mg/g	0.000	
	Vo, ft/d	756	
	k, L/g	0.386	
B1P0	R^2	0.998	0.998
	Avg Ballast Ratio	0.74	0.74
	Avg Polymer Amt, mg/g	0.000	0.000
	Vo, ft/d	815	878
	k, L/g	0.16	0.297
B1P0.2	R^2	0.998	0.998
	Avg Ballast Ratio	0.73	0.73
	Avg Polymer Amt, mg/g	0.181	0.181
	Vo, ft/d	1,026	1,128
	k, L/g	0.170	0.315
B0.5P0	R^2	0.993	0.994
	Avg Ballast Ratio	0.55	0.55
	Avg Polymer Amt, mg/g	0.000	0.000
	Vo, ft/d	819	666
	k, L/g	0.21	0.276
B0.5P0.2	R^2	0.994	0.994
	Avg Ballast Ratio	0.55	0.55
	Avg Polymer Amt, mg/g	0.175	0.175
	Vo, ft/d	975	785
	k, L/g	0.217	0.290

Table 1: Summary of Final Solids Flux Curve Variables

2 CONCLUSIONS

Figure 25 and Table 1 summarizes the final solids flux conditions developed while onsite in July. Figure 26 illustrates that adding magnetite ballast at the ECWRF will improve the plant's settling capabilities. Furthermore the availability to add polymer could allow for additional capabilities quickly especially if needed on a short term basis, such as peak flow type conditions. Review of polymer dosage and/or polymer selections would be advised when implementing a polymer system to ensure the best performance is achieved.

Please note the following example values and conditions are only for comparison purposes and are based solely on the ability to settle solids in the clarifier. There is no consideration of effluent objectives which may be influenced by the biological and other design considerations in attempting to physically process a certain flow through the treatment plant.

For instance, operating at 6,000 mg/L biological suspended solids while utilizing two 75' diameter clarifiers under the B0P0 (current operating condition) solids flux curve would allow the

plant to operate at a maximum of 4.8 MGD before the solids wouldn't settle in the clarifiers. The return rate would need to be at least 5.8 MGD (120% forward flow) to keep the solids from building in the clarifiers. The clarifier overflow rate at this condition would be 543 gpd/ft^2 and solids loading would be at least 60 lbs/d/ft^2 to keep the clarifier blanket under control.

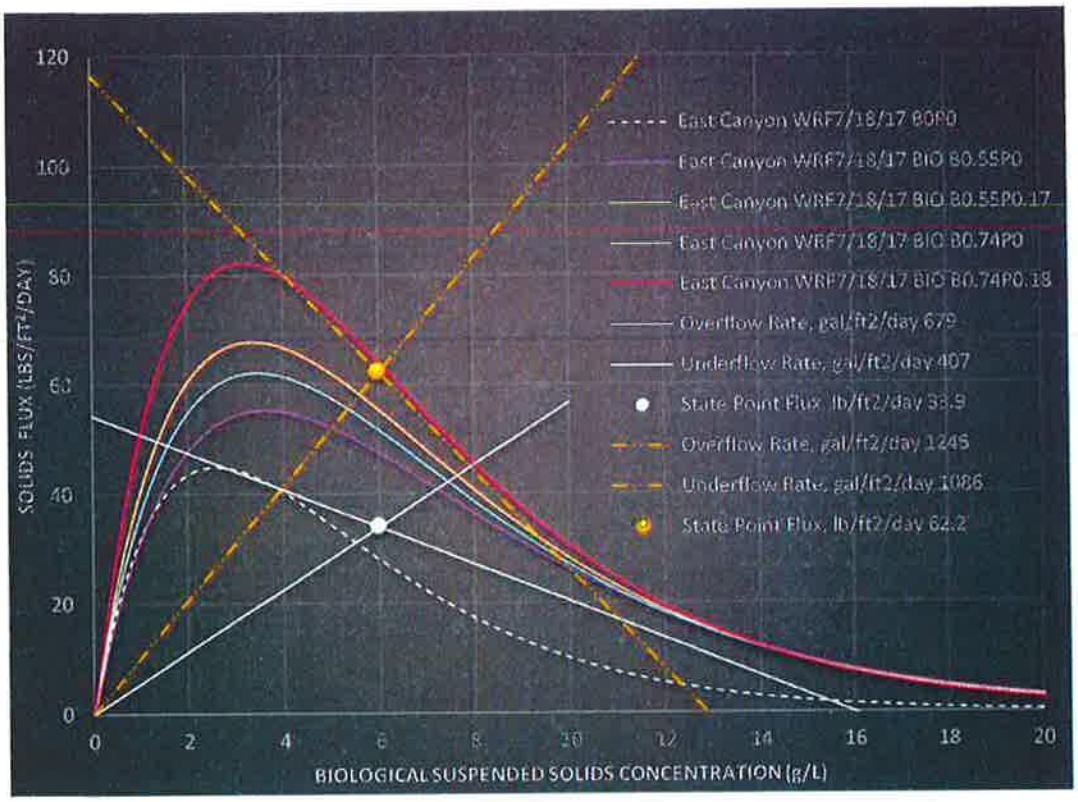
The magnetite only curve, B0.55P0, under the same constraints would allow an increase upwards to 8.35 MGD, 74% increase over conventional, while operating at 6,000 mg/L biological suspended solids (i.e. magnetite backed out for apples to apples comparison). A minimum of 6.0 MGD (72% forward flow) RAS recycle rate would be required to keep the clarifier blankets from rising. Under these conditions the solids loading to the clarifier would be roughly 81 lbs/d/ft^2 (excluding magnetite). The surface overflow rate would be roughly 945 gpd/ft^2.

A higher ratio of magnetite, 0.74:1, could allow up to 9.75 MGD, 103% increase over the conventional, while operating at 6,000 mg/L biological suspended solids (i.e. magnetite backed out for apples to apples comparison). A minimum of 7.9 MGD (81% forward flow) RAS recycle rate would be required to keep the clarifier blankets from rising. This in turn would produce a solids loading to the clarifier of roughly 100 lbs/d/ft^2 (excluding magnetite). The surface overflow rate would be roughly 1103 gpd/ft^2.

The largest curves produced from the testing performed in July of 2017 is that of the higher magnetite scenario with polymer (B0.74P0.18) with the ability to settle solids upwards of 11.2 MGD, 133% flow increase over conventional condition, while operating at 6,000 mg/L biological suspended solids. Maintaining at least an 10 MGD (89%) RAS recycle rate would result in a solids loading to the clarifiers of roughly 120 lbs/d/ft^2. The surface overflow rate would be roughly 1,268 gpd/ft^2. As mentioned previously in this summary a change in polymer selection and/or dosing could likely further increase the ballasted curves thereby enhancing the settling capabilities and loading around the clarifier even further, or reduce the dosage required to achieve the same performance with the polymer used in this testing.

Figure 28 summarizes the July 2017 testing along with two example operating conditions. Based on the observed ballasted solids flux curves developed from this testing, the ECWRF plant would have the capability to operate two (2) 75' diameter clarifiers and process 6 MGD at 6,000 mg/L biological suspended solids in a stable condition while operating with at least an 60% RAS rate. Under these conditions, the biological solids loading to the clarifiers would be 54 lbs/d/ft^2 with an overflow rate of 679 gpd/ft^2. At a 16.5 MGD (2.75x ADF) peak hourly type flow the plant would need (3) 75' diameter clarifiers and would then be able to continue to operate at 6,000 mg/L biological suspended solids with a return rate of at least 14.4 MGD (240% of 6 MGD ADF) in order to prevent any blanket buildup. Under this condition the biological suspended solids loading to the clarifiers would be 117 lbs/d/ft^2 with an overflow rate of 1,245 gpd/ft^2. If the flow is only an hourly type occurrence the return rate could also be much lower with the system merely shifting some solids to the clarifier during that time. Note in order to pass more flow with the same amount of clarifiers, or to pass the equivalent peak flow with two (2) 75' clarifiers, the biological solids loading to the clarifiers would need to be reduced, by running in a storm flow mode or similar fashion, to pass the peak flows.

Figure 28: State Point Analysis of Operating Conditions at 6 MGD influent flow and 16.5 MGD influent flow



APPENDIX D – PRELIMINARY DRAWINGS

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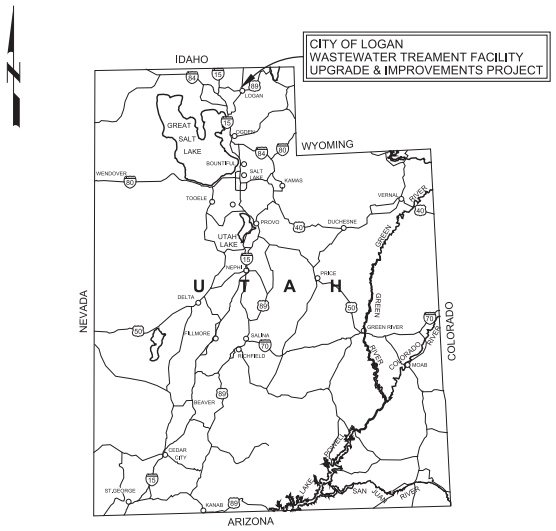
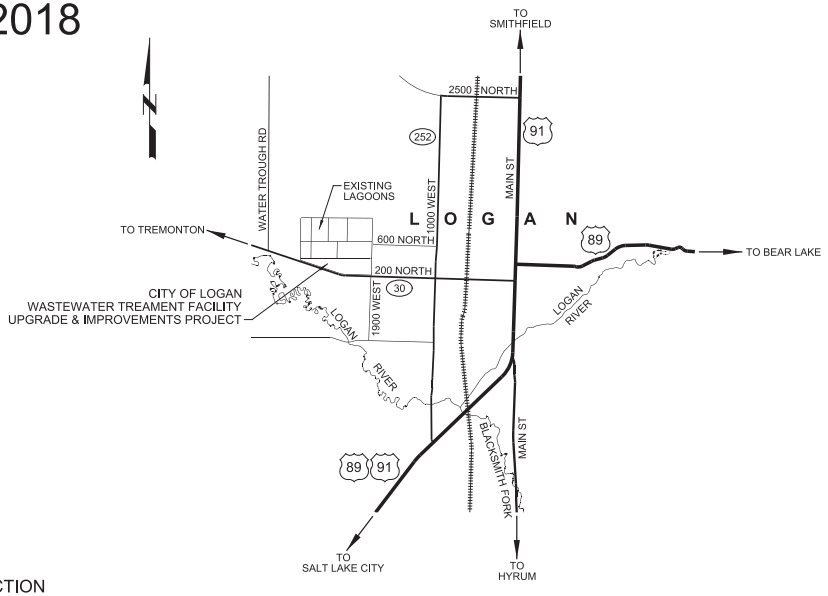
WASTEWATER TREATMENT FACILITY UPGRADE AND IMPROVEMENTS PROJECT

VOLUME 4 OF 6
DRAWINGS
JANUARY 2018



VICINITY MAP



LOCATION MAP

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JOB NO.
8621B.10
DRAWING NO.
G01
SHEET NO.
1 OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B10G01_VOL4.dgn

LOGAN WASTEWATER TREATMENT FACILITY

DESCRIPTION	UNITS	VALUE
GENERAL		
PLANT CAPACITY (MGD)		
ANNUAL AVERAGE FLOW	MGD	18
MAX MONTH FLOW	MGD	21
MAX DAY	MGD	21
* FLOWS OVER 21 MGD GO TO WET WEATHER FLOW EQUILIZATION		
FUTURE CAPACITY (MGD)		
ANNUAL AVERAGE FLOW	MGD	24
MAX MONTH FLOW	MGD	28
MAX DAY	MGD	28
* FLOWS OVER 28 MGD GO TO WET WEATHER FLOW EQUILIZATION		
WASTEWATER CHARACTERISTICS		SUMMER
BOD - AVERAGE	MG/L	100
TSS - AVERAGE	MG/L	115
NH3 - AVERAGE	MG/L	17
TOTAL P - AVERAGE	MG/L	4
TEMPERATURE - MINIMUM	°C	18
WASTEWATER CHARACTERISTICS		WINTER
BOD - AVERAGE	MG/L	140
TSS - AVERAGE	MG/L	180
NH3 - AVERAGE	MG/L	22
TOTAL P - AVERAGE	MG/L	6.3
TEMPERATURE - MINIMUM	°C	13
WET WEATHER FLOW EQUALIZATION		
EXISTING LAGOONS (A1, B1 & E)		
VOLUME AVAILABLE	MG	411
EXISTING HEADWORKS		
COURSE SCREENING		
TYPE		CHAIN AND RAKE
NUMBER		2
OPENING SIZE	IN	3/4
CAPACITY, EA	MGD	20
INFLUENT PUMP STATION		
INFLUENT PUMPS		
TYPE		DRY PIT SUBMERSIBLE
NUMBER		3
CONFIGURATION		2+1
CAPACITY - EA	MGD	10.5
TDH	FT	43
HP	HP	125
CONTROL		VFD
HEADWORKS		
FINE SCREENING		
TYPE		BAND SCREEN
NUMBER		3
OPENING SIZE	MM	6
CAPACITY, EA	MGD	12
GRIT REMOVAL		
TYPE		VORTEX
NUMBER		3
CAPACITY, EA	MGD	12
BIOREACTOR		
NUMBER		3
SECONDARY TREATMENT PROCESS		
HRT - AVERAGE	HRS	9
SRT	DAYS	15-20
MLSS	MG/L	8,000
ANAEROBIC ZONE		
NUMBER OF CELLS		3
VOLUME - TOTAL	MG	0.17
NUMBER OF MIXERS		3
MIXER HP - EA	HP	7.5
MIXER TYPE		VERTICAL
ANOXIC ZONE		
VOLUME	MG	0.43
NUMBER OF MIXERS		2
MIXER HP - EA	HP	20
MIXER TYPE		VERTICAL
ML RECYCLE RATE	%	200-400

DESCRIPTION	UNITS	VALUE
AEROBIC ZONE		
VOLUME	MG	1.56
NO. OF AERATORS		2
AERATOR HP - EA	HP	200
AERATOR TYPE		SURFACE
O2 TRANSFER EFFICENCY	LBS-HP/HR	3.5
NO. SUPPLEMENTAL MIXERS		4
SUPPLEMENTAL MIXERS HP - EA	HP	3
SUPPLEMENTAL MIXERS TYPE		Submersible
SECONDARY CLARIFICATION		
CLARIFIERS		
NUMBER		4
TYPE		CENTER FEED, SPIRAL BLADE
DIAMETER	FT	90
SIDE WATER DEPTH	FT	15
OVERFLOW RATE	GPD/SF	950
SOLIDS LOADING RATE - PEAK	LBS/DAY/SF	73
SOLIDS LOADING RATE - AVERAGE	LBS/DAY/SF	63
POLYMER ADDITION		
CHEMICAL		POLYMER
DOSING RANGE	MG/L	0.1-0.4
RAS PUMPS		
TYPE		HORIZ. NON-CLOG
NUMBER		6
CONFIGURATION		2+1
CAPACITY - EA	GPM	3,200
TDH	FT	20.5
HP	HP	25
CONTROL		VFD
WASTE ACTIVATED SLUDGE		
MAX MONTH	LBS/DAY	17,100
AVERAGE MONTH	LBS/DAY	14,600
WAS VOLUME - MAX MONTH @ 2.0%	GAL/DAY	103,000
WAS VOLUME - AVERAGE MONTH @ 2.0%	GAL/DAY	88,000
SCUM PUMPS		
TYPE		VERTICAL-CHOPPER
NUMBER SCUM BOXES		2
NUMBER PUMPS PER BOX		2
CONFIGURATION		1+1
CAPACITY - EA	GPM	100
TDH	FT	34.0
HP	HP	5
CHEMICAL ADDITION		
PRIMARY COAGULANT		
CHEMICAL		ALUM
ALUM CONCENTRATION IN FEED	MG/L	30-55
DOSING RANGE	G/HR	15-60
STORAGE TANKS		
NUMBER		2
VOLUME - EA	GAL	7,000
TYPE		Fiberglass
DIAMETER	FT	10
BIOMAG		
SCREENING		
TYPE		ROTARY DRUM
NUMBER		1
OPENING SIZE	MM	2
HP	HP	0.5
WAS SCREEN FEED PUMPS		
TYPE		ROTARY LOBE
NUMBER		2
CAPACITY - EA	GPM	150
TDH	FT	20
HP	HP	5
CONTROL		VFD
SHEAR MILL		
NUMBER		3
CAPACITY - EA	GPM	52
HP	HP	40
CONTROL		VFD

DESCRIPTION	UNITS	VALUE
SHEAR MILL FEED PUMPS		
TYPE		ROTARY LOBE
NUMBER		3
CAPACITY - EA	GPM	90
TDH	FT	20
HP	HP	5
CONTROL		VFD
MAGNETITE RECOVERY DRUMS		
NUMBER		6
CAPACITY - EA	GPM	25.8
HP	HP	7.5
CONTROL		VFD
BALLAST DISCHARGE PUMPS		
TYPE		ROTARY LOBE
NUMBER		2
CAPACITY - EA	GPM	30
TDH	FT	20
HP	HP	7.5
CONTROL		VFD
UV DISINFECTION		
TYPE		LPHO
NUMBER OF MODULES		6
NUMBER OF LAMPS/MODULE		12
TOTAL LAMPS		72
UV TRANSMISSION		67% @ 254 NM
DEWATERING FEED PUMPS		
NUMBER		1
TYPE		CIRCULAR
DIAMETER	FT	90
WATER DEPTH	FT	15
WAS STORAGE - MAX MONTH @ 2.0%	DAYS	7
JET AERATION PUMPS		
NUMBER		3
PUMP HP - EA	HP	30
DEWATERING		
WAS PUMPS		
TYPE		PROGRESSIVE CAVITY
NUMBER		2
CONFIGURATION		1+1
CAPACITY - EA	GPM	50-175
TDH	FT	35
HP	HP	10.0
CONTROL		VFD
SOLIDS FEED PUMPS		
TYPE		PROGRESSIVE CAVITY
NUMBER		3
CAPACITY - EA	GPM	110-220
TDH	FT	55
HP	HP	15
CONTROL		VFD
DEWATERING EQUIPMENT		
TYPE		ROTARY FAN PRESS/SCREW PRESS
NUMBER		4
SOLIDS LOADING -EA	LBS/HR	600
DEWATERED CAKE SOLIDS	%	15

REV	DATE	BY	DESCRIPTION

DESIGNED RWB
DRAWN TSD
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DATE JANUARY 2018

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CITY OF LOGAN
WWTF UPGRADE AND IMPROVEMENTS PROJECT
GENERAL
DESIGN CRITERIA

VERIFY SCALES
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SHEET NO. OF XXX

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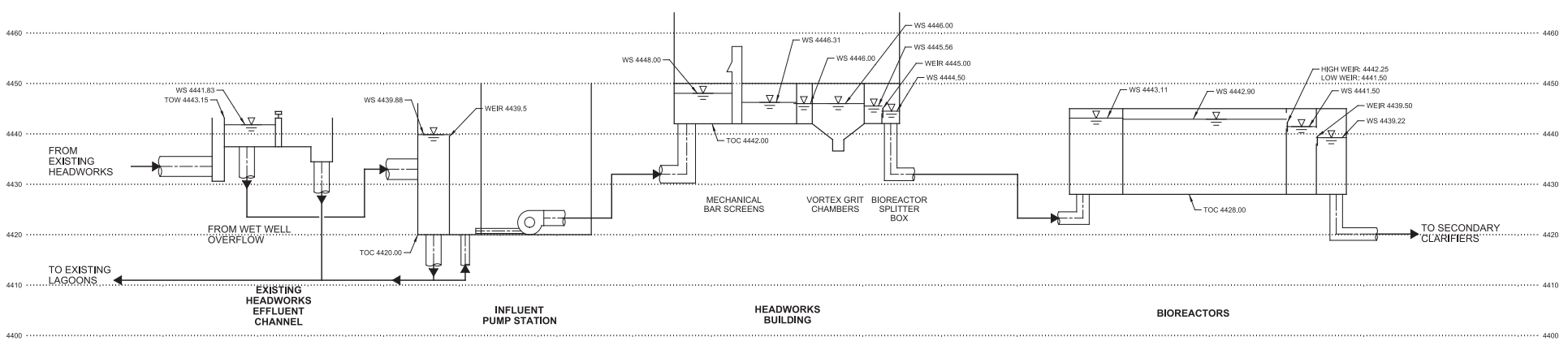
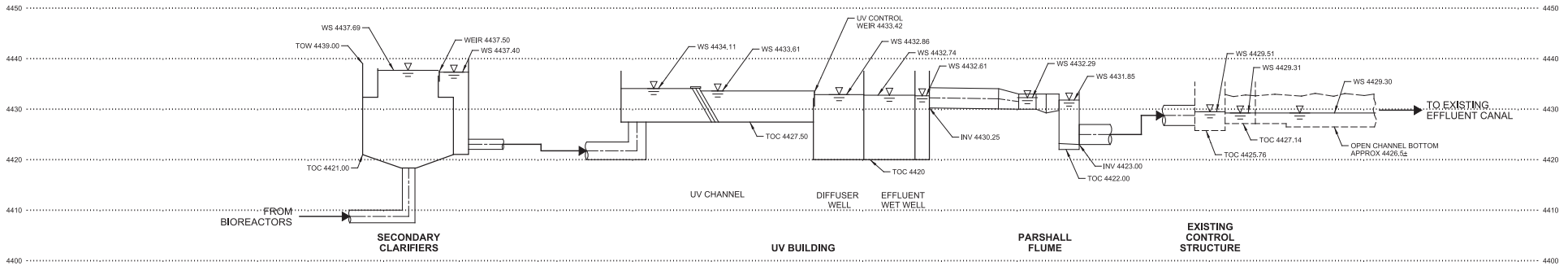


PROFILE DESIGNED FOR FUTURE MAX DAY FLOW OF 28 MGD AND 75% RAS



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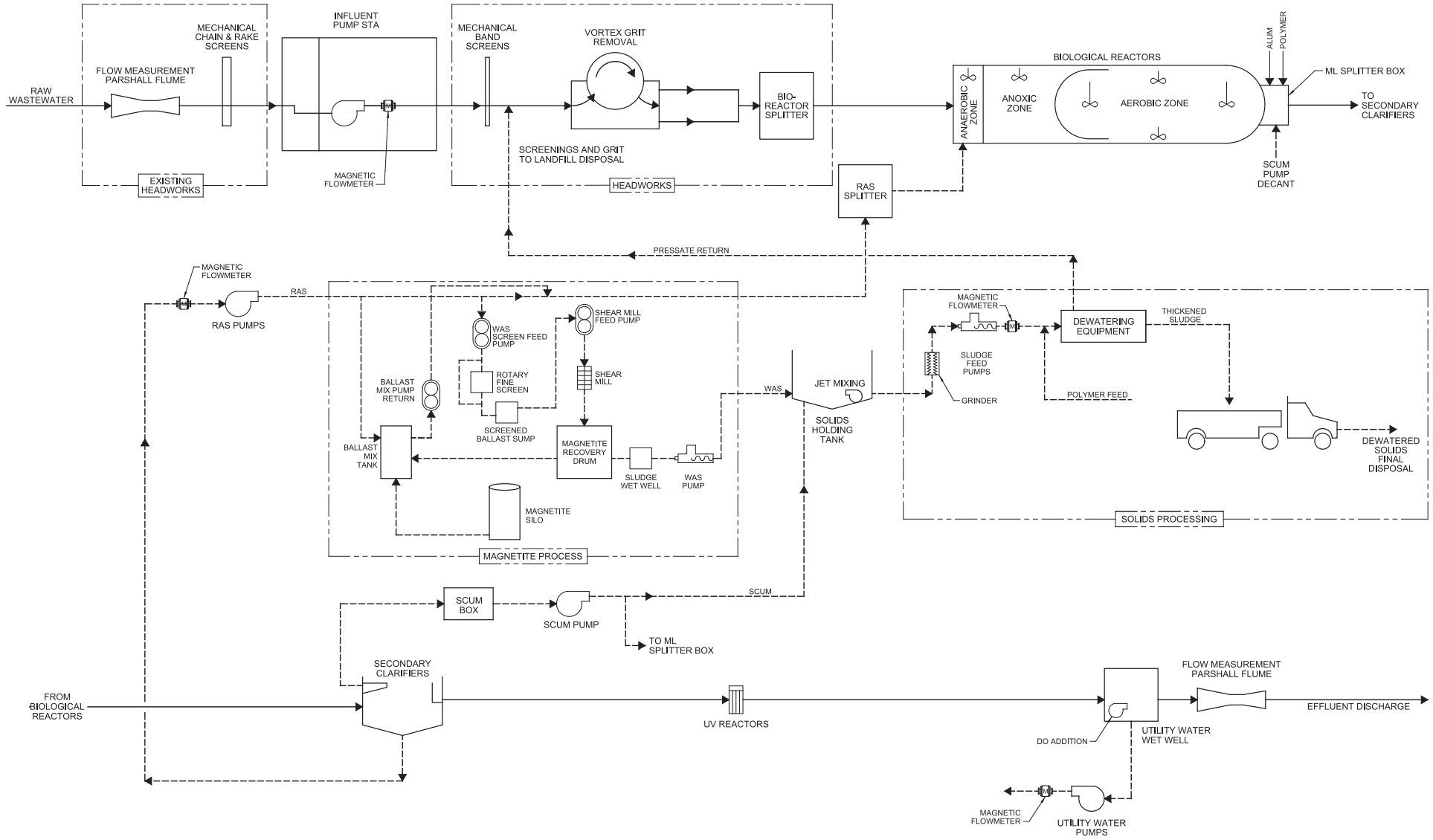

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GENERAL
PROCESS FLOW DIAGRAM

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DRAWING NO. G05
SHEET NO. OF XXX

PROJECT NO.
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Model: Layout1
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GENERAL NOTES:

1. XXXX
2. XXXX

KEY NOTES:

1. SEE DRAWING CC01 FOR SITE SURVEY COORDINATES.
2. SEE DRAWINGS PP01-PP06 FOR PLAN AND PROFILE OF 42" PI LINE FROM EXISTING HEADWORKS BUILDING TO NEW HEADWORKS BUILDING.
3. SEE DRAWINGS 00C03 AND 00C04.
4. SEE DRAWING 00C05 FOR GEOTECHNICAL INVESTIGATION.
5. SEE DRAWINGS CD09 - CD12 FOR EXCAVATION PLANS AND SECTIONS.

NEW FACILITIES
(NOT SHOWN ON DWG 00C03)

29 IPS ELECTRICAL BUILDING
30 INFLUENT PUMP STATION
31 SEPTAGE DUMP STATION

EXISTING FACILITIES
(NOT SHOWN ON DWG 00C03)

32 EXISTING HEADWORKS

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CIVIL
OVERALL SITE PLAN

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DRAWING NO. 00C02
SHEET NO. OF XXX

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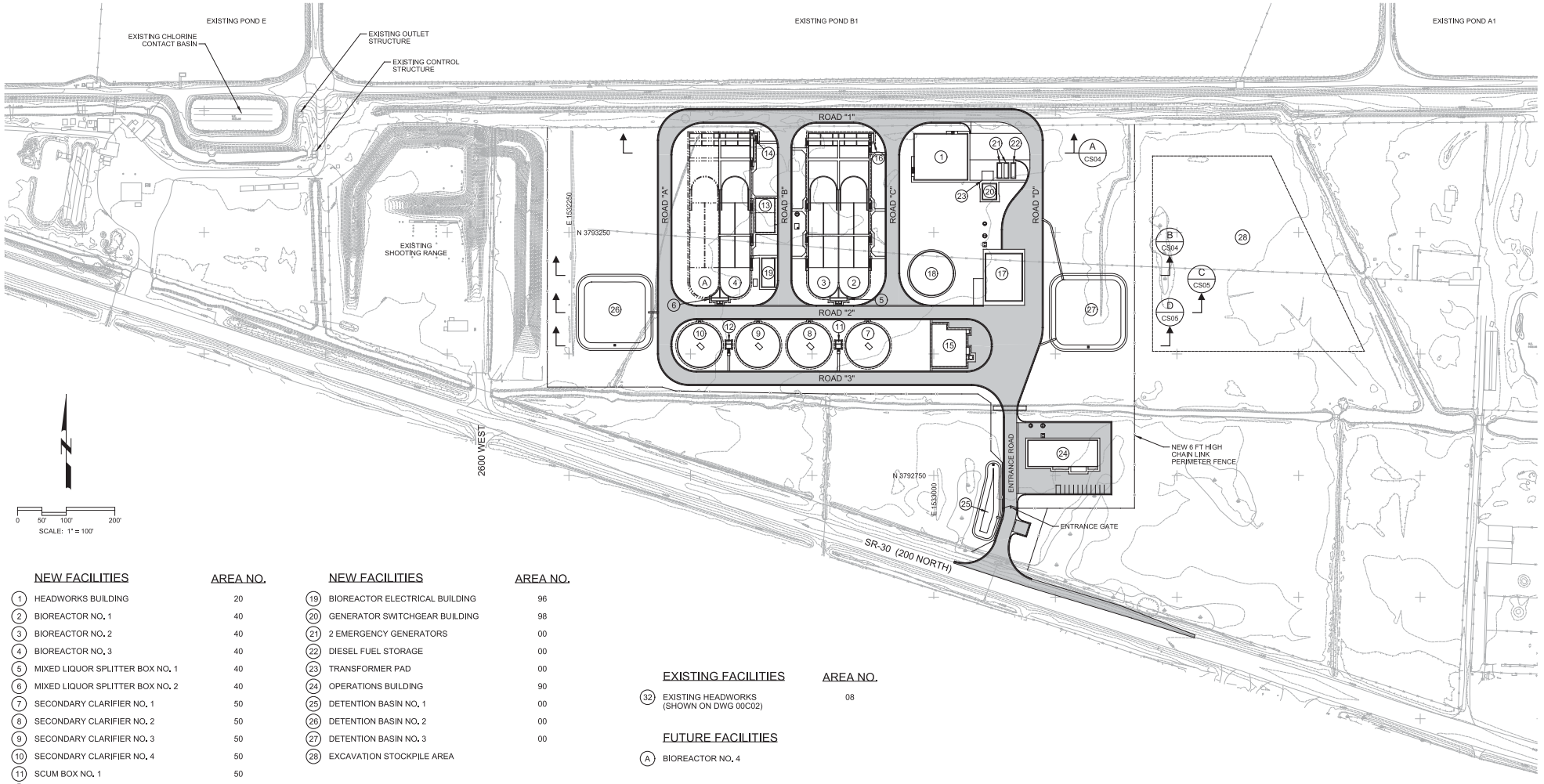

NEW FACILITIES		AREA NO.
1	HEADWORKS BUILDING	20
2	BIOREACTOR NO. 1	40
3	BIOREACTOR NO. 2	40
4	BIOREACTOR NO. 3	40
5	MIXED LIQUOR SPLITTER BOX NO. 1	40
6	MIXED LIQUOR SPLITTER BOX NO. 2	40
7	SECONDARY CLARIFIER NO. 1	50
8	SECONDARY CLARIFIER NO. 2	50
9	SECONDARY CLARIFIER NO. 3	50
10	SECONDARY CLARIFIER NO. 4	50
11	SCUM BOX NO. 1	50
12	SCUM BOX NO. 2	50
13	UV BUILDING	60
14	PARSHALL FLUME	40
15	BIOMAG / RAS BUILDING	70
16	RAS SPLITTER BOX	40
17	DEWATERING BUILDING	80
18	SOLIDS HOLDING TANK	85

NEW FACILITIES		AREA NO.
19	BIOREACTOR ELECTRICAL BUILDING	96
20	GENERATOR SWITCHGEAR BUILDING	98
21	2 EMERGENCY GENERATORS	00
22	DIESEL FUEL STORAGE	00
23	TRANSFORMER PAD	00
24	OPERATIONS BUILDING	90
25	DETENTION BASIN NO. 1	00
26	DETENTION BASIN NO. 2	00
27	DETENTION BASIN NO. 3	00
28	EXCAVATION STOCKPILE AREA	

NEW FACILITIES (NOT SHOWN ON THIS DWG) SEE DWG 00C02		AREA NO.
29	IPS ELECTRICAL BUILDING	95
30	INFLUENT PUMP STATION	10
31	SEPTAGE DUMP STATION	

EXISTING FACILITIES		AREA NO.
32	EXISTING HEADWORKS (SHOWN ON DWG 00C02)	08

FUTURE FACILITIES	
A	BIOREACTOR NO. 4

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MAIN PLANT SITE PLAN
NEW FACILITIES

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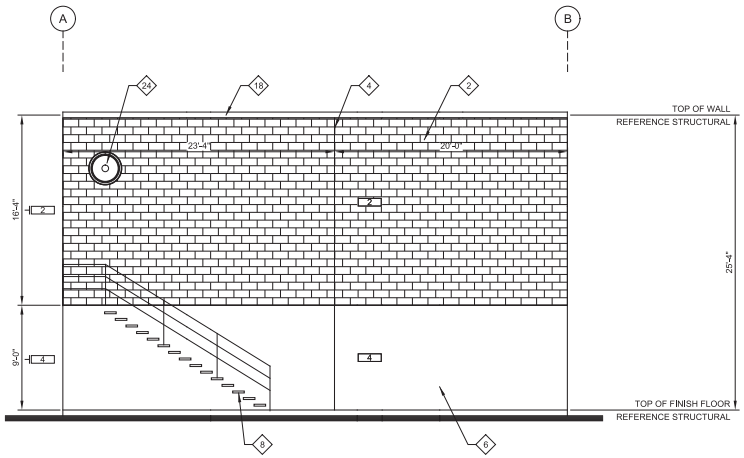

C WEST ELEVATION

SCALE: 3/16" - 1'-0"
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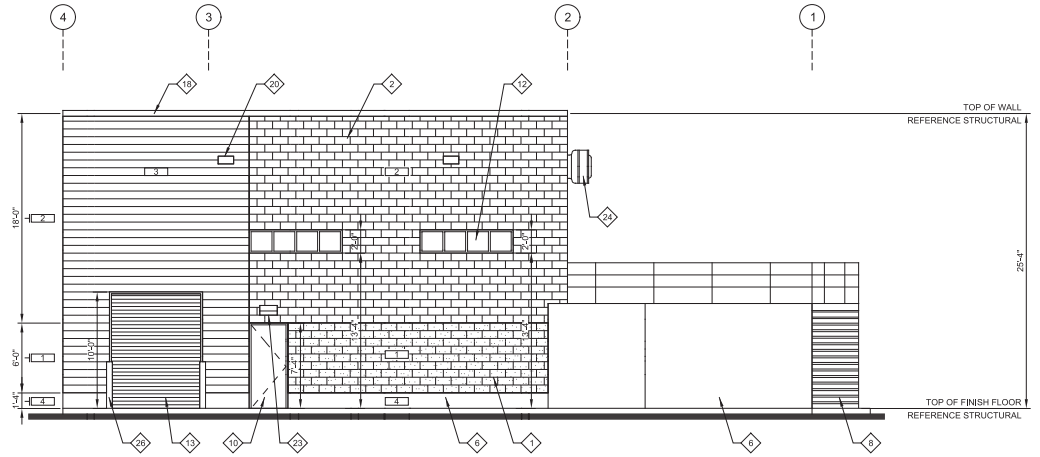

D NORTH ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1010A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

COLOR SCHEDULE:

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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ARCHITECTURAL
INFLUENT PUMP STATION
NORTH AND WEST ELEVATIONS

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DRAWING NO. 10A03
SHEET NO. OF XXX

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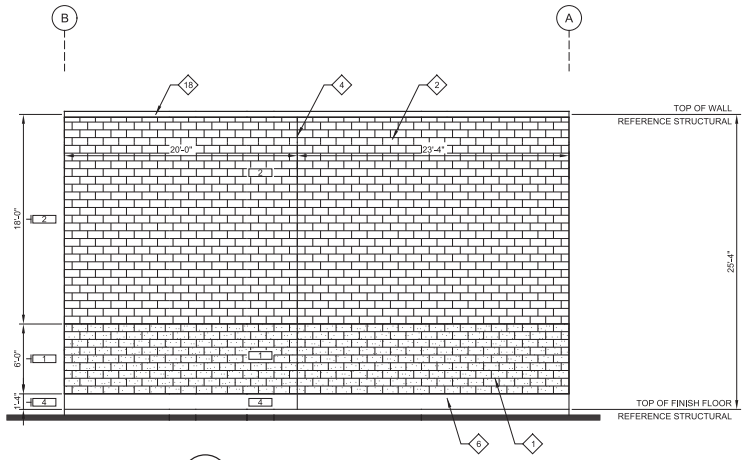

E EAST ELEVATION

SCALE: 3/16" - 1'-0"
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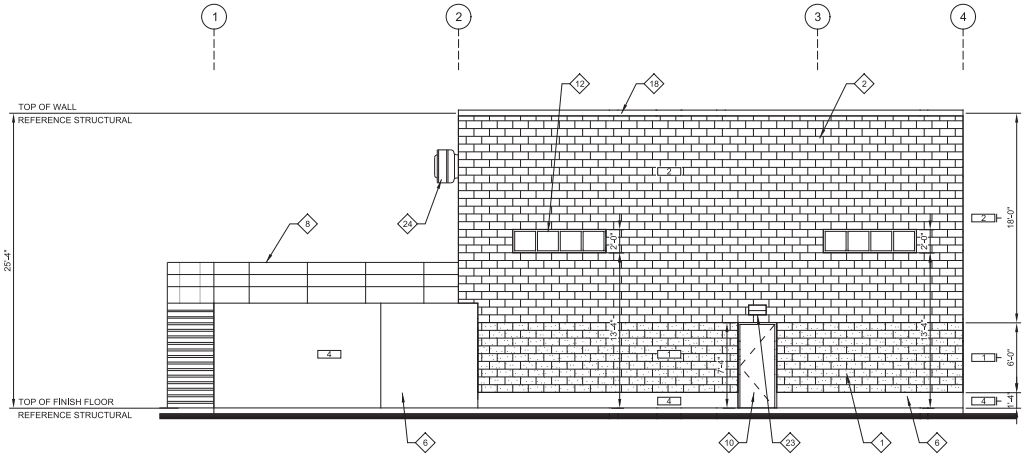

F SOUTH ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1010A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
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25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
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27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

COLOR SCHEDULE:

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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INFLUENT PUMP STATION
SOUTH AND EAST ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

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DRAWING NO. 10A04
SHEET NO. OF XXX

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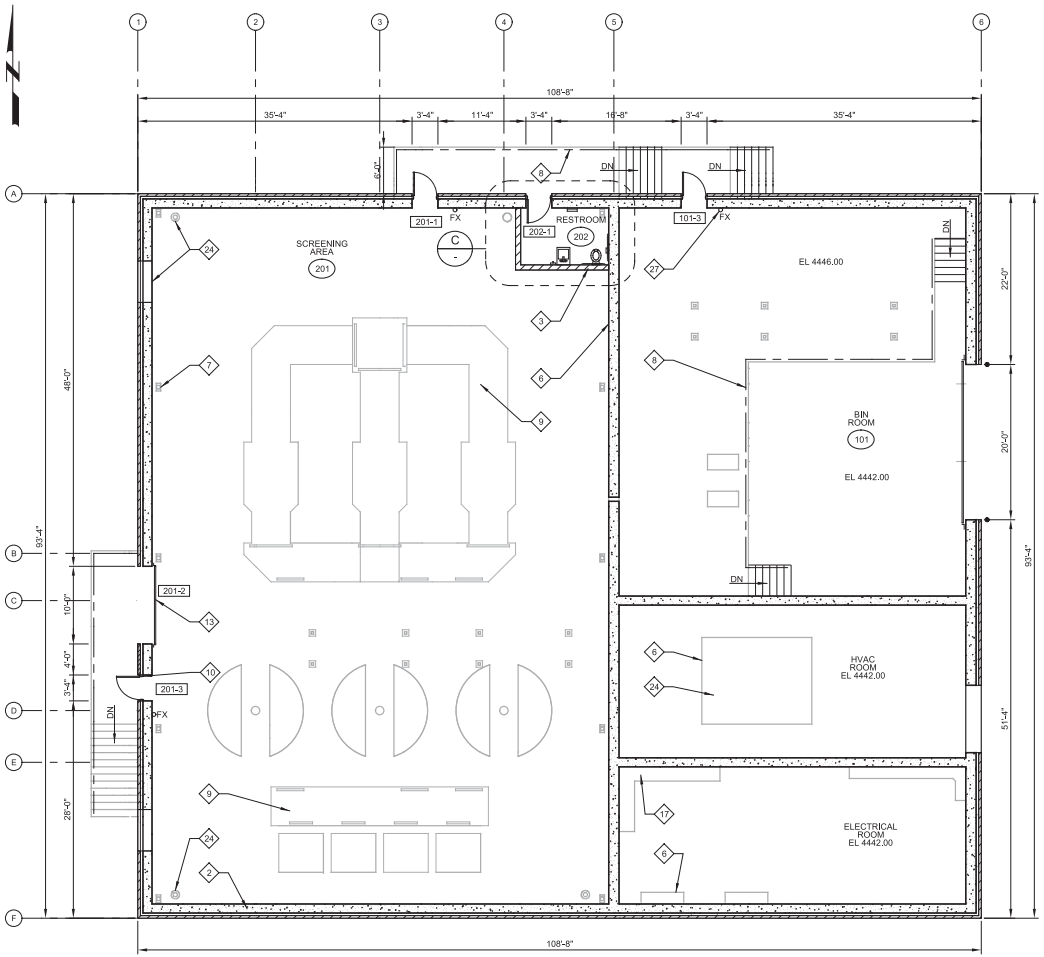

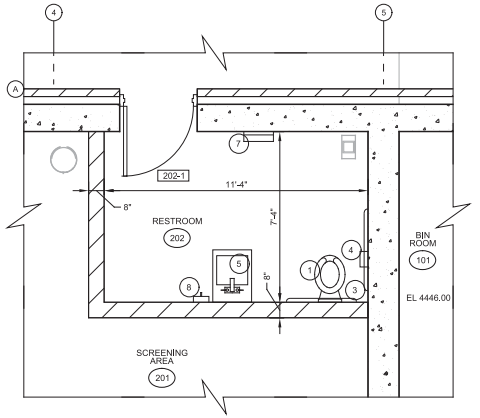

TOILET ROOM SCHEDULE:

1. WALL MOUNTED WATER CLOSET.
2. URINAL.
3. GRAB BARS.
4. TOILET PAPER HOLDER.
5. WALL MOUNTED LAVATORY.
6. SEMI-RECESSED PAPER TOWEL DISPENCER AND RECEPTACLE.
7. WALL MOUNTED PAPER TOWEL DISPENCER AND RECEPTACLE.
8. SOAP DISPENSER.

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30. FLOOR HATCH, REFERENCE STRUCTURAL

B UPPER PLAN
SCALE: 1/8" = 1'-0"
FILE: 8621B1020A102.2dm

C RESTROOM - ENLARGERD PLAN
SCALE: 3/16" = 1'-0"
FILE: 8621B1020A102.2dm

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FLOOR PLAN

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 20A02
SHEET NO. OF XXX

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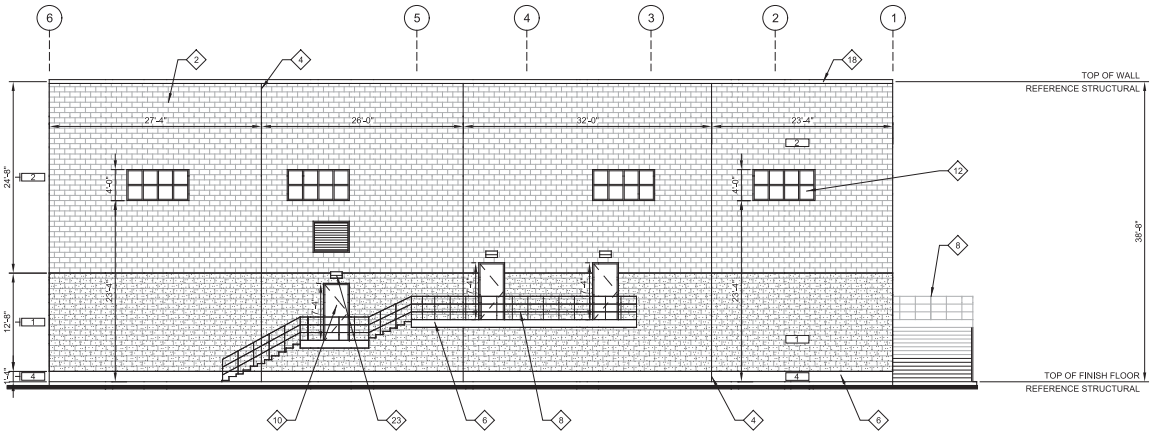

E NORTH ELEVATION

SCALE: 1/8" - 1'-0"
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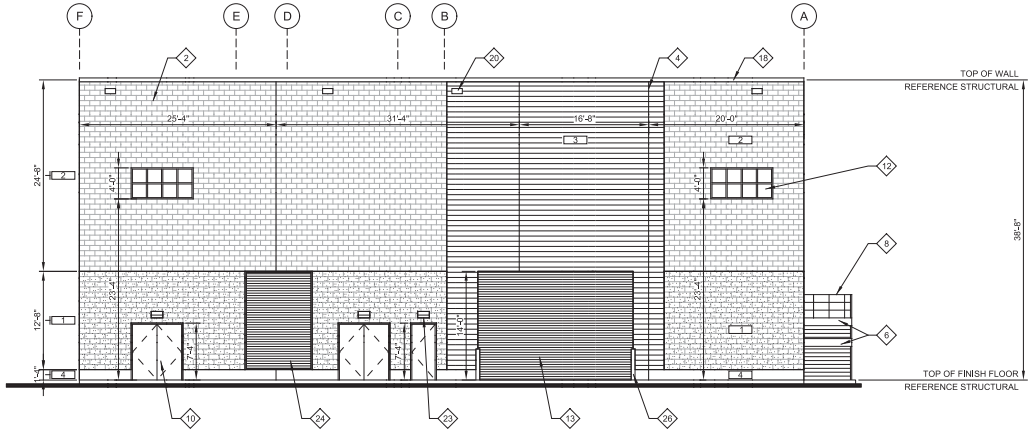

F EAST ELEVATION

SCALE: 1/8" - 1'-0"
FILE: 8621B1020A501.2dm

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3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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VERIFY SCALES
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0 1"
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DRAWING NO. 20A04
SHEET NO. OF XXX

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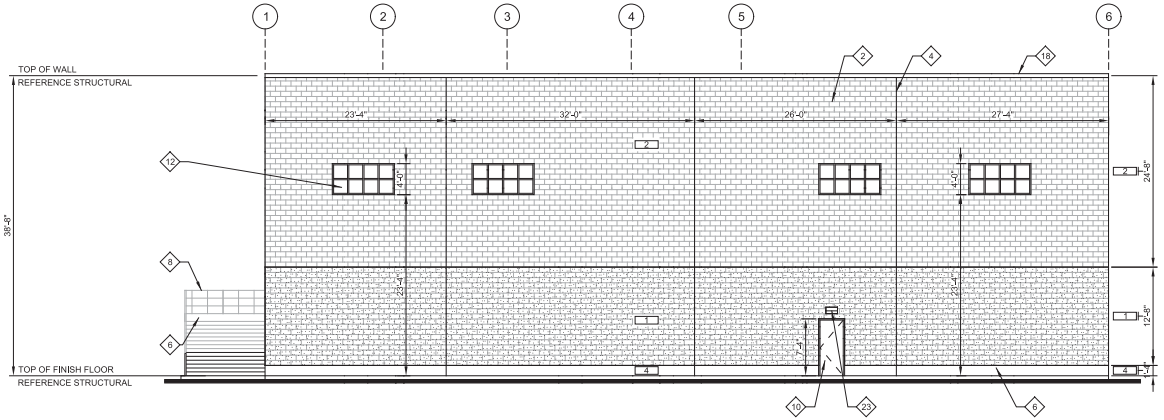

G SOUTH ELEVATION

SCALE: 1/8" - 1'-0"
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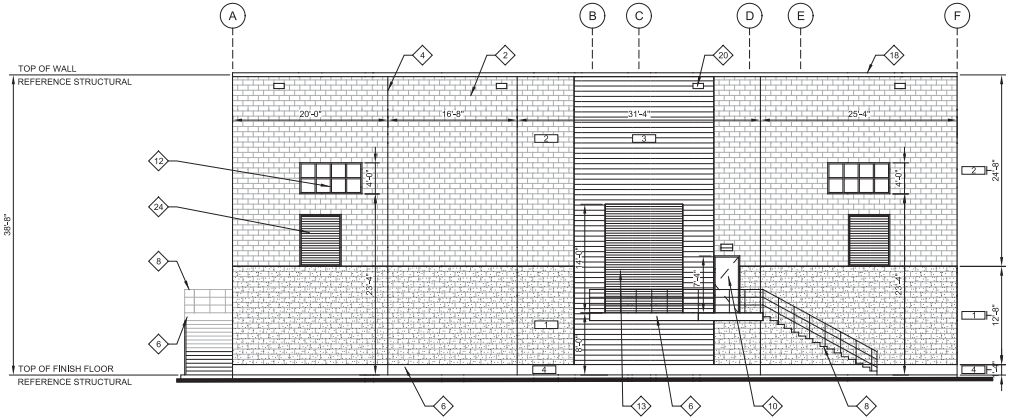

H WEST ELEVATION

SCALE: 1/8" - 1'-0"
FILE: 8621B1020A501.2dm

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JOB NO. 8621B.10
DRAWING NO. 20A05
SHEET NO. OF XXX

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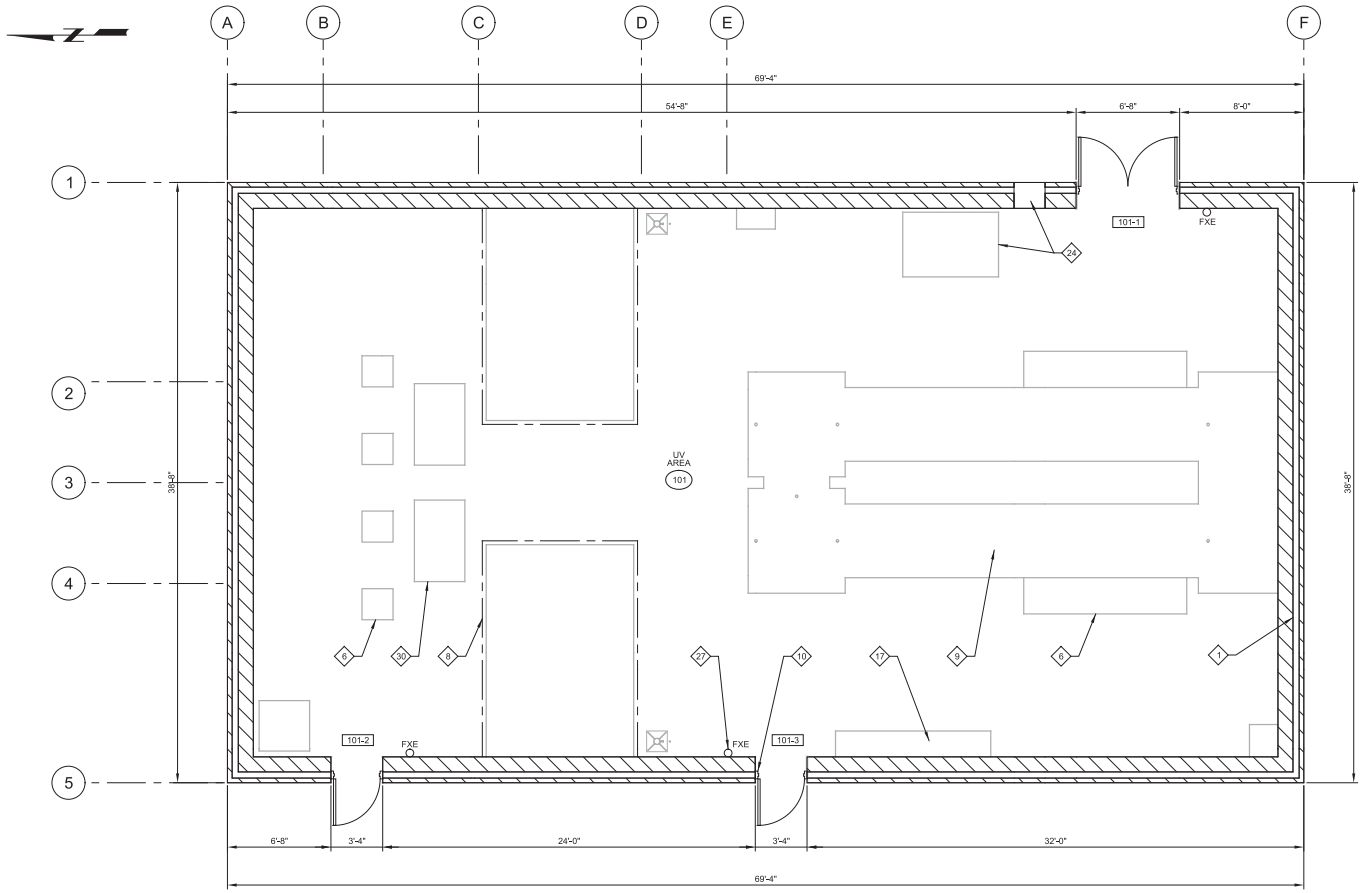

A UPPER PLAN

SCALE: 1/4" = 1'-0"
FILE: 8621B1060A101.2dm

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VERIFY SCALES
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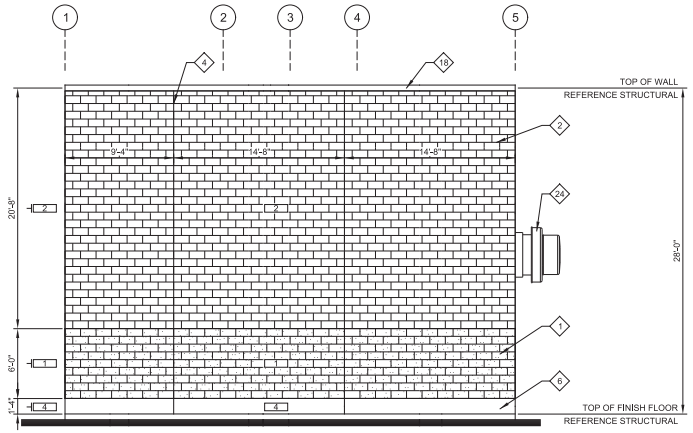

C NORTH ELEVATION

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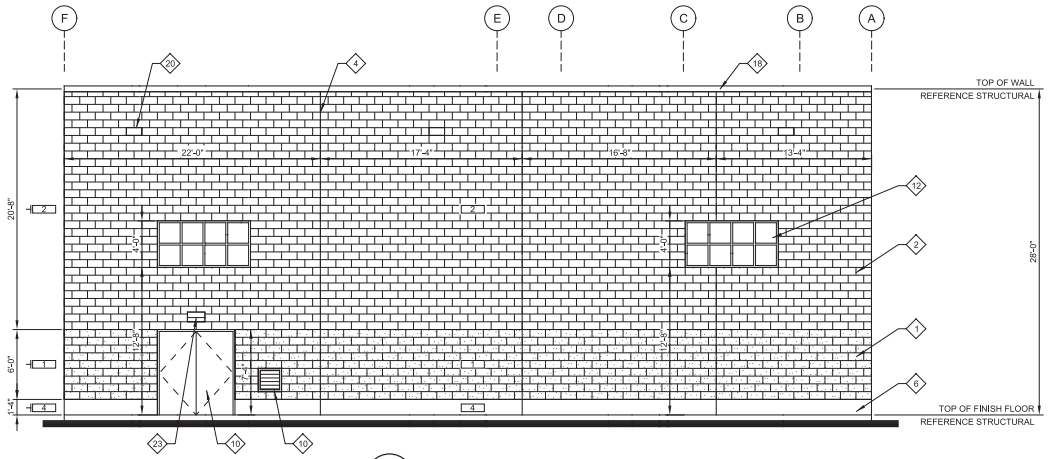

D EAST ELEVATION

SCALE: 3/16" = 1'-0"
FILE: 8621B1060A501.2dm

GENERAL NOTES;

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS ;
NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

COLOR SCHEDULE;

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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0 1"
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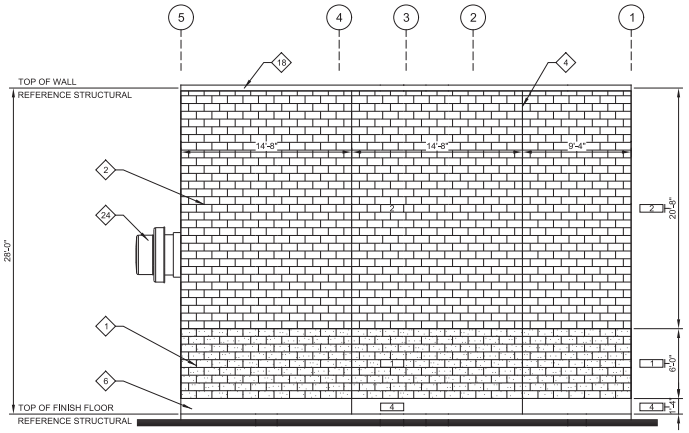

E SOUTH ELEVATION

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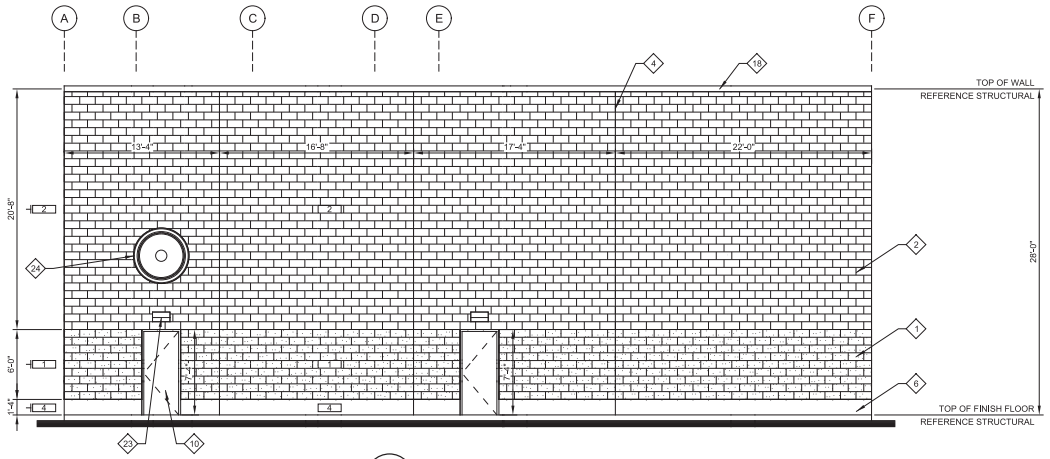

F WEST ELEVATION

SCALE: 3/16" = 1'-0"
FILE: 8621B1060A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :
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2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
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6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
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22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
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29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

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2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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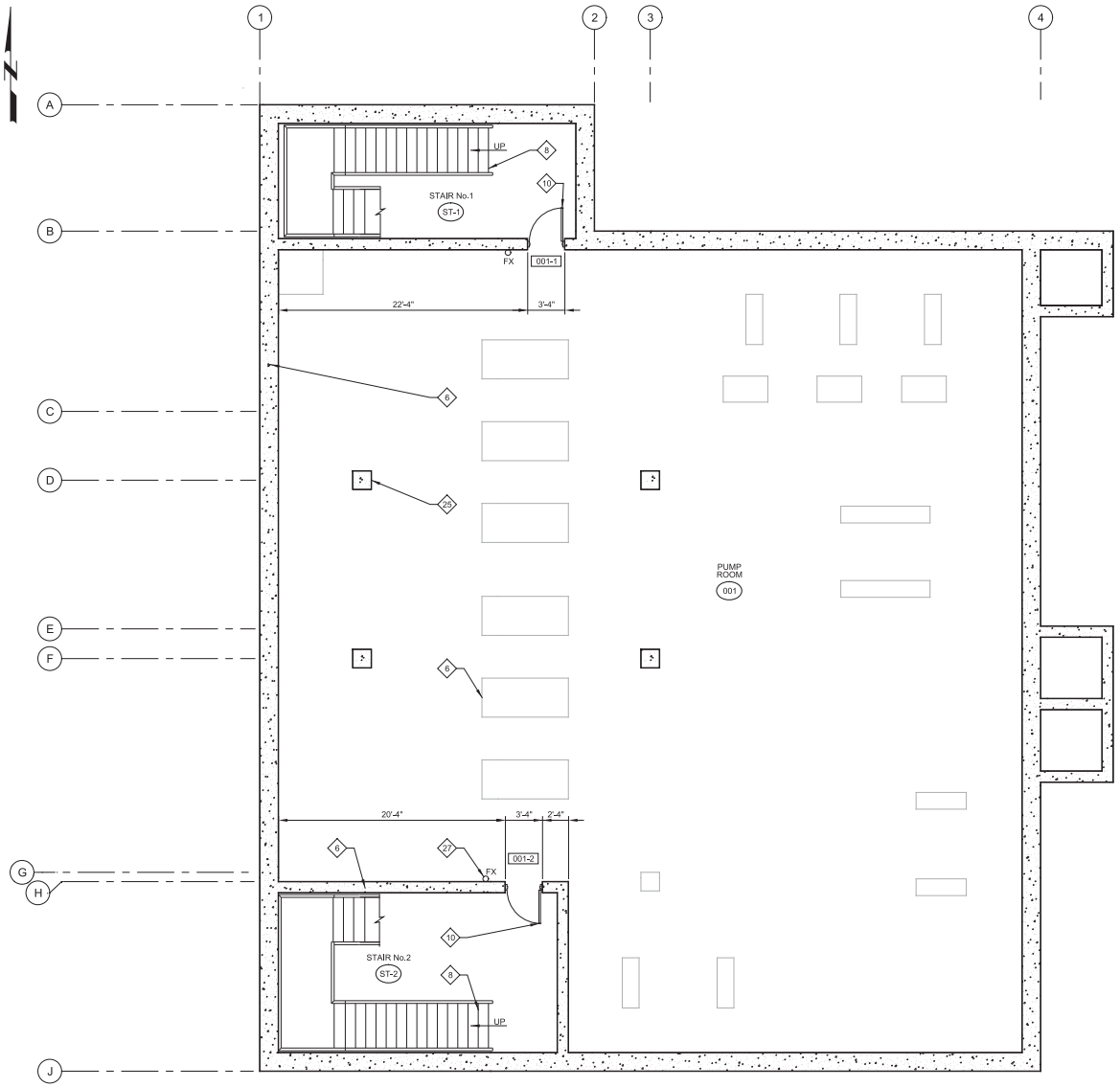

A LOWER PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1070A101.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

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6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
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22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

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VERIFY SCALES
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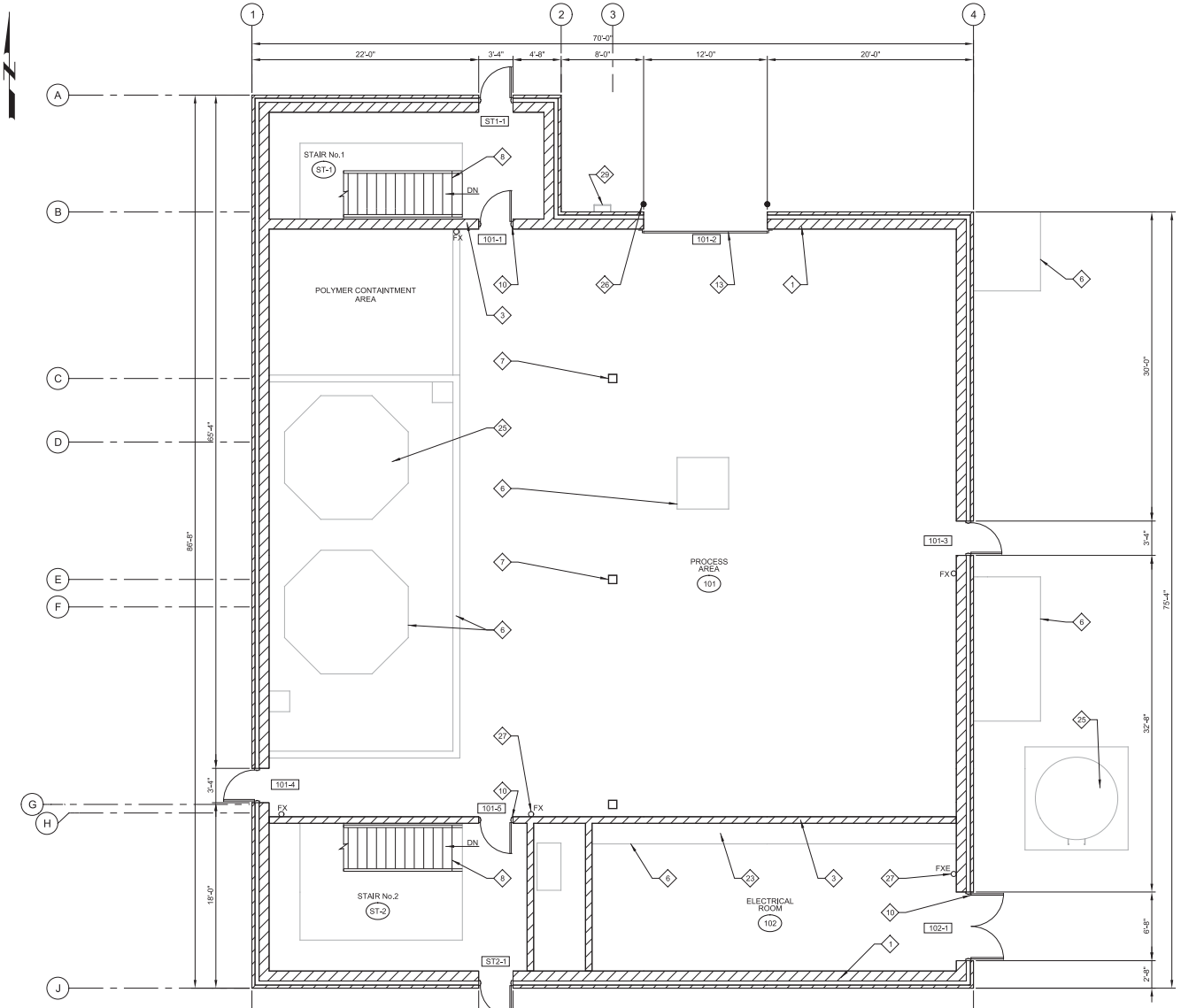

B UPPER PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1070A102.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
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KEY NOTES - FOR PLANS & ELEVATIONS :
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11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
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13. OVERHEAD COILING DOOR AND FRAME
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30. FLOOR HATCH, REFERENCE STRUCTURAL

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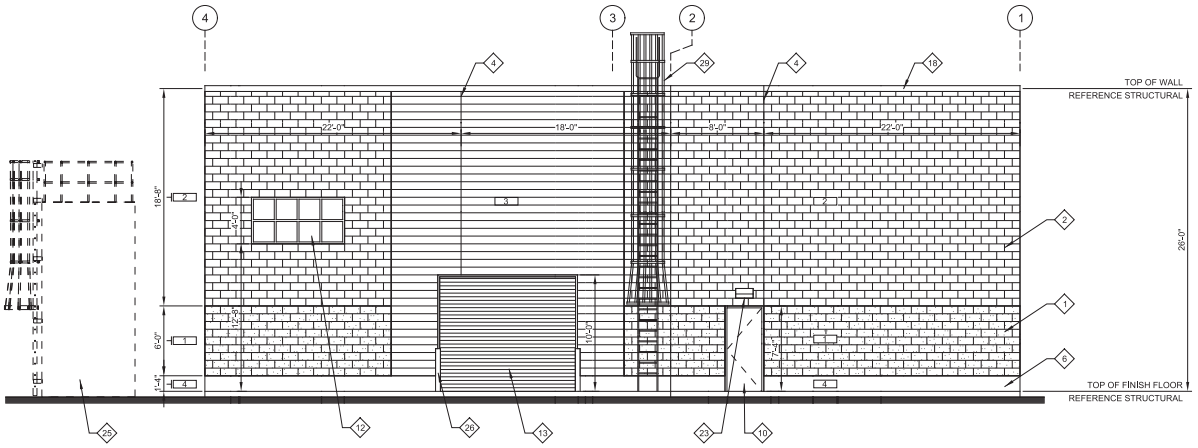

D NORTH ELEVATION

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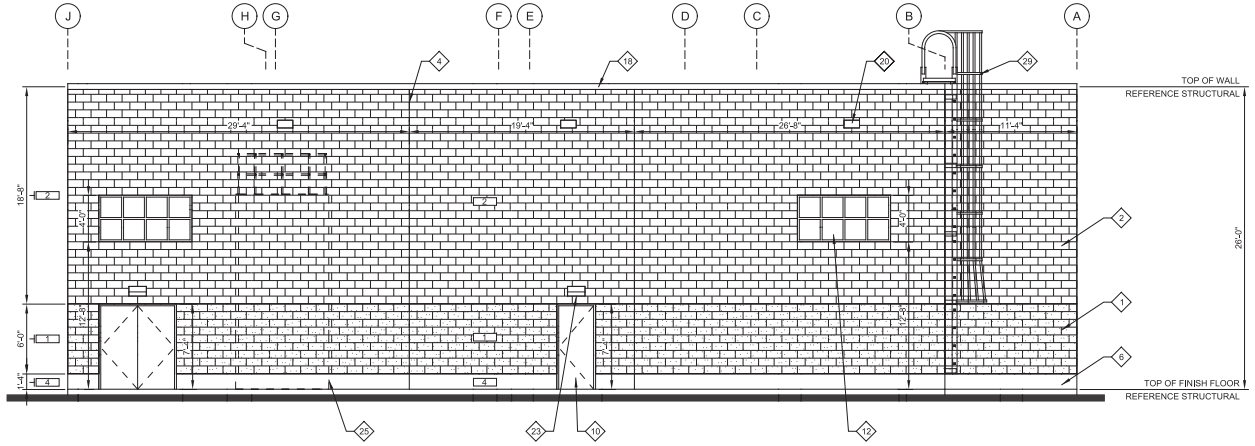

E EAST ELEVATION

SCALE: 3/16" = 1'-0"
FILE: 8621B1070A501.2dm

GENERAL NOTES:

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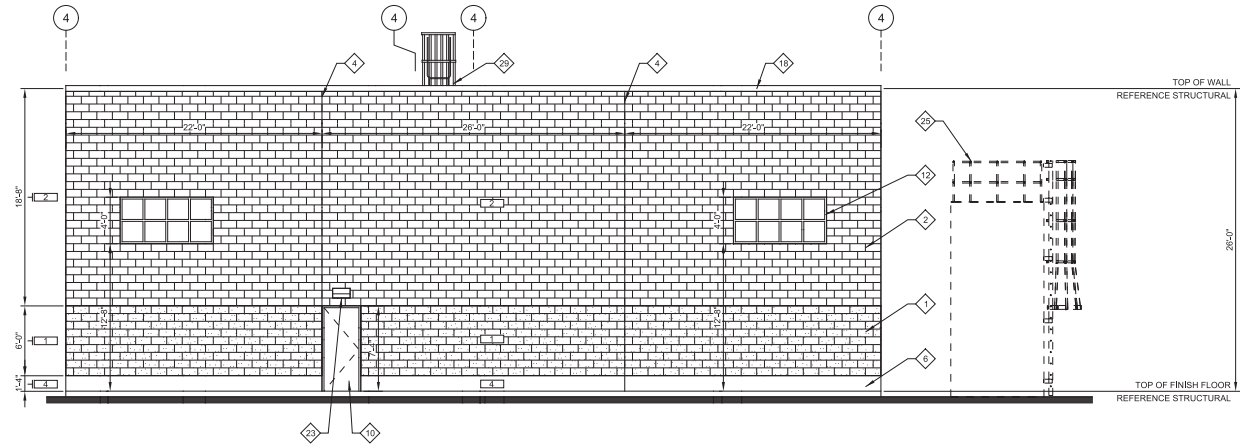

F SOUTH ELEVATION

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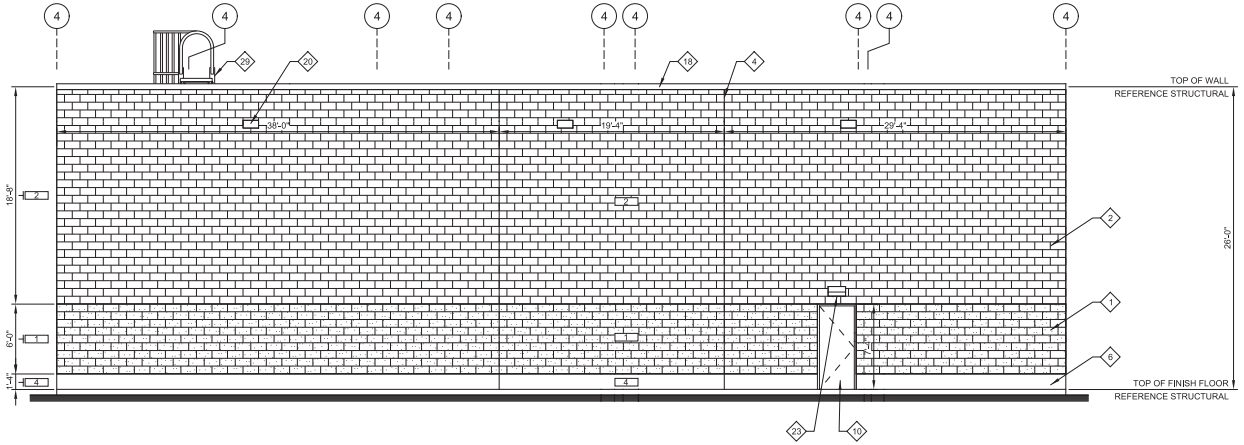

G WEST ELEVATION

SCALE: 3/16" = 1'-0"
FILE: 8621B1070A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

COLOR SCHEDULE:

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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SOUTH AND WEST ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 70A05
SHEET NO. OF XXX

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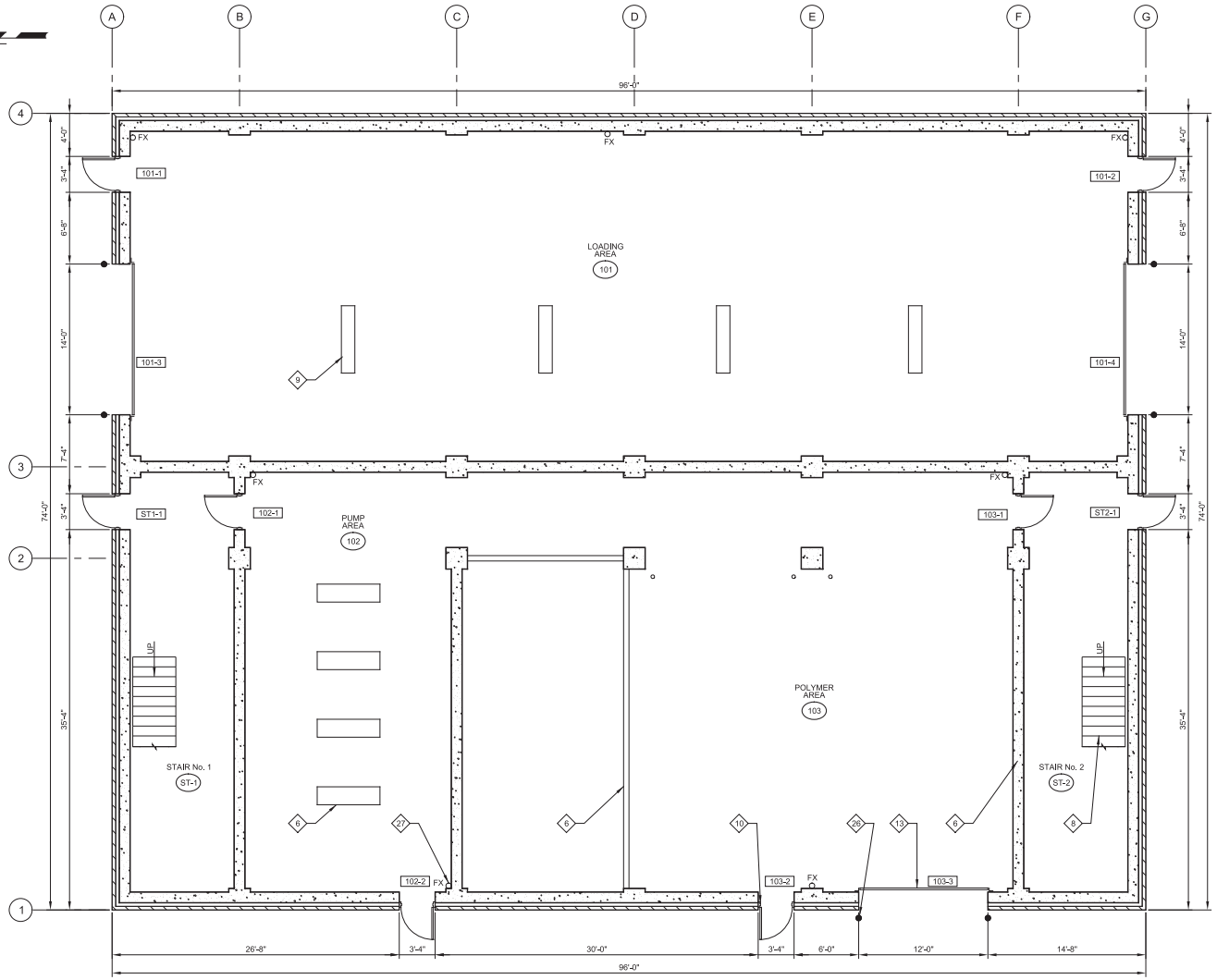

A LOWER PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1080A101.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

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DEWATERING BUILDING FLOOR PLAN

VERIFY SCALES
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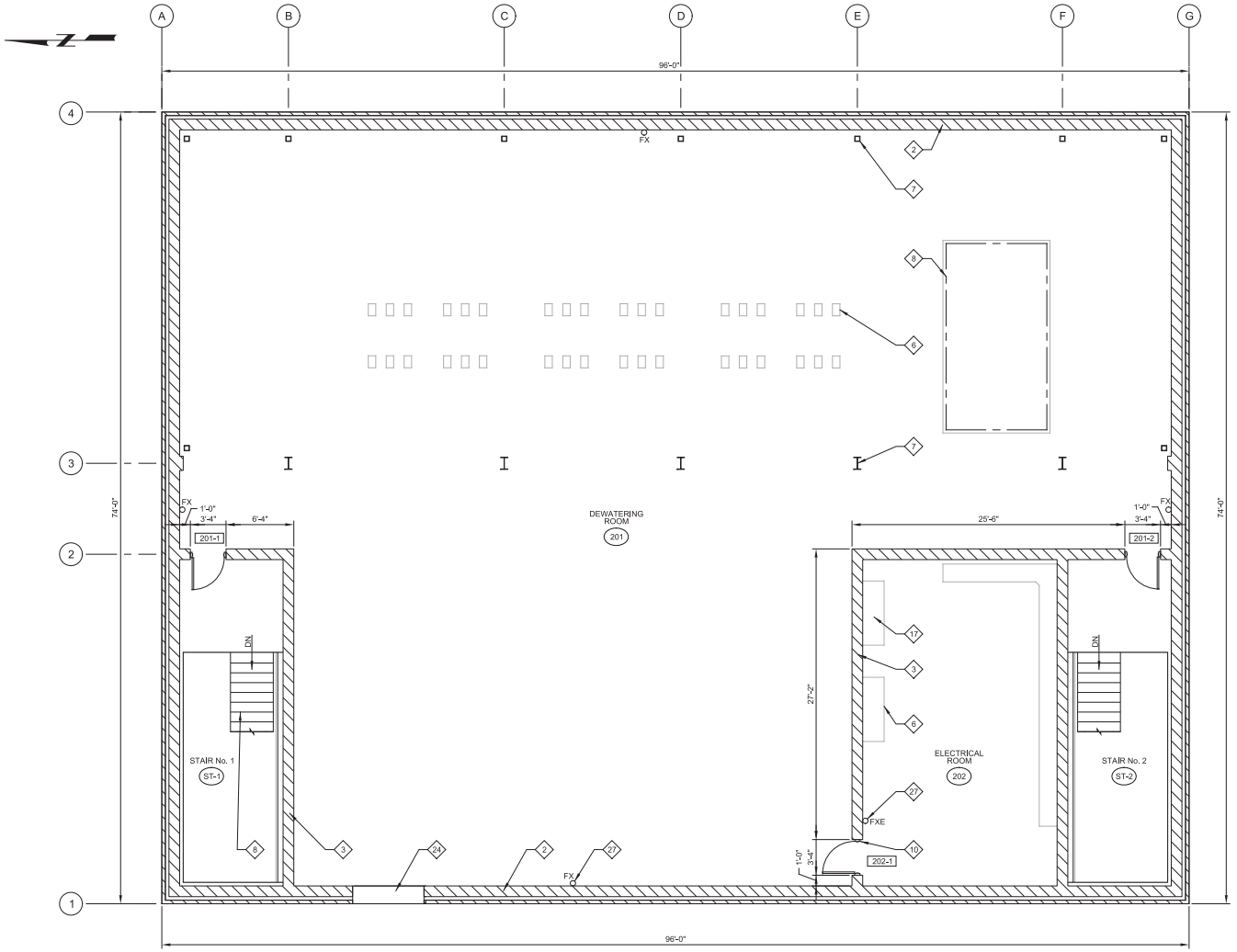
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 80A01
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1080A001.dgn



B UPPER PLAN

SCALE: 3/16" - 1'-0"
FILE: 8621B1080A102.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS :

NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
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22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
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29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

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JOB NO. 8621B.10
DRAWING NO. 80A02
SHEET NO. OF XXX

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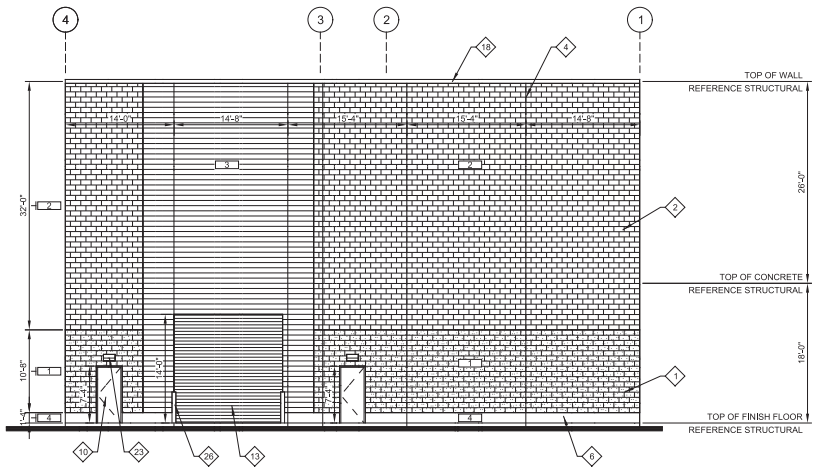

D NORTH ELEVATION

SCALE: 1/8" - 1'-0"
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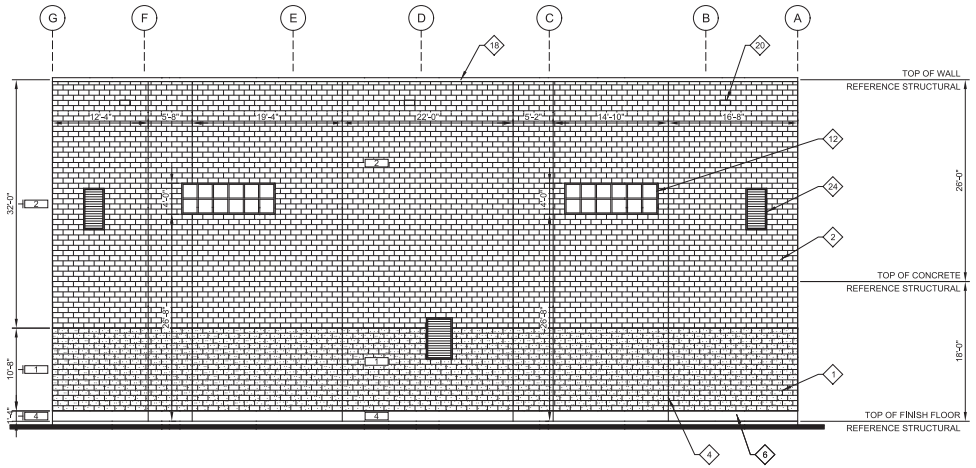

E EAST ELEVATION

SCALE: 1/8" - 1'-0"
FILE: 8621B1080A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
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KEY NOTES - FOR PLANS & ELEVATIONS :

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2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
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5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
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21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
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29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL

COLOR SCHEDULE:

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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NORTH AND EAST ELEVATIONS

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 80A04
SHEET NO. OF XXX

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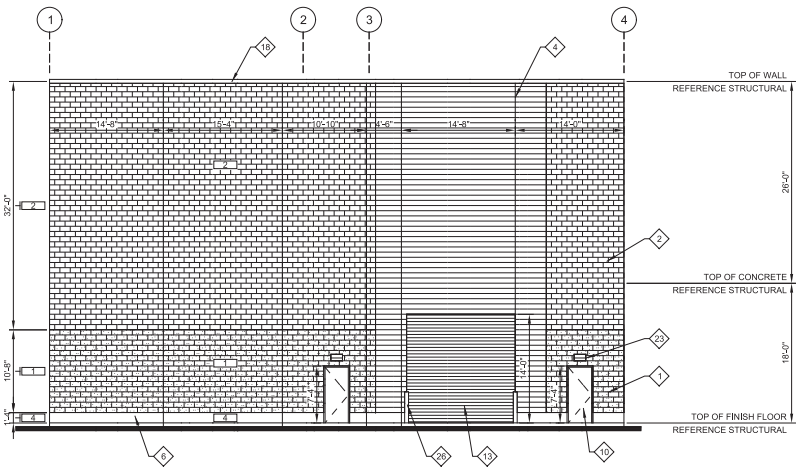

F SOUTH ELEVATION

SCALE: 1/8" - 1'-0"
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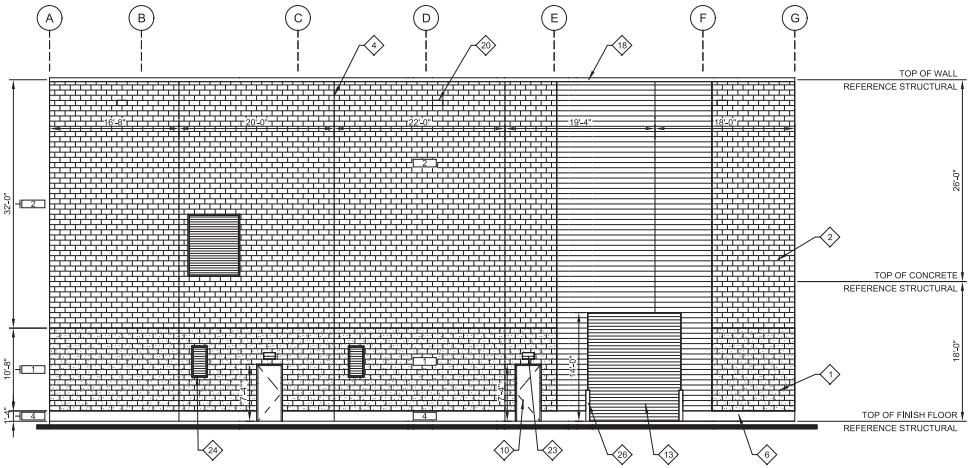

G WEST ELEVATION

SCALE: 1/8" - 1'-0"
FILE: 8621B1080A501.2dm

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
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KEY NOTES - FOR PLANS & ELEVATIONS :

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6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
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11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
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2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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SOUTH AND WEST ELEVATIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 80A05
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1080A005.dgn

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.
5. FURNITURE AND ACCESSORIES SHOWN ARE PART OF ALLOWANCE IN SECTION 01210.

KEY NOTES - FOR PLANS & ELEVATIONS:
NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
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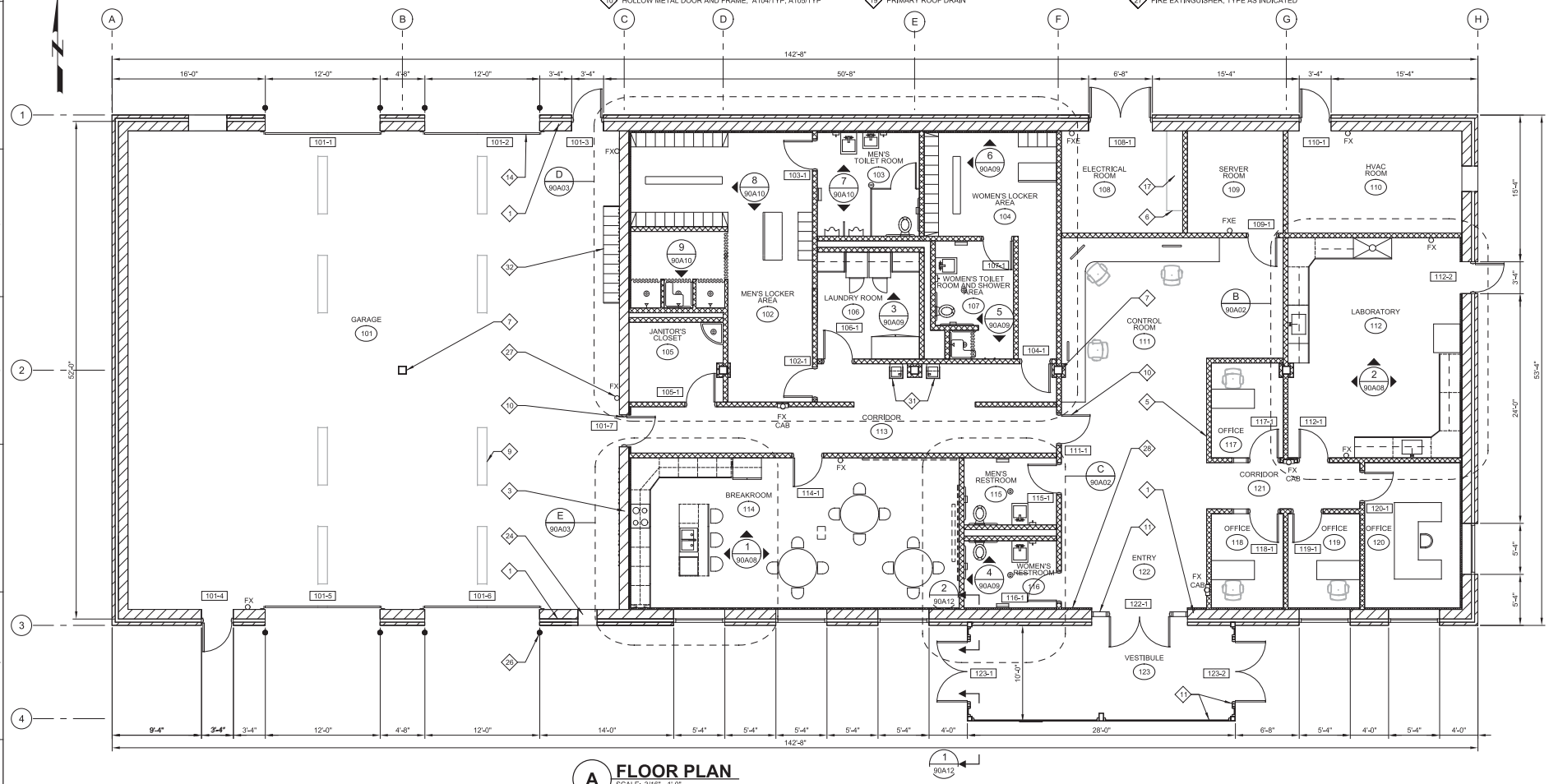
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL
31. ADA COMPLIANT WATER FOUNTAIN AT 34" A.F.F. AND WATER FOUNTAIN AT 38" A.F.F.
32. SEATING BENCH WITH CUBBIES
33. ALUMINUM METAL PANELS
34. ALUMINUM WINDOW



A FLOOR PLAN

SCALE: 3/16" - 1'-0"
FILE: 8621B1090A101.2dm

REV	DATE	BY	DESCRIPTION

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ARCHITECTURAL
OPERATIONS BUILDING
FLOOR PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 90A01
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1090A001.dgn

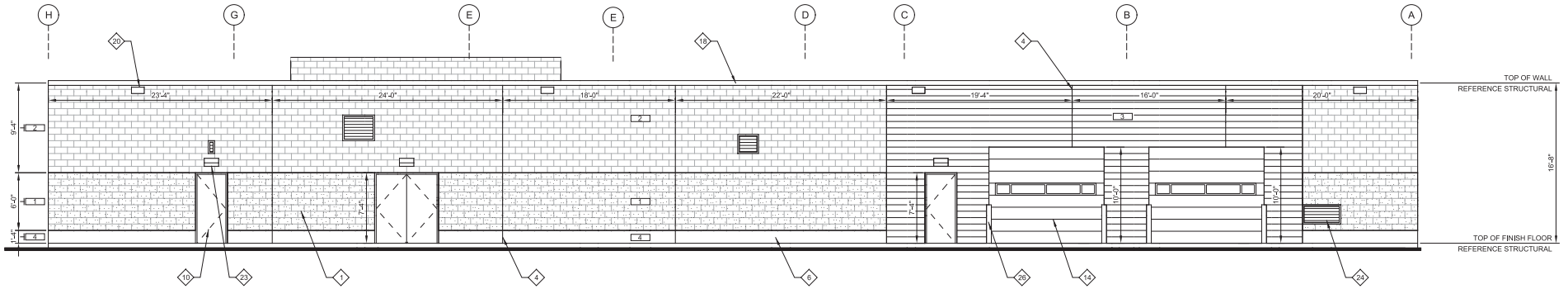
Plot Date: 18-JAN-2018 1:38:14 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: BMurillo

GENERAL NOTES:

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

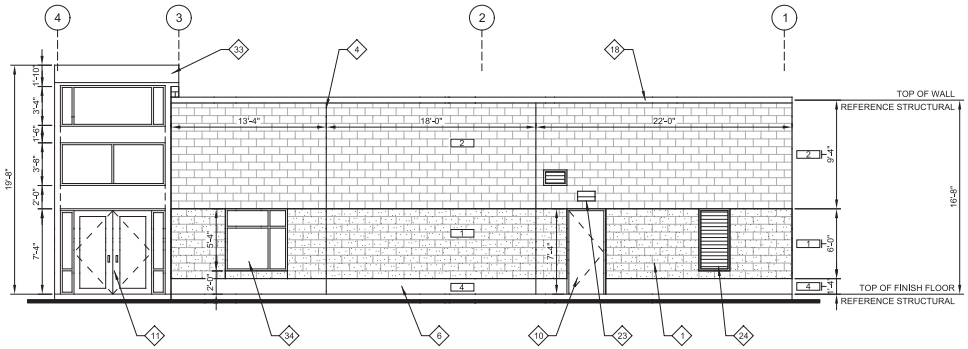
KEY NOTES - FOR PLANS & ELEVATIONS:
NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
2. CAVITY WALL - 4" INTEGRALLY COLORED SMOOTH-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, AND INTEGRALLY COLORED MASONRY UNIT
3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
18. METAL COPING
19. PRIMARY ROOF DRAIN
20. OVERFLOW SCUPPER, SECONDARY ROOF DRAIN
21. SINGLE-PLY ROOF MEMBRANE OVER PROTECTIVE BOARD AND RIGID INSULATION
22. CRICKET PER MANUFACTURER
23. EXTERIOR LIGHT FIXTURE, REFERENCE ELECTRICAL DRAWINGS
24. REFERENCE HVAC DRAWINGS FOR UNIT, DUCTWORK, LOUVER, AND FAN REQUIREMENTS
25. REFERENCE MECHANICAL DRAWINGS FOR EQUIPMENT REQUIREMENTS
26. GUARD POST, EACH SIDE OF COILING DOOR, C160/TYP
27. FIRE EXTINGUISHER, TYPE AS INDICATED
28. METAL FURRING STRIPS WITH GYPSUM BOARD, TERMINATION ABOVE CEILING
29. ALUMINUM LADDER ABOVE PARAPET WITH CAGE
30. FLOOR HATCH, REFERENCE STRUCTURAL
31. ADA COMPLIANT WATER FOUNTAIN AT 34" A.F.F. AND WATER FOUNTAIN AT 38" A.F.F.
32. SEATING BENCH WITH CUBBIES
33. ALUMINUM METAL PANELS
34. ALUMINUM WINDOW



H NORTH ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1090A501.2dm



J EAST ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1090A501.2dm

COLOR SCHEDULE:

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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DATE JANUARY 2018

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NORTH AND EAST ELEVATIONS

VERIFY SCALES
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0 1"
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JOB NO. 8621B.10
DRAWING NO. 90A06
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1090A006.dgn

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User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: BMurillo

GENERAL NOTES

1. EXTERIOR CONCRETE MASONRY UNITS SHALL BE FINISHED WITH WATER REPELLANT.
2. ROOF HIGH POINT (HP) AND LOW POINT (LP) SHALL BE COORDINATED WITH STRUCTURAL DRAWINGS FOR METAL DECK SLOPING, MINIMUM 6" OF INSULATION R-30.
3. REFERENCE STRUCTURAL DRAWINGS FOR CAST-IN-PLACE AND CONCRETE DIMENSIONS.
4. REFERENCE STRUCTURAL DRAWINGS FOR TOP OF FINISH FLOOR AND TOP OF WALL ELEVATIONS.

KEY NOTES - FOR PLANS & ELEVATIONS ;
NOT ALL KEY NOTES ARE APPLICABLE TO EACH DRAWING

1. CAVITY WALL - 4" INTEGRALLY COLORED SPLIT-FACE MASONRY VENEER, AIR SPACE, INSULATION, VAPOR BARRIER, FLASHING, INTERALLY COLORED CONCTETE CONCRETE MASONRY UNIT, AND CAST-IN-PLACE CONCRTE STEM WALL PER STRUCTURAL. COLOR TO BE SELECTED BY OWNER
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3. 8" OR 12" CONCRETE MASONRY UNITS, REFERENCE STRUCTURAL DRAWINGS
4. MASONRY CONTROL JOINT (TYP)
5. GYPSUM WALLBOARD 2-5/8" TYP WITH BATT INSULATION, SEE SPECIFICATIONS SECTION 09110
6. CAST-IN-PLACE CONCRETE SLABS, EQUIPMENT PADS, COLUMNS, AND CURBS, REFERENCE STRUCTURAL DRAWINGS
7. REFERENCE STRUCTURAL DRAWINGS FOR STRUCTURAL STEEL FRAMING
8. REFERENCE STRUCTURAL DRAWINGS FOR EXTENT AND TYPE OF HANDRAIL, RAILING, AND STAIR REQUIRMENTS
9. PLATFORMS, PLATED COVER, AND GRATING, REFERENCE STRUCTURAL DRAWINGS
10. HOLLOW METAL DOOR AND FRAME, A104/TYP, A105/TYP
11. ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS, A125/TYP
12. INSULATED WALL PANEL, SEE SPECIFICATION
13. OVERHEAD COILING DOOR AND FRAME
14. SECTIONAL DOOR AND FRAME
15. CONCRETE ENTRANCE PAD PER CIVIL
16. ROOF HATCH
17. REFERENCE ELECTRICAL DRAWINGS FOR ELECTRICAL EQUIPMENT REQUIREMENTS
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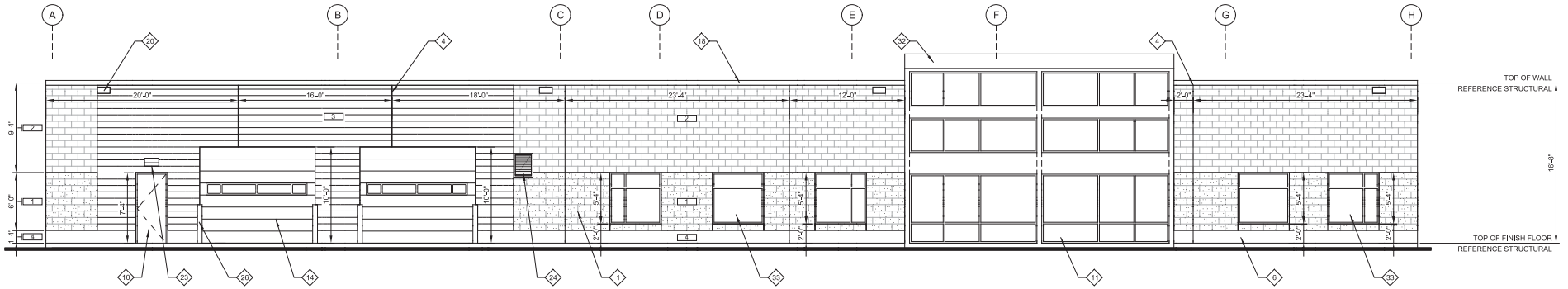
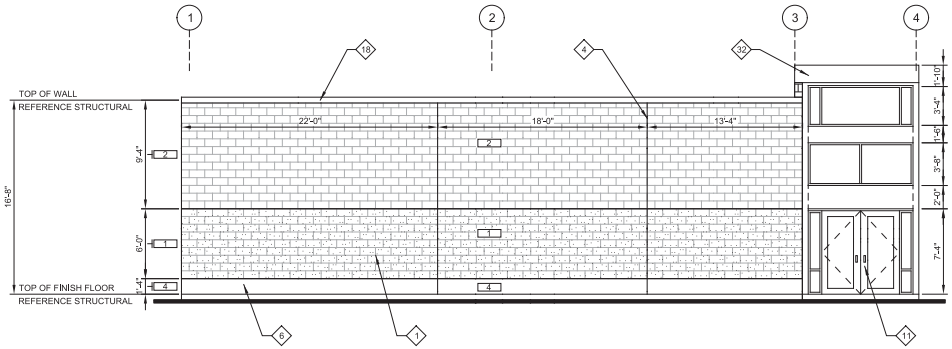


K SOUTH ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1090A501.2dm



L WEST ELEVATION

SCALE: 3/16" - 1'-0"
FILE: 8621B1090A501.2dm

COLOR SCHEDULE;

1. SPLIT-FACE BLOCK, COLOR 'A' - RED
2. SPLIT-FACE BLOCK, COLOR 'B' - GREY
3. SMOOTH-FACE BLOCK, COLOR 'C' - EBONY
4. STANDARD CONCRETE FINISH

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DATE JANUARY 2018

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SOUTH AND WEST ELEVATIONS

VERIFY SCALES
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0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 90A07
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1090A007.dgn

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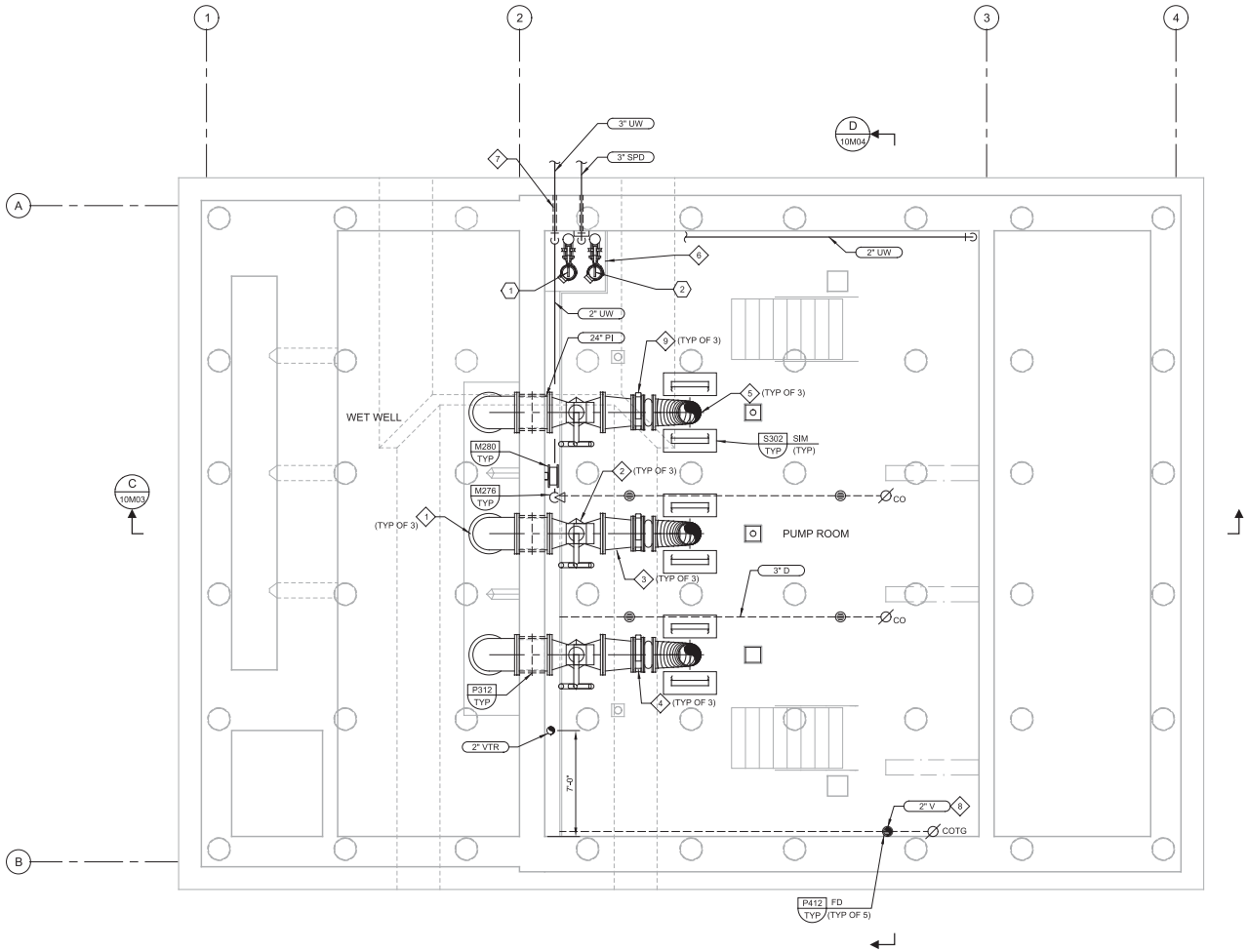

GENERAL NOTES:

1. RUN DRAIN LINES THROUGH THE SLAB. SLOPE AT 1/4" PER FOOT MIN.
2. SEE CIVIL DRAWING YP09 FOR YARD PIPING.
3. CONTRACTOR SHALL COORDINATE ALL PIPING CONNECTIONS AND MATCH FLANGES.
4. CONTRACTOR SHALL COORDINATE ALL MECHANICAL EQUIPMENT AND PIPE PENETRATIONS WITH STRUCTURAL DRAWINGS.
5. GENERAL MECHANICAL NOTES APPLY TO ALL SHEETS.
6. HORIZONTAL PIPE SUPPORTS FOR 4" DIA AND SMALLER PER DETAIL P664/TYP.
7. VERTICAL PIPE SUPPORTS FOR 4" DIA AND SMALLER PER DETAIL P662/TYP.

KEY NOTES:

1. 24" ELBOW WITH SUCTION BELL
2. 24" ECCENTRIC PLUG VALVE
3. 24" FLEXIBLE COUPLING
4. 24" X 20" ECCENTRIC REDUCER
5. 20" x 16" REDUCING ELBOW
6. INSTALL SUMP PUMPS PER DETAIL M242/TYP.
7. PENETRATION PER DETAIL P304/TYP.
8. ROUTE DISCHARGE FROM AIR RELEASE VALVE DOWN WALL TO FLOOR DRAIN.
9. PIPE SUPPORT PER DETAIL P629/TYP.

KEY TAGS:

1	SUMP PUMP	PMP-10.080
2	SUMP PUMP	PMP-10.090

A LOWER PLAN

SCALE: 1/4" = 1'-0"
FILE: 8621B1010M0101

REV	DATE	BY	DESCRIPTION

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DATE JANUARY 2018

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WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
INFLUENT PUMP STATION
SUCTION AND DRAINAGE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 10M01
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1010M001.dgn

Plot Date: 18-JAN-2018 7:16:35 PM
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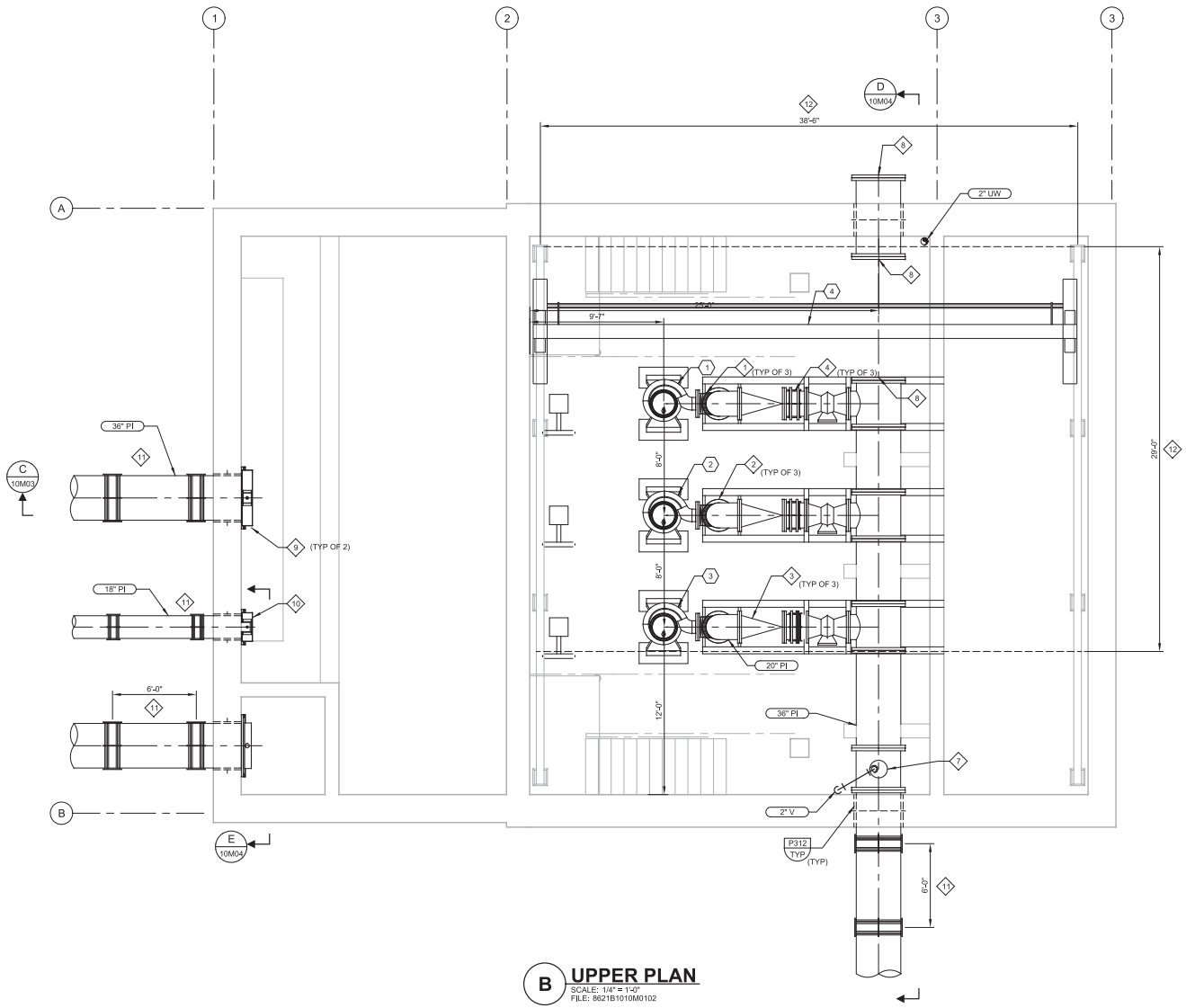
LAST SAVED BY: mmorris



B **UPPER PLAN**
SCALE: 1/4" = 1'-0"
FILE: 8621B1010M0102

GENERAL NOTES:

1. SEE NOTES ON 10M01.
2. SEE 10S03 FOR DETAILS ON BRIDGE CRANE.

KEY NOTES:

1. 14" x 20" INCREASING ELBOW.
2. 20" FLEXIBLE COUPLING IN VERTICAL.
3. 20" CUSHIONED SWING CHECK VALVE. TYP.
4. 20" RESTRAINED FLEXIBLE COUPLING. SEE TPYICAL DETAIL P110/TYP.
5. 20" PLUG VALVE. TYP.
6. 36" x 20" INCREASING TEE.
7. 4" SEWAGE AIR RELEASE VALVE ON THE DISCHARGE HEADER. SEE TYPICAL DETAIL P242/TYP.
8. 36" BLIND FLANGE.
9. 36" x 36" ST STL SLIDE GATE PER DETAIL P710/TYP WITH FLOOR PEDESTAL.
10. 18" x 18" ST STL SLIDE GATE
11. PROVIDE 2X RESTRAINED FLEXIBLE COUPLING PER DETAIL P110/TYP.
12. HORIZONTAL LIMIT OF BRIDGE CRANE TRAVEL.

KEY TAGS:

1	INFLUENT PUMP NO. 1	PMP-10.010
2	INFLUENT PUMP NO. 2	PMP-10.020
3	INFLUENT PUMP NO. 3	PMP-10.030
4	BRIDGE CRANE	BC-10.001

REV	DATE	BY	DESCRIPTION

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DATE JANUARY 2018

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WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
INFLUENT PUMP STATION
DISCHARGE PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 10M02
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1010M002.dgn

Plot Date: 18-JAN-2018 7:16:38 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: mmorris

KEY TAGS:

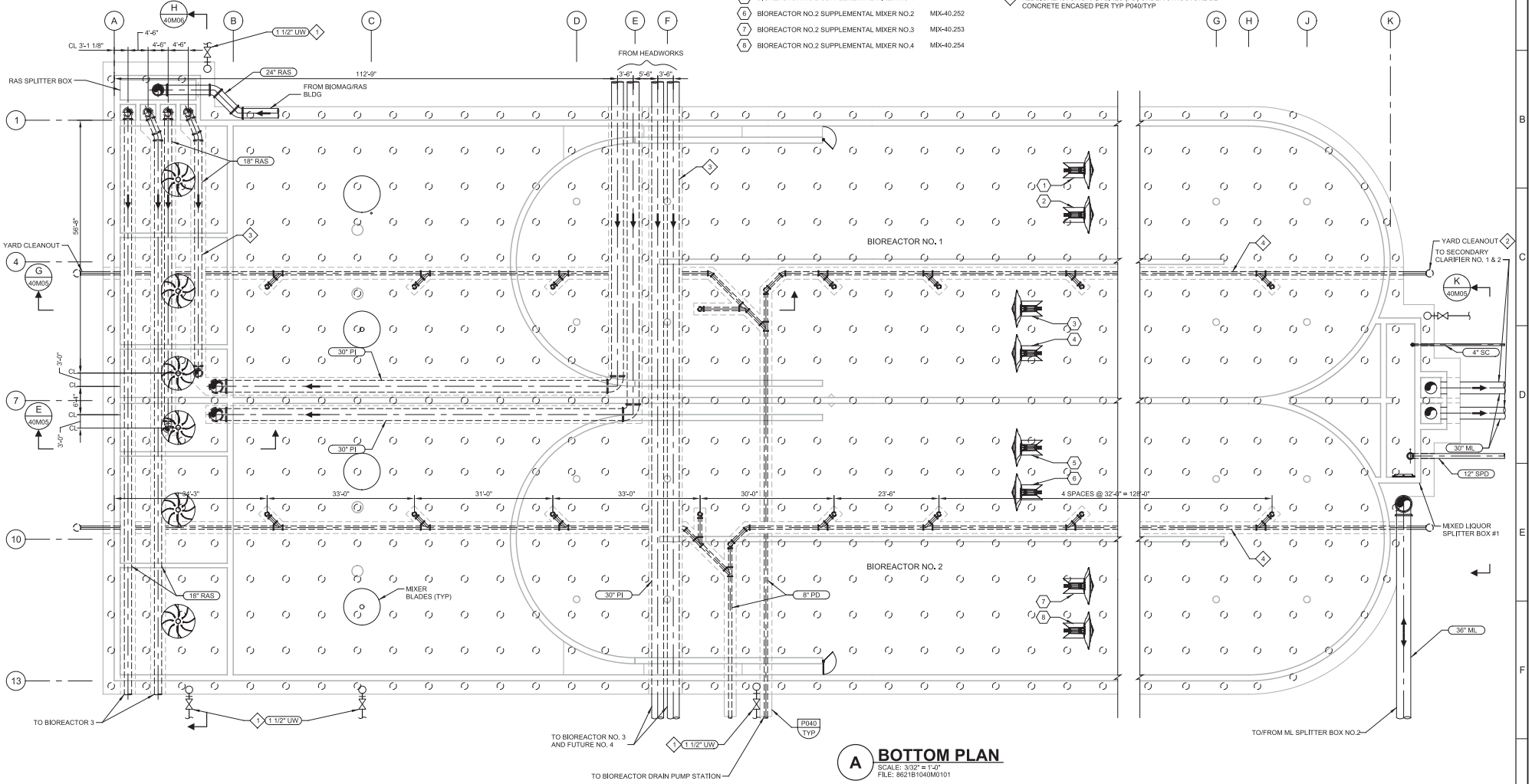
1	BIOREACTOR NO.1 SUPPLEMENTAL MIXER NO.1	MIX-40.151
2	BIOREACTOR NO.1 SUPPLEMENTAL MIXER NO.2	MIX-40.152
3	BIOREACTOR NO.1 SUPPLEMENTAL MIXER NO.3	MIX-40.153
4	BIOREACTOR NO.1 SUPPLEMENTAL MIXER NO.4	MIX-40.154
5	BIOREACTOR NO.2 SUPPLEMENTAL MIXER NO.1	MIX-40.251
6	BIOREACTOR NO.2 SUPPLEMENTAL MIXER NO.2	MIX-40.252
7	BIOREACTOR NO.2 SUPPLEMENTAL MIXER NO.3	MIX-40.253
8	BIOREACTOR NO.2 SUPPLEMENTAL MIXER NO.4	MIX-40.254

KEY NOTES:

1. STOP & WASTE VALVE WITH VALVE BOX. SEE TYPICAL DETAIL P022 (SIMILAR).
2. YARD CLEANOUTS PER DETAIL P004/TYP TYPE 1 TYP OF 4
3. ALL PLANT INFLUENT LINES (PI) AND RAS LINES (RAS) UNDER STRUCTURE BE CONCRETE ENCASED PER TYP P043/TYP.
4. ALL BIOREACTOR DRAIN LINES (PD) UNDER STRUCTURE BE CONCRETE ENCASED PER TYP P040/TYP

GENERAL NOTES:

1. XXXX
2. XXXX



A BOTTOM PLAN

SCALE: 3/32" = 1'-0"
FILE: 8621B1040M0101

REV	DATE	BY	DESCRIPTION

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DRAWN DCS
CHECKED
DATE JANUARY 2018

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WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
BIOREACTORS NO. 1 AND 2
LOWER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 40M01
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1040M001.dgn

Plot Date: 18-JAN-2018 7:20:19 PM
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DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: jkleve

KEY TAGS:

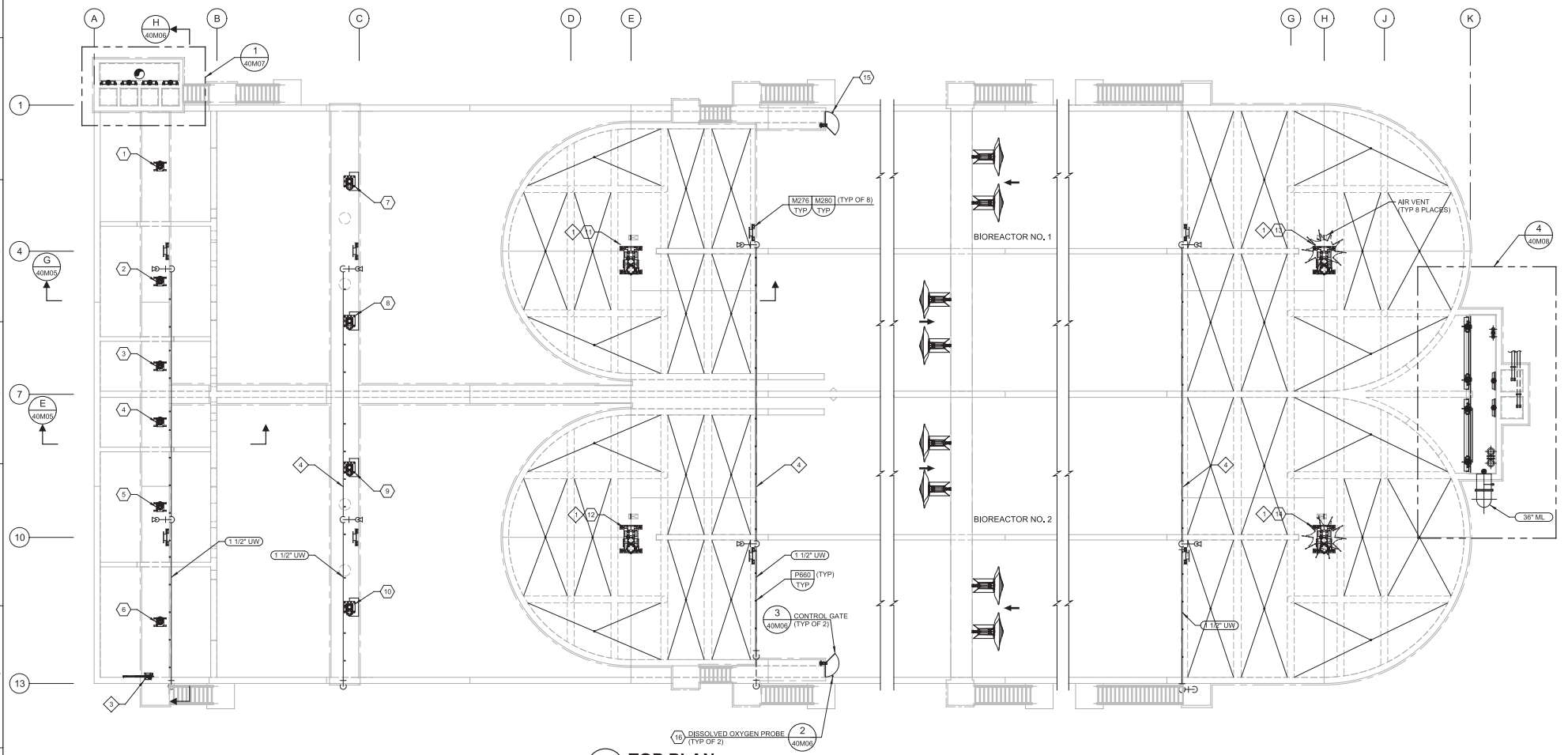
1	BIOREACTOR NO.1 ANEROBIC MIXER NO.1	MIX-40.113	7	BIOREACTOR NO.1 ANOXIC MIXER NO. 1	MIX-40.121	13	BIOREACTOR NO. 1 AERATOR NO. 2	AER-40.140
2	BIOREACTOR NO.1 ANEROBIC MIXER NO. 2	MIX-40.112	8	BIOREACTOR NO.1 ANOXIC MIXER NO. 2	MIX-40.122	14	BIOREACTOR NO. 2 AERATOR NO. 2	AER-40.240
3	BIOREACTOR NO.1 ANEROBIC MIXER NO. 3	MIX-40.111	9	BIOREACTOR NO.2 ANOXIC MIXER NO. 1	MIX-40.222	15	DISSOLVED OXYGEN ANALYZER	AER-40.165
4	BIOREACTOR NO.2 ANEROBIC MIXER NO. 1	MIX-40.211	10	BIOREACTOR NO.2 ANOXIC MIXER NO. 2	MIX-40.221	16	DISSOLVED OXYGEN ANALYZER	AER-40.265
5	BIOREACTOR NO.2 ANEROBIC MIXER NO. 2	MIX-40.212	11	BIOREACTOR NO. 1 AERATOR NO. 1	AER-40.130			
6	BIOREACTOR NO.2 ANEROBIC MIXER NO.3	MIX-40.213	12	BIOREACTOR NO. 2 AERATOR NO. 1	AER-40.230			

KEY NOTES:

1. COORDINATE AERATOR STRUCTURAL OPENINGS, SIZES AND LOCATIONS WITH AERATOR MANUFACTURER.
2. SLIDE GATE HAND WHEEL.
3. 3/4 TON DAVIT CRANE AND BASE MOUNT TO DECK.
4. SURFACE MOUNT UW LINE. USE PIPE SUPPORT TYPICAL DETAIL P660 SPACED AT 4'-0" OC.

GENERAL NOTES:

1. ALL UW LINES TO SLOPE MINIMUM 1% TO STOP TO WASTE VALVE.
2. INSULATE ALL EXPOSED PIPING PER SPECIFICATION XXXX



C **TOP PLAN**
SCALE: 3/32" = 1'-0"
FILE: 8621B1040M0102

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DATE JANUARY 2018

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MECHANICAL
BIOREACTORS NO. 1 AND 2
UPPER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 40M03
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1040M003.dgn

Plot Date: 18-JAN-2018 7:20:18 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: jkleve

KEY TAGS:

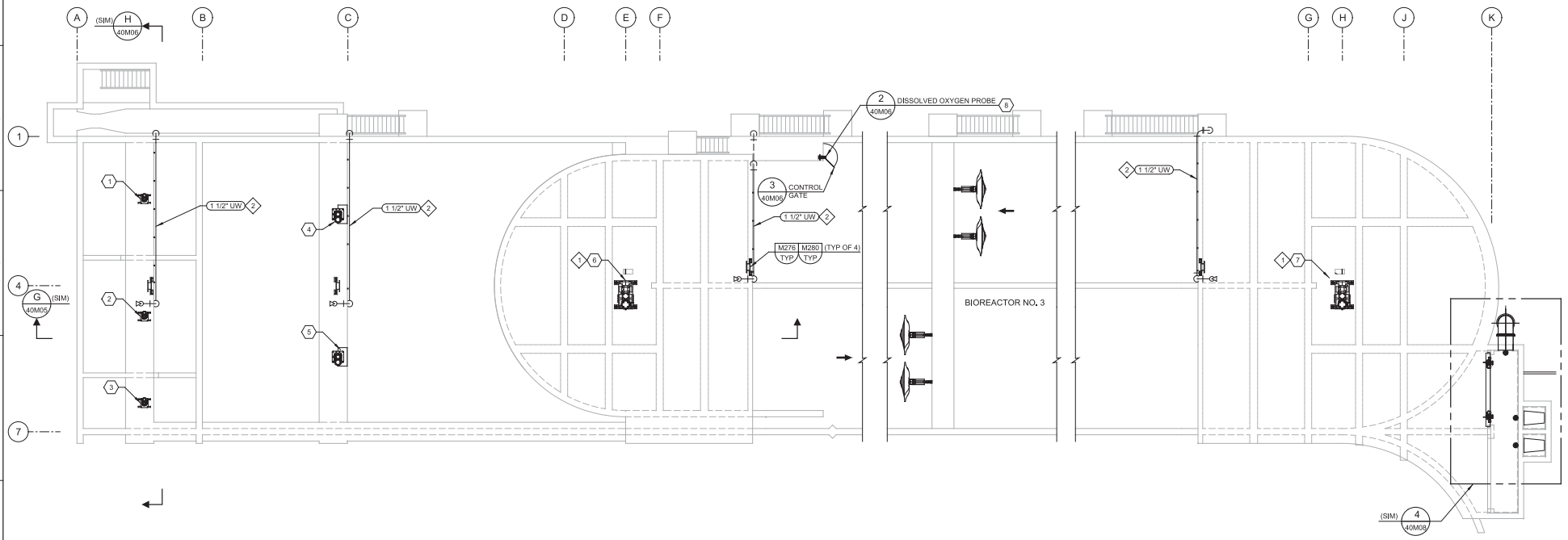
1	BIOREACTOR NO. 3 ANAEROBIC MIXER NO. 1	MIX-40.313
2	BIOREACTOR NO. 3 ANAEROBIC MIXER NO. 2	MIX-40.312
3	BIOREACTOR NO. 3 ANAEROBIC MIXER NO. 3	MIX-40.311
4	BIOREACTOR NO. 3 ANOXIC MIXER NO. 1	MIX-40.321
5	BIOREACTOR NO. 3 ANOXIC MIXER NO. 2	MIX-40.322
6	BIOREACTOR NO. 3 AERATOR NO. 1	AER-40.330
7	BIOREACTOR NO. 3 AERATOR NO. 2	AER-40.340
8	DISSOLVED OXYGEN ANALYZER	AE-40.365

KEY NOTES:

1. COORDINATE AERATOR STRUCTURAL OPENINGS, SIZES AND LOCATIONS WITH AERATOR MANUFACTURER.
2. SURFACE MOUNT UW LINE. USE PIPE SUPPORT TYPICAL DETAIL P660 SPACED AT 4'-0" OC.

GENERAL NOTES:

1. ALL UW LINES TO SLOPE MINIMUM 1% TO STOP TO WASTE VALVE.
2. INSULATE ALL EXPOSED PIPING PER SPECIFICATION XXXX



D TOP PLAN

SCALE: 3/32" = 1'-0"
FILE: 8621B1040M0202

REV	DATE	BY	DESCRIPTION

DESIGNED RWB
DRAWN DCS
CHECKED
DATE JANUARY 2018

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CITY OF LOGAN
WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
BIOREACTOR NO. 3
UPPER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 40M04
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1040M004.dgn

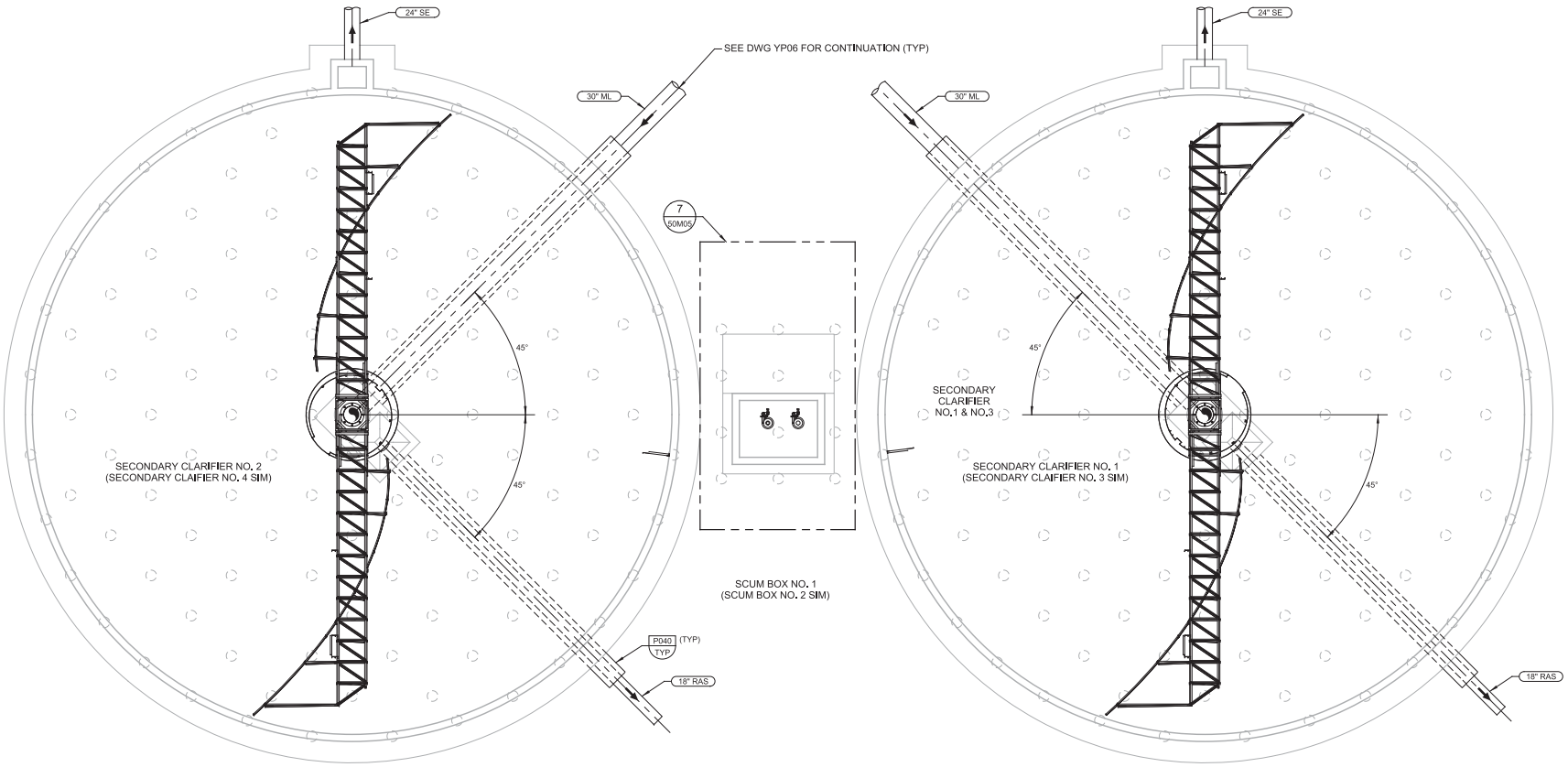
Plot Date: 18-JAN-2018 7:20:23 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: jkleve

GENERAL NOTES:

1. SECONDARY CLARIFIERS 1 AND 2 ARE SHOWN. SECONDARY CLARIFIERS 3 AND 4 ARE SIMILAR.
2. SEE CIVIL DRAWINGS FOR CONTINUATION OF YARD PIPING.

KEY NOTES:

1 XXXX



A LOWER PLAN

SCALE: 1/8" = 1'-0"
FILE: 8621B1050M0101

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DATE JANUARY 2018

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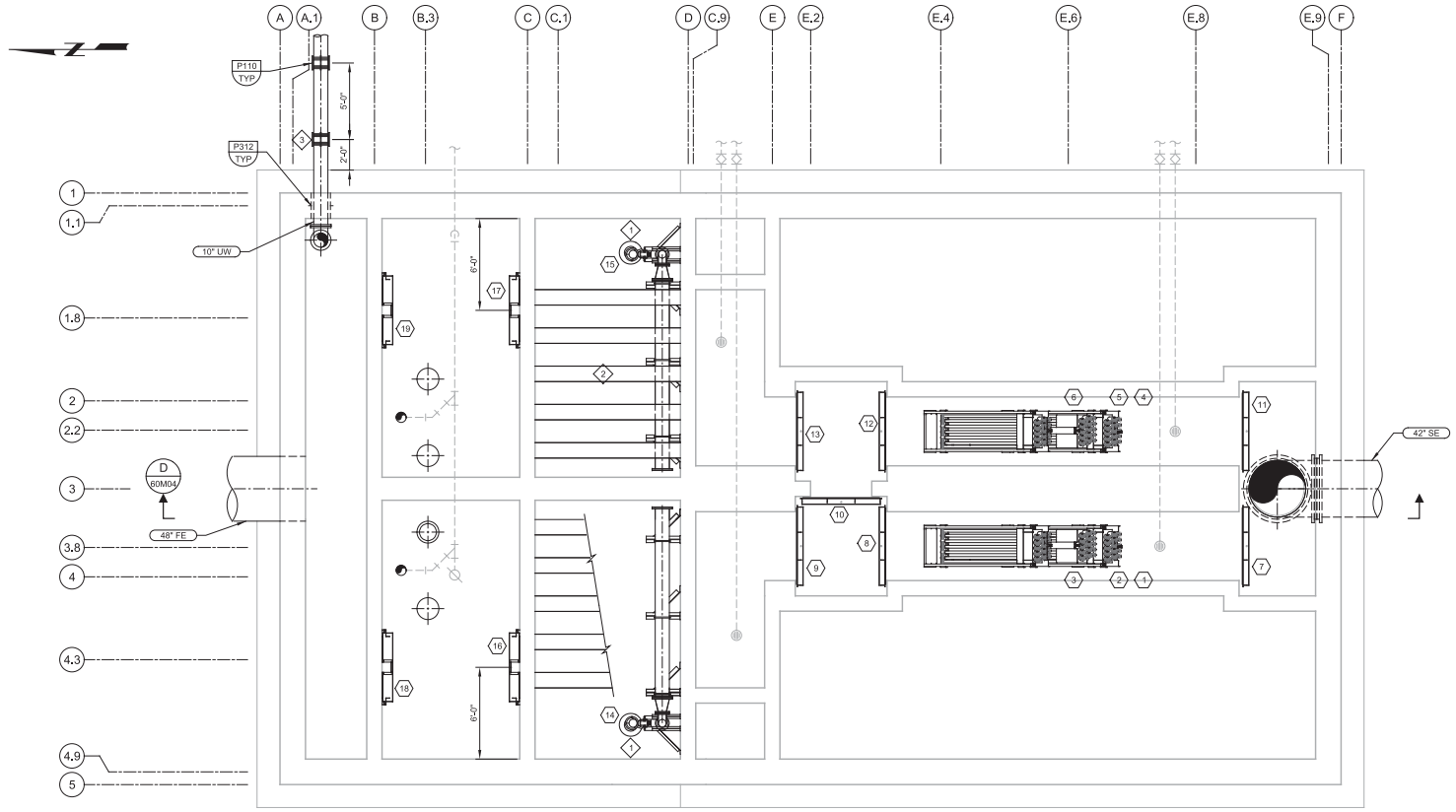
MECHANICAL
SECONDARY CLARIFIERS
LOWER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 50M01
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1050M001.dgn

Plot Date: 18-JAN-2018 7:21:24 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: mmorris



A **LOWER PLAN**
SCALE: 1/4" = 1'-0"
FILE: 8621B1060M101

GENERAL NOTES:

1. XXXX
2. XXXX

KEY NOTES:

1. SUBMERSIBLE JET MOTIVE PUMP WITH BASE ELBOW AND ST STL GUIDE RAILS. PUMP VENDOR SHALL PROVIDE GUIDE RAIL BRACKETS AT 5 FEET INTERVALS O.C.
2. FRP LAUNDER. TYP OF 10.
3. 10" UW PIPE CENTERLINE ELEVATION 4433.00.

KEY TAGS;

1	UVR	60.110
2	UVR	60.120
3	UVR	60.130
4	UVR	60.140
5	UVR	60.150
6	UVR	60.160
7	GAT	60.102
8	GAT	60.103
9	GAT	60.104
10	GAT	60.109
11	GAT	60.202
12	GAT	60.203
13	GAT	60.204
14	PMP	60.310
15	PMP	60.320
16	GAT	60.115
17	GAT	60.205
18	GAT	60.106
19	GAT	60.206

REV	DATE	BY	DESCRIPTION

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DRAWN
CHECKED
DATE JANUARY 2018

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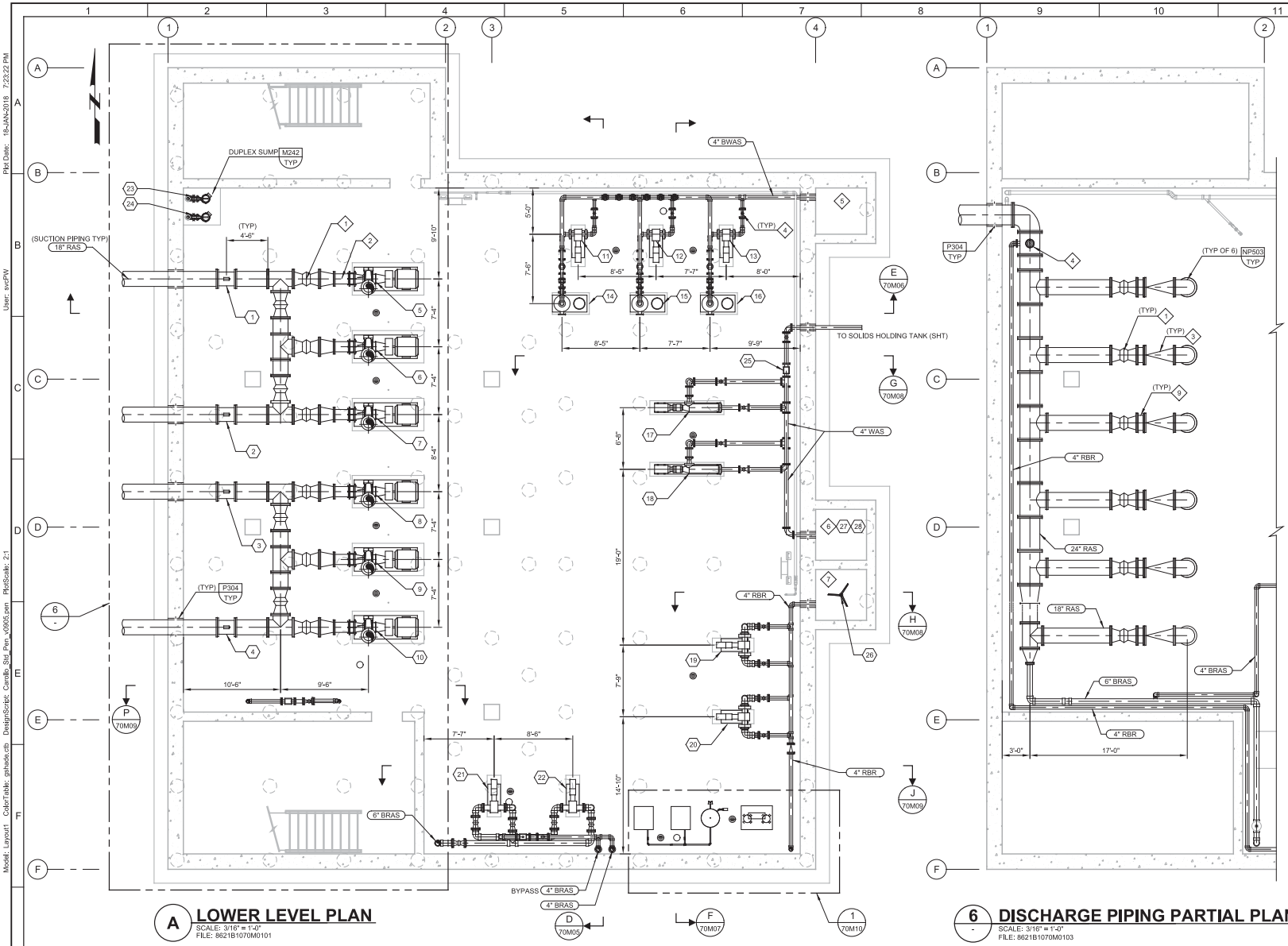
MECHANICAL
UV BUILDING
LOWER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 60M01
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1060M001.dgn

Plot Date: 18-JAN-2018 7:22:24 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: mmorris



GENERAL NOTES:

1. FOR ALL SCH 80 PVC PIPE THAT RUNS FLUSH WITH THE WALL OR CELLING WITH NO FLANGES, SUPPORT PIPE PER DETAIL P660/TYP.
2. FOR ALL PIPING THAT RUNS PARALLEL TO THE WALL WITH FLANGES, SUPPORT PIPE PER DETAIL P658/TYP.
3. SUPPORT ALL PIPING 6" AND LESS OFF THE FLOOR PER DETAIL P624/TYP.
4. SUPPORT HUNG SCH 80 PVC PIPING UNDER SUSPENDED SLAB PER DETAIL P638/TYP AND P630/TYP.

KEY NOTES:

1. 18" PLUG VALVE, TYP OF 16. VALVES ON THE DISCHARGE PIPING TO HAVE CHAIN OPERATORS
2. DISMANTLING JOINT
3. 18" SWING CHECK VALVE
4. 2" WASTEWATER SERVICE COMBINATION AIR/VACUUM VALVE. ROUTE VENT TO NEAREST FLOOR DRAIN.
5. SCREENED BALLAST SUMP
6. WAS HOLDING TANK. CONTRACTOR TO PROVIDE ULTRASONIC AND LEVEL SWITCH MOUNT PER TYP DETAIL
7. BALLAST MIX TANK
8. 3" ISOLATION VALVES ON SUCTION SIDE OF SHEAR MILL FEED PUMPS. TYP OF 3.
9. 18" FL x PE WITH VICTAULIC ADAPTER. TYP OF 6 LOCATIONS.

KEY TAGS:

1	RAS FLOW METER	FE-70.001
2	RAS FLOW METER	FE-70.002
3	RAS FLOW METER	FE-70.003
4	RAS FLOW METER	FE-70.004
5	RAS PUMP	PMP-70.010
6	RAS PUMP	PMP-70.020
7	RAS PUMP	PMP-70.030
8	RAS PUMP	PMP-70.040
9	RAS PUMP	PMP-70.050
10	RAS PUMP	PMP-70.060
11	SHEAR MILL FEED PUMP	PMP-70.140
12	SHEAR MILL FEED PUMP	PMP-70.150
13	SHEAR MILL FEED PUMP	PMP-70.160
14	SHEAR MILL	SM-70.210
15	SHEAR MILL	SM-70.220
16	SHEAR MILL	SM-70.230
17	WAS PUMP	PMP-70.710
18	WAS PUMP	PMP-70.720
19	BALLAST DISCHARGE PUMP	PMP-70.420
20	BALLAST DISCHARGE PUMP	PMP-70.430
21	WAS SCREEN FEED PUMP	PMP-70.101
22	WAS SCREEN FEED PUMP	PMP-70.102
23	SUMP PUMP	PMP-70.080
24	SUMP PUMP	PMP-70.090
25	WAS FLOW METER	FE-70.740
26	BALLAST TANK MIXER	MIX-70.410
27	ULTRASONIC	FIT-70.701
28	LEVEL SWITCH	LSLL - 70.700

A LOWER LEVEL PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1070M0101

6 DISCHARGE PIPING PARTIAL PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1070M0103

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WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
BIOMAG / RAS BUILDING
LOWER LEVEL PLANS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 70M01
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1070M001.dgn

Plot Date: 18-JAN-2018 7:23:22 PM
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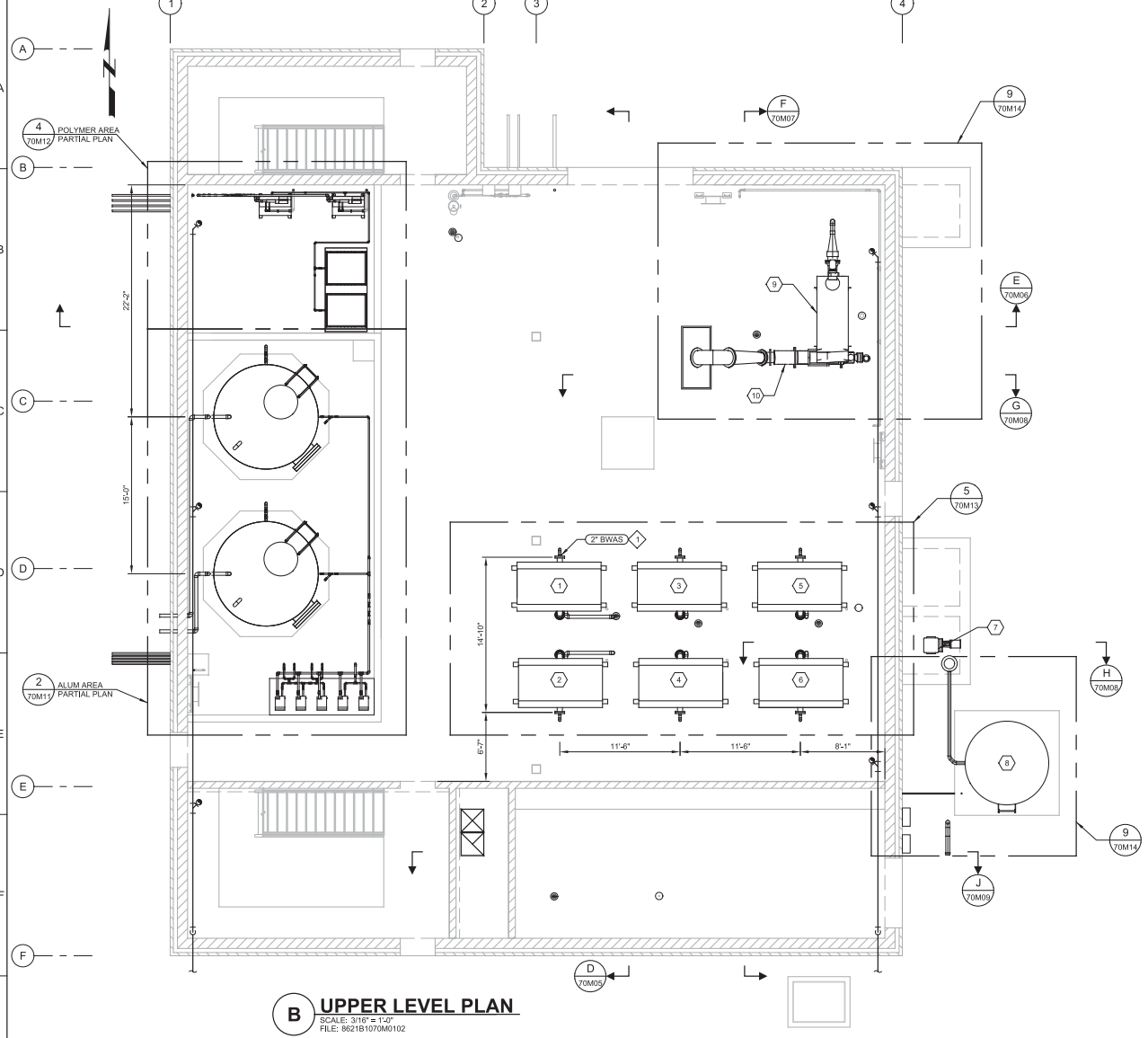
Model: Layout1
LAST SAVED BY: dscheele



B **UPPER LEVEL PLAN**
SCALE: 3/16" = 1'-0"
FILE: 8621B1070M0102

GENERAL NOTES;

1. XXXX
2. XXXX

KEY NOTES;

1. TAP 2" BWAS LINE WITH THREADED CONNECTION INTO BLIND FLANGE. TYP OF 6.

KEY TAGS;

1	MAGNETIC RECOVERY DRUM NO. 1	MD-70.310
2	MAGNETIC RECOVERY DRUM NO. 2	MD-70.320
3	MAGNETIC RECOVERY DRUM NO. 3	MD-70.330
4	MAGNETIC RECOVERY DRUM NO. 4	MD-70.340
5	MAGNETIC RECOVERY DRUM NO. 5	MD-70.350
6	MAGNETIC RECOVERY DRUM NO. 6	MD-70.360
7	BALLAST TANK MIXER	MIX-70.410
8	MAGNETITE STORAGE TANK	TNK-70.550
9	ROTARY SLUDGE SCREEN	SSC-70.110
10	WASHER COMPACTOR	CTP-70.120

REV	DATE	BY	DESCRIPTION

DESIGNED RWB
DRAWN JRL
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DATE JANUARY 2018

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WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
BIOMAG / RAS BUILDING
UPPER LEVEL PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 70M03
SHEET NO. OF XXX

PROJECT NO.
FILE NAME: 8621B1070M003.dgn

Plot Date: 18-JAN-2018 7:23:17 PM
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DesignScript: Carollo_Std_Pen_v0905.pen
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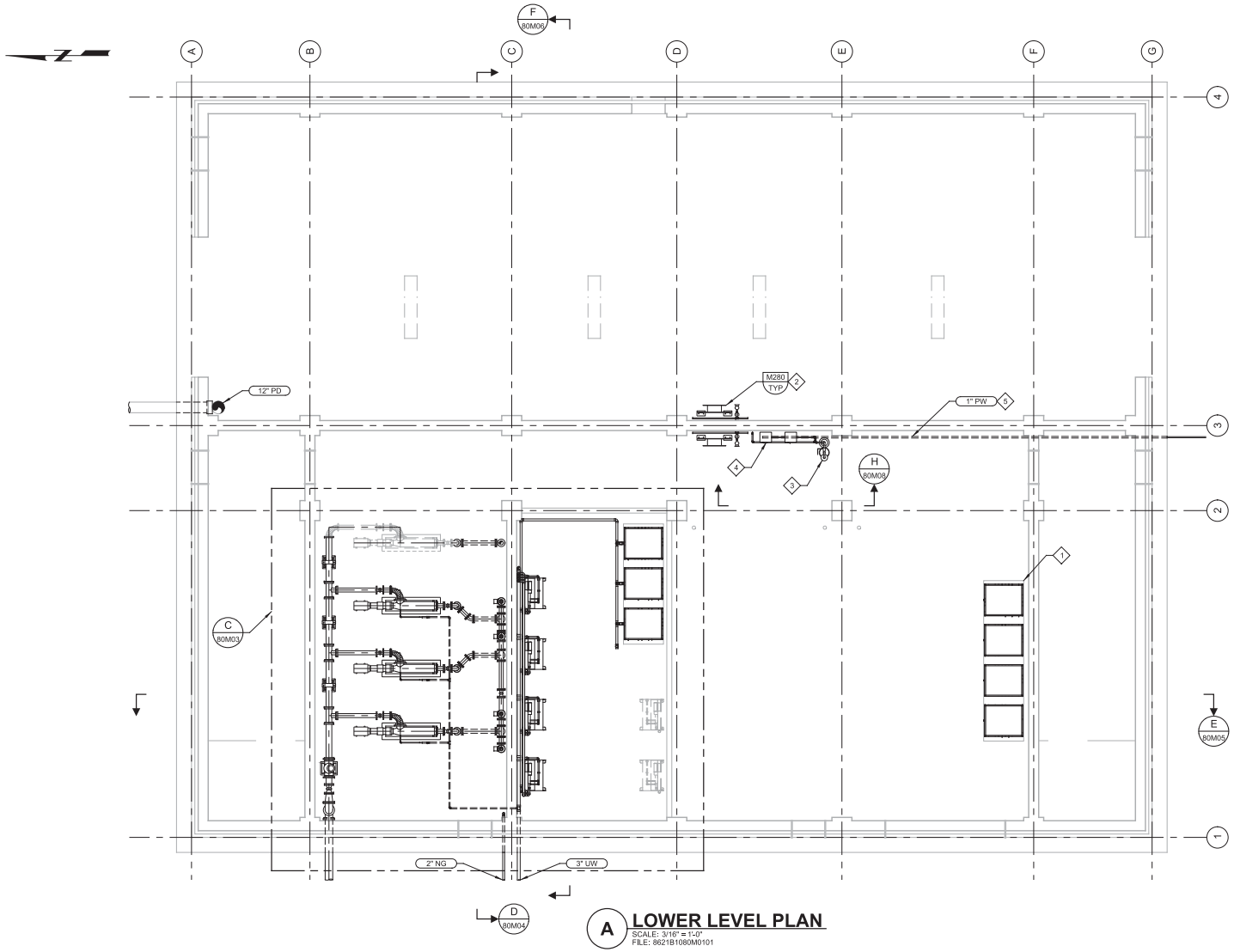
LAST SAVED BY: jkleve



KEY NOTES:

1. POLYMER TANK STORAGE, STAKED TWO HIGH. CONTRACTOR TO PROVIDE 16' x 4' x 4.5' STAINLESS STEEL TABLE TO STAKE TOTES UP TO 1,200 LBS. SUBMIT STRUCTURAL DESIGN AND CALCULATIONS TO ENGINEER FOR APPROVAL.
2. HOSE BIB AND HOSE RACK. TYP.
3. EYEWASH AND SHOWER
4. TANK LESS WATER HEATERS
5. RUN PW LINE UNDER PILE CAP.

A LOWER LEVEL PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1080M0101

REV	DATE	BY	DESCRIPTION

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DRAWN JPC
CHECKED
DATE JANUARY 2018

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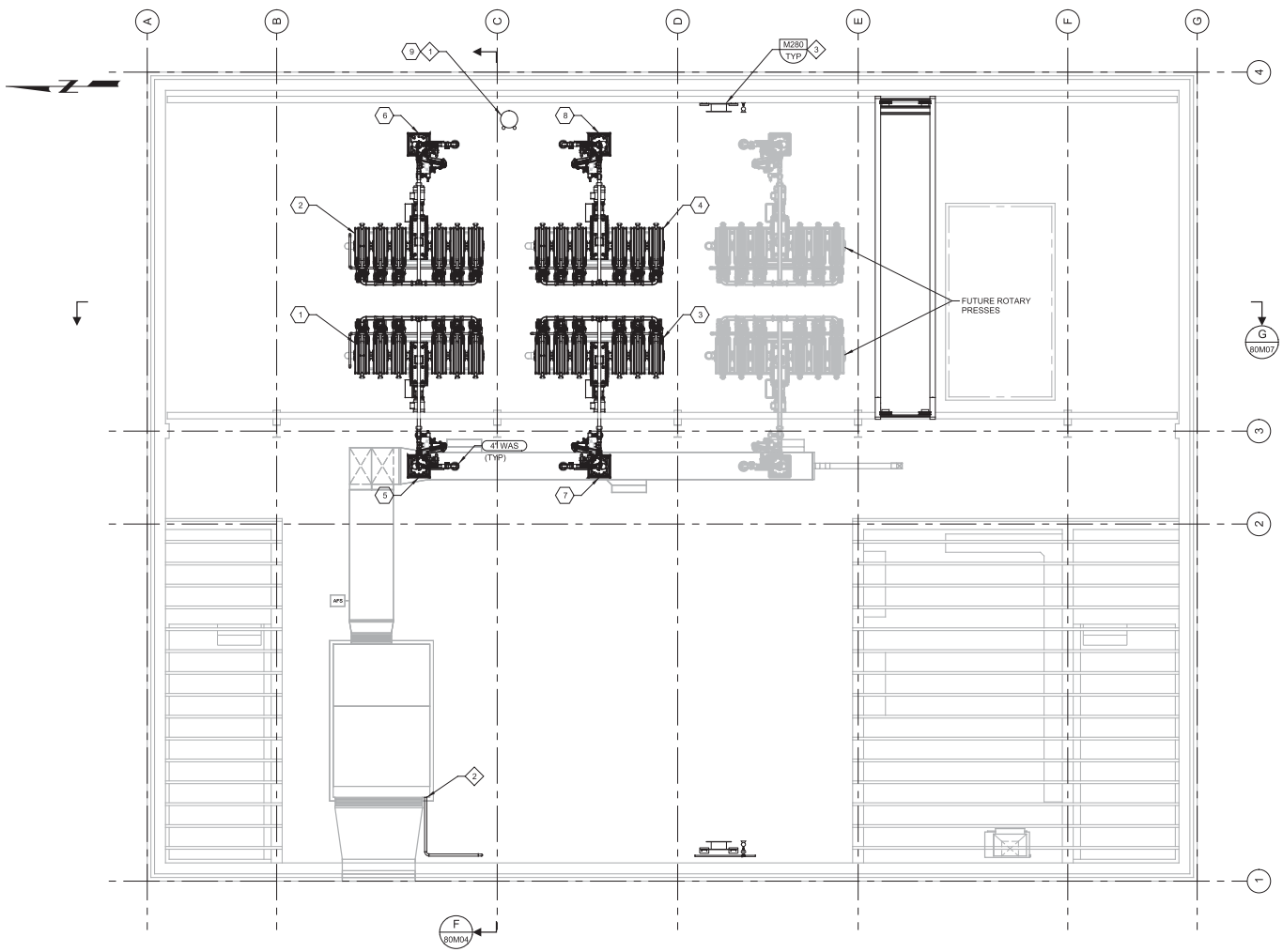
WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
DEWATERING BUILDING
LOWER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 80M01
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1080M001.dgn

Plot Date: 18-JAN-2018 7:24:06 PM
User: svcPW
Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 2:1
LAST SAVED BY: dscheele



KEY NOTES;

1. COMPRESSOR PROVIDED BY MANUFACTURE. CONTRACTOR TO RUN COMPRESSED AIR LINES FROM COMPRESSOR TO EACH UNIT BASED ON MANUFACTURE RECOMMENDATIONS.
2. CONNECT 2" NG LINE TO MAKE UP AIR UNIT. CONTRACTOR TO VERIFY CONNECTION LOCATION.
3. HOSE BIB AND HOSE RACK. TYP OF 2 LOCATIONS

KEY TAGS;

1	ROTARY FAN PRESS NO. 1	RPR - 80.110
2	ROTARY FAN PRESS NO. 2	RPR - 80.120
3	ROTARY FAN PRESS NO. 3	RPR - 80.130
4	ROTARY FAN PRESS NO. 4	RPR - 80.140
5	FLOCCULATOR NO. 1	FLC - 80.210
6	FLOCCULATOR NO. 2	FLC - 80.220
7	FLOCCULATOR NO. 3	FLC - 80.230
8	FLOCCULATOR NO. 4	FLC - 80.240
9	COMPRESSOR	

B UPPER LEVEL PLAN

SCALE: 3/16" = 1'-0"
FILE: 8621B1080M0102

REV	DATE	BY	DESCRIPTION

DESIGNED RWB
DRAWN JPC
CHECKED
DATE JANUARY 2018

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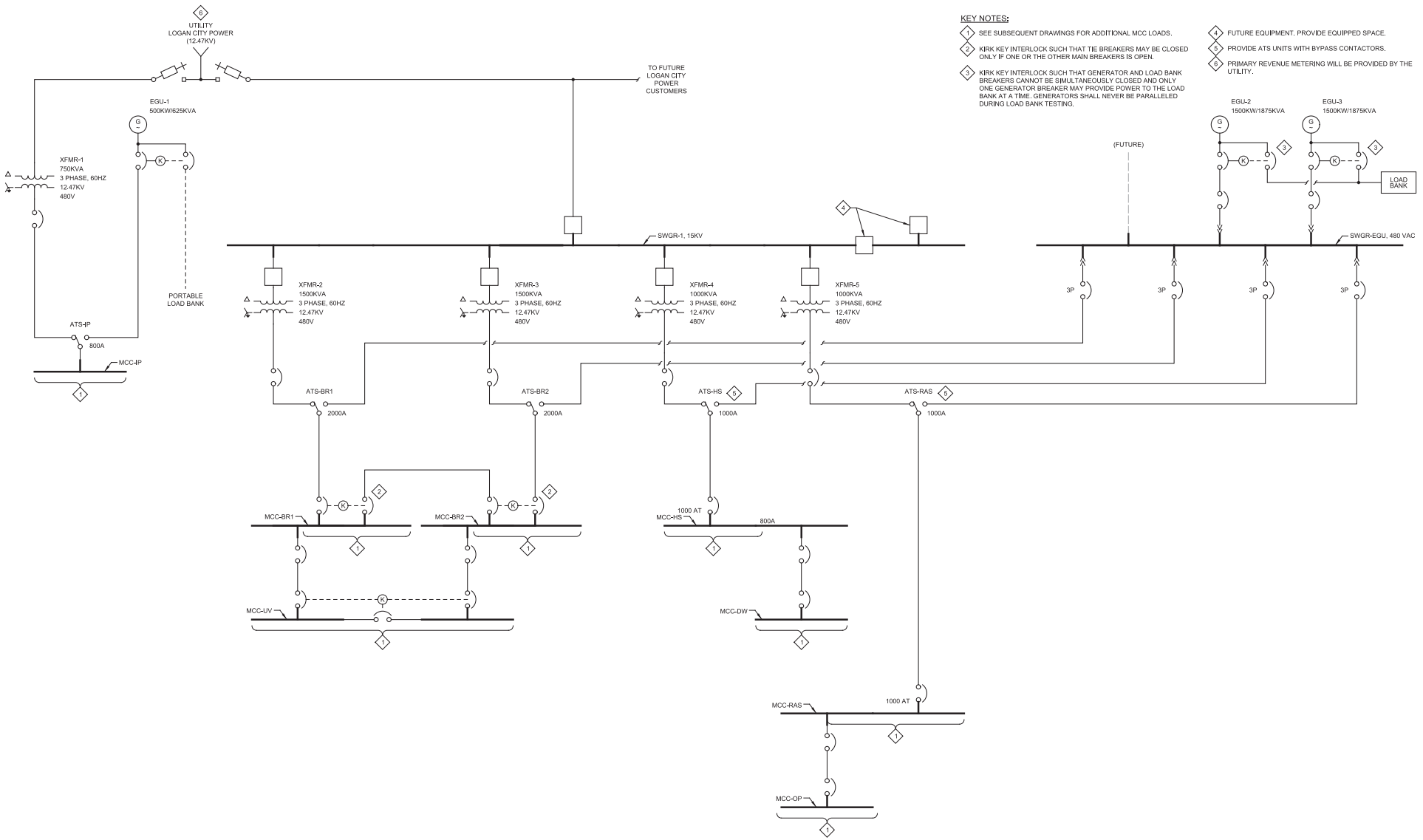
CITY OF LOGAN
WWTF UPGRADE AND IMPROVEMENTS PROJECT
MECHANICAL
DEWATERING BUILDING
UPPER PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 80M02
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1080M002.dgn

Plot Date: 18-JAN-2018 7:24:06 PM
User: svcPW
PlotScale: 2:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: dscheele



REV	DATE	BY	DESCRIPTION

DESIGNED GCE
DRAWN EYP
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DATE JANUARY 2018

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CITY OF LOGAN
WWTF UPGRADE AND IMPROVEMENTS PROJECT
ELECTRICAL
OVERALL ONE-LINE DIAGRAM

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 8621B.10
DRAWING NO. 01E01
SHEET NO. OF XXX

PROJECT NO. 8621B.10 FILE NAME: 8621B1001E001.dgn

Plot Date: 19-JAN-2018 10:23:23 AM User: mhood PlotScale: 2:1 DesignScript: Carollo_Std_Pen_v0905.pen ColorTable: gshade.ctb Model: Layout1 LAST SAVED BY: jgilkey

APPENDIX E – PROCESS MODELING

BioWin user and configuration data

Project details

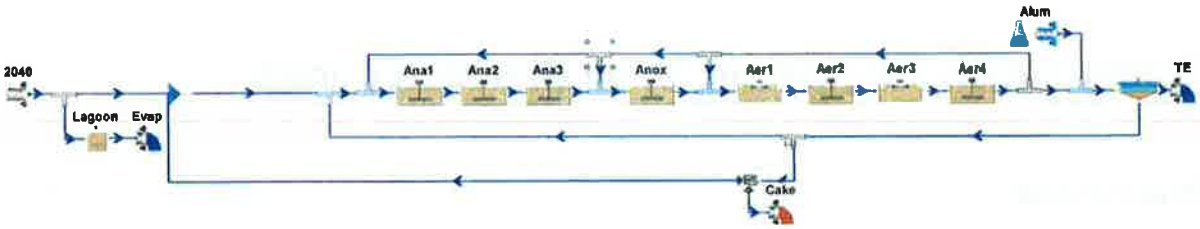
Plant name: Logan **User name: AConklin**

Created: 2/25/2016 **Saved: 2/9/2018**

Target SRT: 13.00 days

T

Flowsheet



Configuration information for all Variable volume bioreactor units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]	# of diffusers
Lagoon	411.0000	3.052E+6	18.000	Un-aerated

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Lagoon	0

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mountin g height	Min. air flow rate per diffuser	Max. air flow rate per diffuser	'A' in diffuser pressure drop = A + B*(Qa/Di ff) + C*(Qa/Di ff)^2	'B' in diffuser pressure drop = A + B*(Qa/Di ff) + C*(Qa/Di ff)^2	'C' in diffuser pressure drop = A + B*(Qa/Di ff) + C*(Qa/Di ff)^2
Lagoon	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.000 0	3.0000	0	0

Configuration information for all Bioreactor units

Physical data

Element name	Volume [Mil. Gal]	Area [ft2]	Depth [ft]	# of diffusers
Ana1	0.1700	1539.2641	14.764	Un-aerated
Anox	1.2900	1.168E+4	14.764	Un-aerated
Aer2	1.1700	1.059E+4	14.764	Un-aerated
Aer4	1.1700	1.059E+4	14.764	Un-aerated
Ana3	0.1700	1539.2641	14.764	Un-aerated
Ana2	0.1700	1539.2641	14.764	Un-aerated

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Ana1	0
Anox	0
Aer2	0
Aer4	0
Ana3	0
Ana2	0

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser	Max. air flow rate per diffuser	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Ana1	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0
Anox	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0
Aer2	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0
Aer4	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0
Ana3	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0
Ana2	1.2400	0.8960	0.8880	0.4413	0.2500	12.0000	240.0000	3.0000	0	0

Configuration information for all Model clarifier units

Physical data

Element name	Volume[Mil. Gal]	Area[ft2]	Depth[ft]	Number of layers	Top feed layer	Feed Layers
SC	4.2830	3.817E+4	15.000	10	6	1

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
SC	Ratio	1.00

Element name	Average Temperature	Reactive
SC	Uses global setting	Yes

Local settling parameters

Element name	Maximum Vesilind settling velocity (Vo)	Vesilind hindered zone settling parameter (K) [L/g]	Clarification switching function [mg/L]	Specified TSS conc.for height calc. [mg/L]	Maximum compactability constant [mg/L]
SC	0.783	0.315	100.0000	2500.0000	2.500E+4

Configuration information for all Effluent units

Configuration information for all COD Influent units

Operating data Average (flow/time weighted as required)

Element name	2040
Flow	17.3709369233978

Total COD mgCOD/L	256.89
Total Kjeldahl Nitrogen mgN/L	27.23
Total P mgP/L	4.02
Nitrate N mgN/L	0
pH	7.49
Alkalinity mmol/L	3.90
ISS Influent mgISS/L	21.70
Calcium mg/L	80.00
Magnesium mg/L	15.00
Dissolved O2 mg/L	0

Element name	2040
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.7500
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.2000
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0350
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0110
FZbh - OHO COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotroph COD fraction [gCOD/g of total COD]	1.000E-4
FZaob - AOB COD fraction [gCOD/g of total COD]	1.000E-4
FZnob - NOB COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - AAO COD fraction [gCOD/g of total COD]	1.000E-4
FZbp - PAO COD fraction [gCOD/g of total COD]	1.000E-4
FZbpa - Propionic acetogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbam - Acetoclastic methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZbhm - H2-utilizing methanogens COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Metal addition units

Operating data Average (flow/time weighted as required)

Element name	Alum
Ordinary heterotrophic organisms (OHO) mgCOD/L	0
Methylotrophs mgCOD/L	0
Ammonia oxidizing biomass (AOB) mgCOD/L	0
Nitrite oxidizing biomass (NOB) mgCOD/L	0
Anaerobic ammonia oxidizers (AAO) mgCOD/L	0
Polyphosphate accumulating organisms (PAO) mgCOD/L	0
Propionic acetogens mgCOD/L	0
Methanogens - acetoclastic mgCOD/L	0
Methanogens - hydrogenotrophic mgCOD/L	0
Endogenous products mgCOD/L	0
Slowly bio. COD (part.) mgCOD/L	0
Slowly bio. COD (colloid.) mgCOD/L	0
Part. inert. COD mgCOD/L	0
Part. bio. org. N mgN/L	0
Part. bio. org. P mgP/L	0
Part. inert N mgN/L	0
Part inert P mgP/L	0
Stored PHA mgCOD/L	0
Releasable stored polyP mgP/L	0
Fixed stored polyP mgP/L	0
Readily bio. COD (complex) mgCOD/L	0
Acetate mgCOD/L	0
Propionate mgCOD/L	0
Methanol mgCOD/L	0
Dissolved H2 mgCOD/L	0
Dissolved CH4 mg/L	0
Ammonia N mgN/L	0
Sol. bio. org. N mgN/L	0

Nitrous Oxide N mgN/L	0
Nitrite N mgN/L	0
Nitrate N mgN/L	0
Dissolved N2 mgN/L	0
PO4-P (Sol. & Me Complexed) mgP/L	0
Sol. inert COD mgCOD/L	0
Sol. inert TKN mgN/L	0
ISS Influent mgISS/L	0
Struvite mgISS/L	0
Hydroxy-dicalcium-phosphate mgISS/L	0
Hydroxy-apatite mgISS/L	0
Magnesium mg/L	0
Calcium mg/L	0
Metal mg/L	58447.10
Other Cations (strong bases) meq/L	5.00
Other Anions (strong acids) meq/L	6517.96
Total CO2 mmol/L	7.00
User defined 1 mg/L	0
User defined 2 mg/L	0
User defined 3 mgVSS/L	0
User defined 4 mgISS/L	0
Dissolved O2 mg/L	0
Flow	0.000492104054143647

Configuration information for all Sidestream Mixer units

Physical data

Element name	Volume[Mil. Gal]	Area[ft2]	Depth[ft]
RAS mixer	0	N/A	N/A
MLR mixer	0	N/A	N/A
Sidestream Mixer18	0	N/A	N/A

Sidestream Mixer16	0	N/A	N/A
Sidestream Mixer27	0	N/A	N/A

Configuration information for all General Mixer units

Physical data

Element name	Volume[Mil. Gal]	Area[ft2]	Depth[ft]
Recycle mixer	0	N/A	N/A

Configuration information for all Dewatering unit units

Physical data

Element name	No Volume
Dewatering	0

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Dewatering	Flow paced	1.00 %

Element name	Percent removal
Dewatering	90.00

Configuration information for all Sludge units

Configuration information for all Splitter units

Physical data

Element name	Volume[Mil. Gal]	Area[ft2]	Depth[ft]
Round n round	0	N/A	N/A
WAS splitter	0	N/A	N/A
MLR splitter	0	N/A	N/A
Lagoon splitter	0	N/A	N/A
Anaerobic Zone IMLR splitter	0	N/A	N/A

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Round n round	Flowrate [Side]	1393
WAS splitter	Flowrate [Side]	0.173927417120444
MLR splitter	Flowrate [Main]	18
Lagoon splitter	Flowrate [Main]	21
Anaerobic Zone IMLR splitter	Flowrate [Main]	0

Configuration information for all Bioreactor (surface aerators) units

Physical data

Element name	Volume[Mil. Gal]	Area[ft2]	Depth[ft]
Aer1	1.1700	1.059E+4	14.764
Aer3	1.1700	1.059E+4	14.764

Operating data Average (flow/time weighted as required)

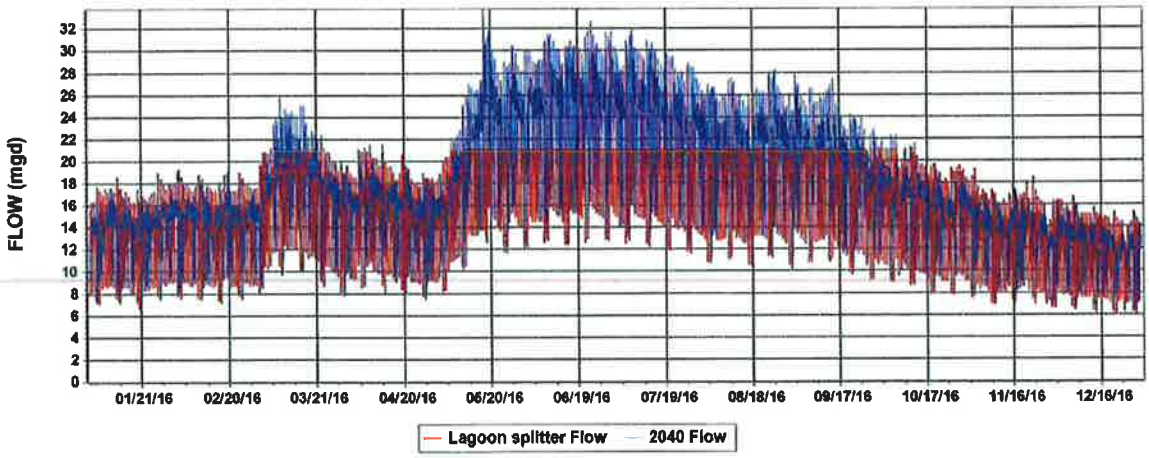
Element name	Average Power supply rate [hp]
Aer1	300.0
Aer3	300.0

Aeration equipment parameters

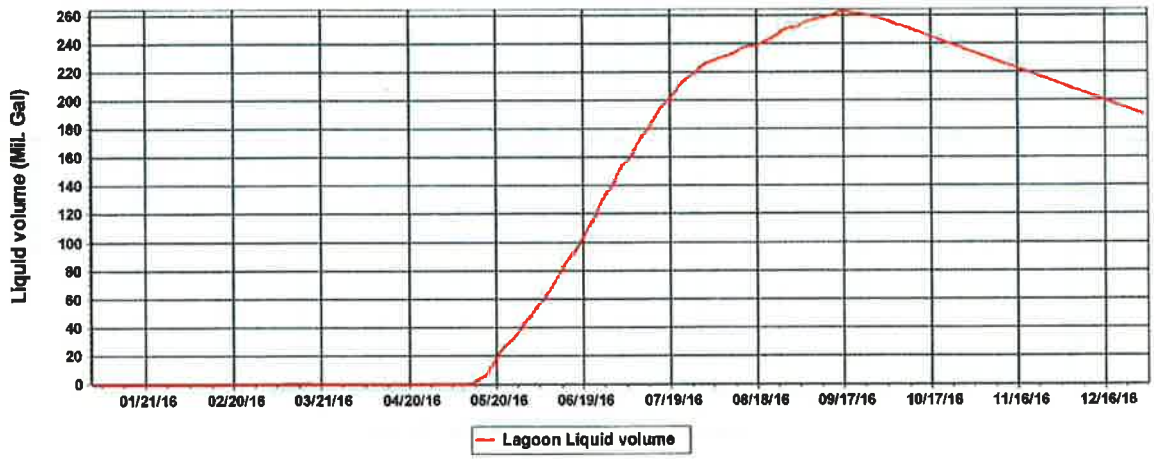
Element name	Surface aerator Std. oxygen transfer rate [lb O /(hp hr)]	Maximum power per rotor [hp]
Aer1	3.5000	26.8097
Aer3	3.5000	26.8097

BioWin Album

Album page - Lagoon split

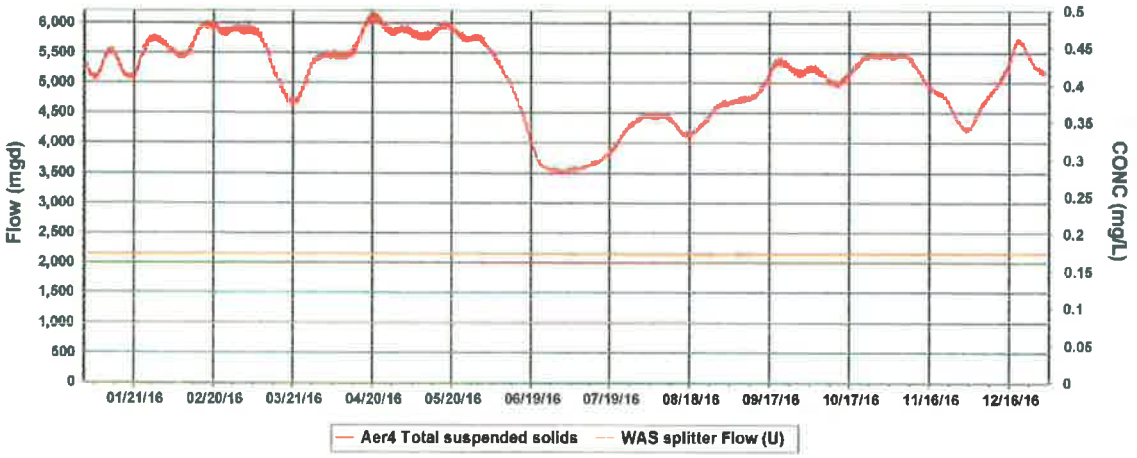


Album page - Lagoon Vol



Album page - Lagoon Cumulative

Album page - MLSS



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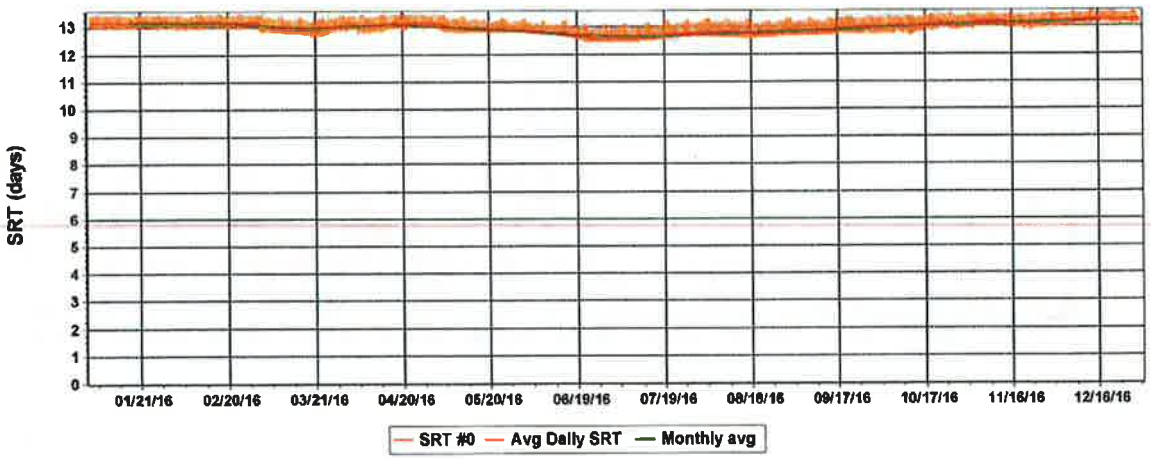
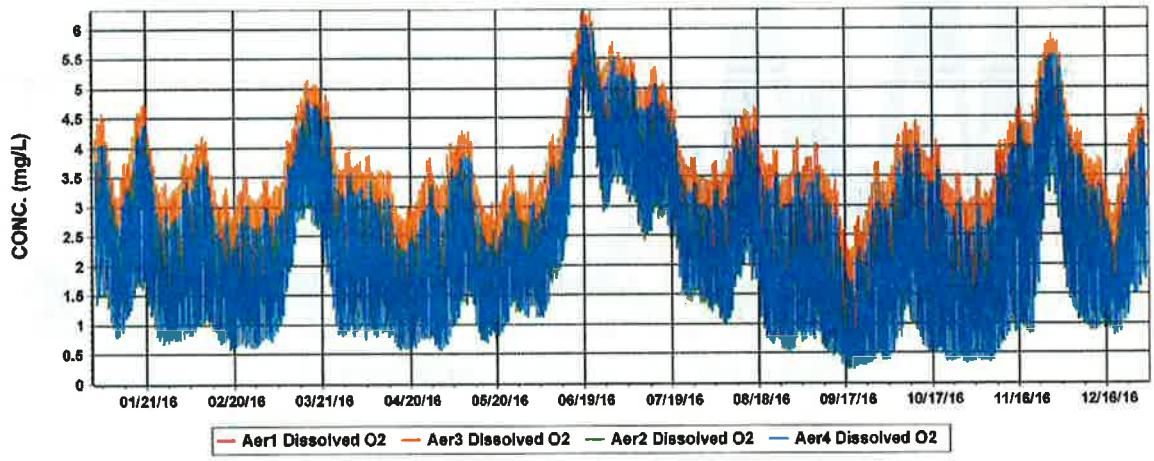
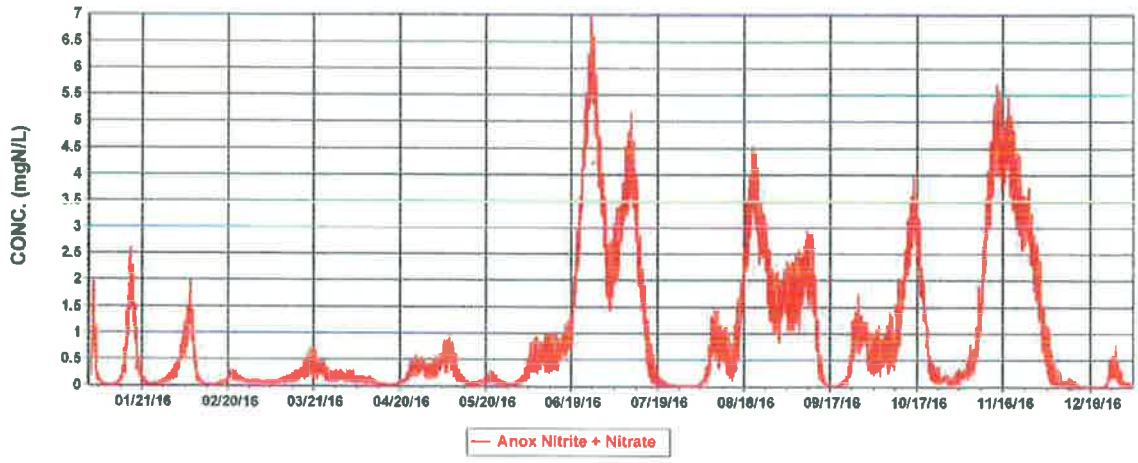


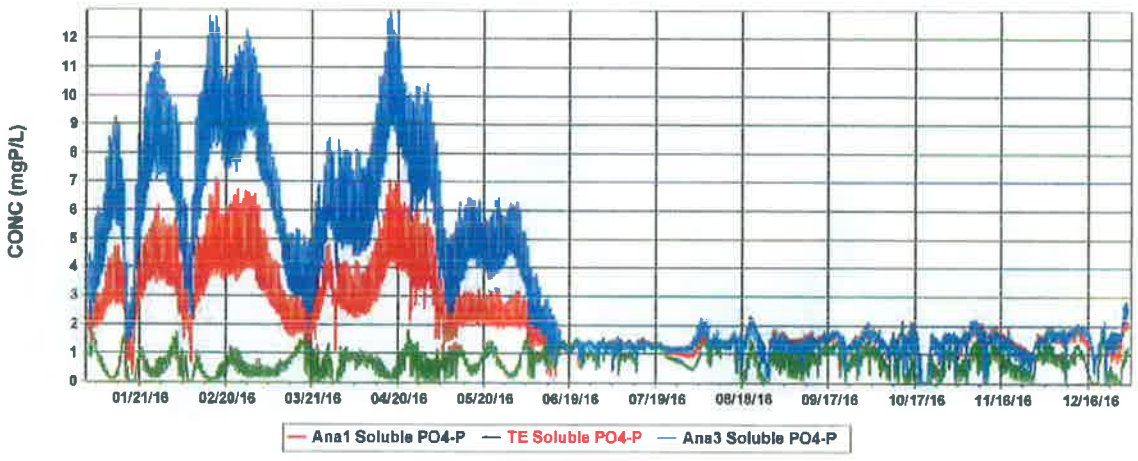
Album page - DO



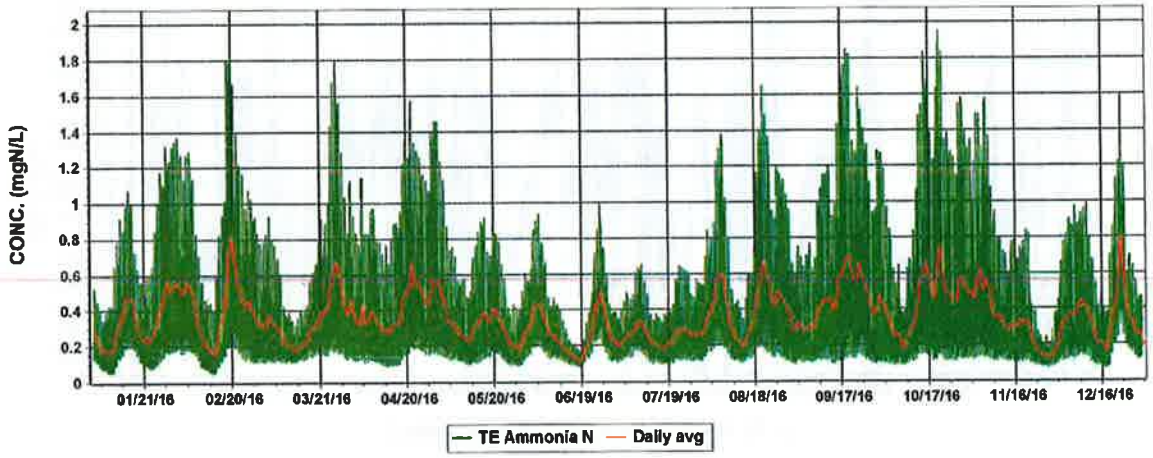
Album page - Anox NO3



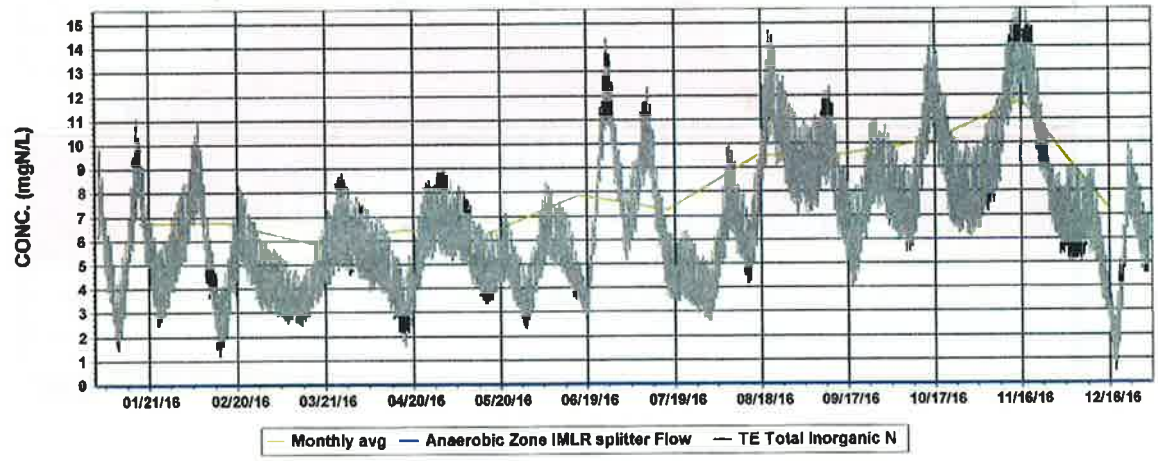
Album page - P release



Album page - Eff NH3



Album page - Eff TN



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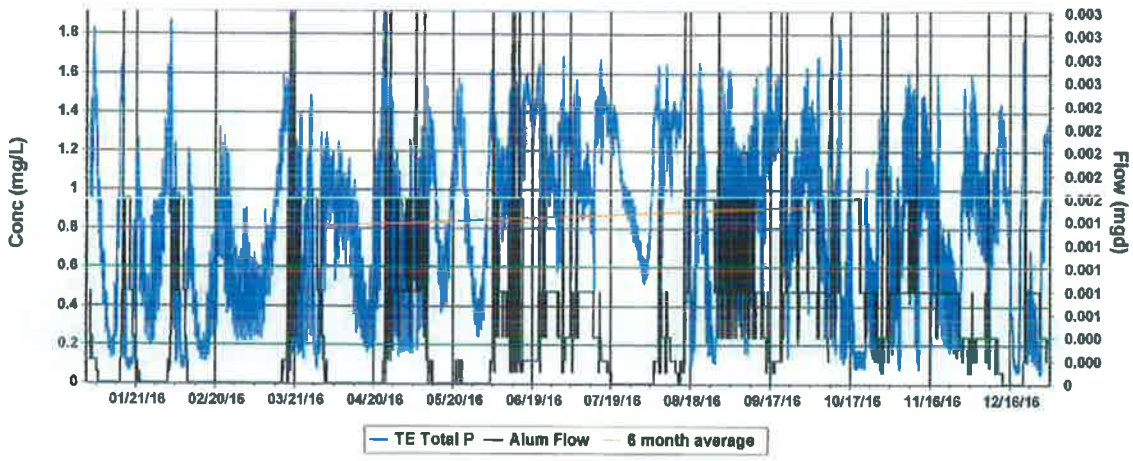
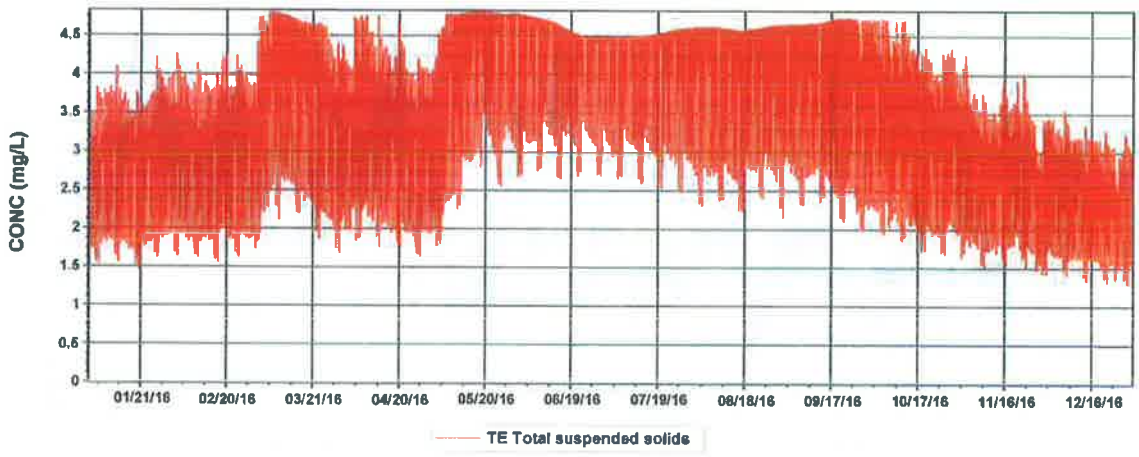


Album page - Page 18



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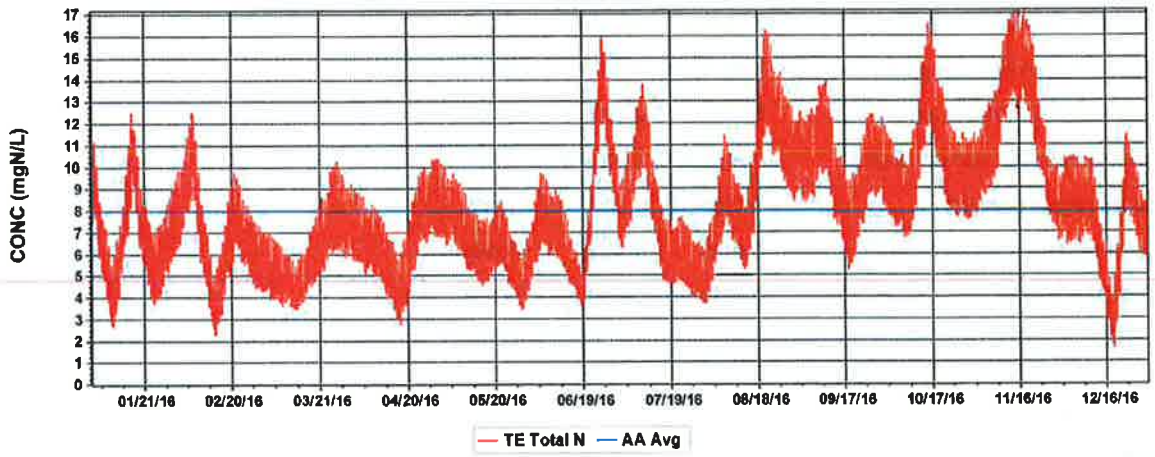

Global Parameters

Common

Name	Default	Value	
Hydrolysis rate [1/d]	2.1000	2.1000	1.0290
Hydrolysis half sat. [-]	0.0600	0.0600	1.0000
Anoxic hydrolysis factor [-]	0.2800	0.2800	1.0000
Anaerobic hydrolysis factor (AS) [-]	0.0400	0.0400	1.0000
Anaerobic hydrolysis factor (AD) [-]	0.5000	0.5000	1.0000
Adsorption rate of colloids [L/(mgCOD d)]	0.1500	0.1500	1.0290
Ammonification rate [L/(mgCOD d)]	0.0800	0.0800	1.0290
Assimilative nitrate/nitrite reduction rate [1/d]	0.5000	0.5000	1.0000
Endogenous products decay rate [1/d]	0	0	1.0000

AOB

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9000	0.9000	1.0720
Substrate (NH4) half sat. [mgN/L]	0.7000	0.7000	1.0000
Byproduct NH4 logistic slope [-]	50.0000	50.0000	1.0000
Byproduct NH4 inflection point [mgN/L]	1.4000	1.4000	1.0000
AOB denite DO half sat. [mg/L]	0.1000	0.1000	1.0000
AOB denite HNO2 half sat. [mgN/L]	5.000E-6	5.000E-6	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiHNO2 [mmol/L]	0.0050	0.0050	1.0000

NOB

Name	Default	Value	
Max. spec. growth rate [1/d]	0.7000	0.7000	1.0600
Substrate (NO2) half sat. [mgN/L]	0.1000	0.1000	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiNH3 [mmol/L]	0.0750	0.0750	1.0000

AAO

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2000	0.2000	1.1000
Substrate (NH4) half sat. [mgN/L]	2.0000	2.0000	1.0000
Substrate (NO2) half sat. [mgN/L]	1.0000	1.0000	1.0000
Aerobic decay rate [1/d]	0.0190	0.0190	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0095	0.0095	1.0290
Ki Nitrite [mgN/L]	1000.0000	1000.0000	1.0000
Nitrite sensitivity constant [L / (d mgN)]	0.0160	0.0160	1.0000

OHO

Name	Default	Value	
Max. spec. growth rate [1/d]	3.2000	3.2000	1.0290
Substrate half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Anoxic growth factor [-]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.6200	0.6200	1.0290
Anoxic decay rate [1/d]	0.2330	0.2330	1.0290
Anaerobic decay rate [1/d]	0.1310	0.1310	1.0290
Fermentation rate [1/d]	1.6000	1.6000	1.0290
Fermentation half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Fermentation growth factor (AS) [-]	0.2500	0.2500	1.0000
Free nitrous acid inhibition [mol/L]	1.000E-7	1.000E-7	1.0000

Methylotrophs

Name	Default	Value	
Max. spec. growth rate [1/d]	1.3000	1.3000	1.0720
Methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.0400	0.0400	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0300	0.0300	1.0290
Free nitrous acid inhibition [mmol/L]	1.000E-7	1.000E-7	1.0000

PAO

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9500	0.9500	1.0000

Max. spec. growth rate, P-limited [1/d]	0.4200	0.4200	1.0000
Substrate half sat. [mgCOD(PHB)/mgCOD(Zbp)]	0.1000	0.1000	1.0000
Substrate half sat., P-limited [mgCOD(PHB)/mgCOD(Zbp)]	0.0500	0.0500	1.0000
Magnesium half sat. [mgMg/L]	0.1000	0.1000	1.0000
Cation half sat. [mmol/L]	0.1000	0.1000	1.0000
Calcium half sat. [mgCa/L]	0.1000	0.1000	1.0000
Aerobic/anoxic decay rate [1/d]	0.1000	0.1000	1.0000
Aerobic/anoxic maintenance rate [1/d]	0	0	1.0000
Anaerobic decay rate [1/d]	0.0400	0.0400	1.0000
Anaerobic maintenance rate [1/d]	0	0	1.0000
Sequestration rate [1/d]	4.5000	4.5000	1.0000
Anoxic growth factor [-]	0.3300	0.3300	1.0000

Acetogens

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2500	0.2500	1.0290
Substrate half sat. [mgCOD/L]	10.0000	10.0000	1.0000
Acetate inhibition [mgCOD/L]	10000.0000	10000.0000	1.0000
Anaerobic decay rate [1/d]	0.0500	0.0500	1.0290
Aerobic/anoxic decay rate [1/d]	0.5200	0.5200	1.0290

Methanogens

Name	Default	Value	
Acetoclastic max. spec. growth rate [1/d]	0.3000	0.3000	1.0290
H2-utilizing max. spec. growth rate [1/d]	1.4000	1.4000	1.0290
Acetoclastic substrate half sat. [mgCOD/L]	100.0000	100.0000	1.0000
Acetoclastic methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
H2-utilizing CO2 half sat. [mmol/L]	0.1000	0.1000	1.0000
H2-utilizing substrate half sat. [mgCOD/L]	1.0000	1.0000	1.0000

H2-utilizing methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Acetoclastic propionic inhibition [mgCOD/L]	10000.0000	10000.0000	1.0000
Acetoclastic anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
Acetoclastic aerobic/anoxic decay rate [1/d]	0.6000	0.6000	1.0290
H2-utilizing anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
H2-utilizing aerobic/anoxic decay rate [1/d]	2.8000	2.8000	1.0290

pH

Name	Default	Value
OHO low pH limit [-]	4.0000	4.0000
OHO high pH limit [-]	10.0000	10.0000
Methylotrophs low pH limit [-]	4.0000	4.0000
Methylotrophs high pH limit [-]	10.0000	10.0000
Autotrophs low pH limit [-]	5.5000	5.5000
Autotrophs high pH limit [-]	9.5000	9.5000
PAO low pH limit [-]	4.0000	4.0000
PAO high pH limit [-]	10.0000	10.0000
OHO low pH limit (anaerobic) [-]	5.5000	5.5000
OHO high pH limit (anaerobic) [-]	8.5000	8.5000
Propionic acetogens low pH limit [-]	4.0000	4.0000
Propionic acetogens high pH limit [-]	10.0000	10.0000
Acetoclastic methanogens low pH limit [-]	5.0000	5.0000
Acetoclastic methanogens high pH limit [-]	9.0000	9.0000
H2-utilizing methanogens low pH limit [-]	5.0000	5.0000
H2-utilizing methanogens high pH limit [-]	9.0000	9.0000

Switches

Name	Default	Value
OHO DO half sat. [mgO2/L]	0.0500	0.2500

PAO DO half sat. [mgO2/L]	0.0500	0.0500
Anoxic/anaerobic NOx half sat. [mgN/L]	0.1500	0.1500
AOB DO half sat. [mgO2/L]	0.2500	0.2500
NOB DO half sat. [mgO2/L]	0.5000	0.5000
AAO DO half sat. [mgO2/L]	0.0100	0.0100
Anoxic NO3(->NO2) half sat. [mgN/L]	0.1000	0.1000
Anoxic NO3(->N2) half sat. [mgN/L]	0.0500	0.0500
Anoxic NO2(->N2) half sat. (mgN/L)	0.0100	0.0100
NH3 nutrient half sat. [mgN/L]	0.0050	0.0050
PolyP half sat. [mgP/mgCOD]	0.0100	0.0100
VFA sequestration half sat. [mgCOD/L]	5.0000	5.0000
P uptake half sat. [mgP/L]	0.1500	0.1500
P nutrient half sat. [mgP/L]	0.0010	0.0010
Autotroph CO2 half sat. [mmol/L]	0.1000	0.1000
H2 low/high half sat. [mgCOD/L]	1.0000	1.0000
Propionic acetogens H2 inhibition [mgCOD/L]	5.0000	5.0000
Synthesis anion/cation half sat. [meq/L]	0.0100	0.0100

Common

Name	Default	Value
Biomass volatile fraction (VSS/TSS)	0.9200	0.9200
Endogenous residue volatile fraction (VSS/TSS)	0.9200	0.9200
N in endogenous residue [mgN/mgCOD]	0.0700	0.0700
P in endogenous residue [mgP/mgCOD]	0.0220	0.0220
Endogenous residue COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Particulate substrate COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000
Particulate inert COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000
Molecular weight of other anions [mg/mmol]	35.5000	35.5000
Molecular weight of other cations [mg/mmol]	39.1000	39.1000

AOB

Name	Default	Value
Yield [mgCOD/mgN]	0.1500	0.1500
AOB denite NO2 fraction as TEA [-]	0.5000	0.5000
Byproduct NH4 fraction to N2O [-]	0.0025	0.0025
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

NOB

Name	Default	Value
Yield [mgCOD/mgN]	0.0900	0.0900
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

AAO

Name	Default	Value
Yield [mgCOD/mgN]	0.1140	0.1140
Nitrate production [mgN/mgBiomassCOD]	2.2800	2.2800
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

OHO

Name	Default	Value
Yield (aerobic) [-]	0.6660	0.6660
Yield (fermentation, low H2) [-]	0.1000	0.1000
Yield (fermentation, high H2) [-]	0.1000	0.1000
H2 yield (fermentation low H2) [-]	0.3500	0.3500
H2 yield (fermentation high H2) [-]	0	0
Propionate yield (fermentation, low H2) [-]	0	0
Propionate yield (fermentation, high H2) [-]	0.7000	0.7000
CO2 yield (fermentation, low H2) [-]	0.7000	0.7000
CO2 yield (fermentation, high H2) [-]	0	0
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Endogenous fraction - aerobic [-]	0.0800	0.0800
Endogenous fraction - anoxic [-]	0.1030	0.1030
Endogenous fraction - anaerobic [-]	0.1840	0.1840
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield (anoxic) [-]	0.5400	0.5400
Yield propionic (aerobic) [-]	0.6400	0.6400
Yield propionic (anoxic) [-]	0.4600	0.4600
Yield acetic (aerobic) [-]	0.6000	0.6000
Yield acetic (anoxic) [-]	0.4300	0.4300
Yield methanol (aerobic) [-]	0.5000	0.5000
Adsorp. max. [-]	1.0000	1.0000
Max fraction to N2O at high FNA over nitrate [-]	0.0500	0.0500
Max fraction to N2O at high FNA over nitrite [-]	0.1000	0.1000

Methylotrophs

Name	Default	Value
Yield (anoxic) [-]	0.4000	0.4000
N in biomass [mgN/mgCOD]	0.0700	0.0700

P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Max fraction to N2O at high FNA over nitrate [-]	0.1000	0.1000
Max fraction to N2O at high FNA over nitrite [-]	0.1500	0.1500

PAO

Name	Default	Value
Yield (aerobic) [-]	0.6390	0.6390
Yield (anoxic) [-]	0.5200	0.5200
Aerobic P/PHA uptake [mgP/mgCOD]	0.9300	0.9300
Anoxic P/PHA uptake [mgP/mgCOD]	0.3500	0.3500
Yield of PHA on sequestration [-]	0.8890	0.8890
N in biomass [mgN/mgCOD]	0.0700	0.0700
N in sol. inert [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous part. [-]	0.2500	0.2500
Inert fraction of endogenous sol. [-]	0.2000	0.2000
P/Ac release ratio [mgP/mgCOD]	0.5100	0.5100
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield of low PP [-]	0.9400	0.9400
Mg to P mole ratio in polyphosphate [mmolMg/mmolP]	0.3000	0.3000
Cation to P mole ratio in polyphosphate [meq/mmolP]	0.1500	0.1500
Ca to P mole ratio in polyphosphate [mmolCa/mmolP]	0.0500	0.0500
Cation to P mole ratio in organic phosphate [meq/mmolP]	0.0100	0.0100

Acetogens

Name	Default	Value
Yield [-]	0.1000	0.1000

H2 yield [-]	0.4000	0.4000
CO2 yield [-]	1.0000	1.0000
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Methanogens

Name	Default	Value
Acetoclastic yield [-]	0.1000	0.1000
Methanol acetoclastic yield [-]	0.1000	0.1000
H2-utilizing yield [-]	0.1000	0.1000
Methanol H2-utilizing yield [-]	0.1000	0.1000
N in acetoclastic biomass [mgN/mgCOD]	0.0700	0.0700
N in H2-utilizing biomass [mgN/mgCOD]	0.0700	0.0700
P in acetoclastic biomass [mgP/mgCOD]	0.0220	0.0220
P in H2-utilizing biomass [mgP/mgCOD]	0.0220	0.0220
Acetoclastic fraction to endog. residue [-]	0.0800	0.0800
H2-utilizing fraction to endog. residue [-]	0.0800	0.0800
Acetoclastic COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
H2-utilizing COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

General

Name	Default	Value
Tank head loss per metre of length (from flow) [m/m]	0.0025	0.0025

Heating fuel/Chemical Costs

Name	Default	Value
Methanol [$/gal]	1.6656	1.6656
Ferric [$/gal]	0.3785	0.3785
Aluminium [$/gal]	0.3028	0.3028
Natural gas [$/MMBTU]	3.1652	3.1652
Heating oil [$/gal]	1.8927	1.8927
Diesel [$/gal]	2.6498	2.6498
Custom fuel [$/gal]	3.7854	3.7854
Biogas sale price [$/MMBTU]	2.1101	2.1101

Anaerobic digester

Name	Default	Value
Bubble rise velocity (anaerobic digester) [cm/s]	23.9000	23.9000
Bubble Sauter mean diameter (anaerobic digester) [cm]	0.3500	0.3500
Anaerobic digester gas hold-up factor []	1.0000	1.0000

Combined Heat and Power (CHP) engine

Name	Default	Value
Methane heat of combustion [kJ/mole]	800.0000	800.0000
Hydrogen heat of combustion [kJ/mole]	240.0000	240.0000
CHP engine heat price [$/kWh]	0	0
CHP engine power price [$/kWh]	0.1500	0.1500

Calorific values of heating fuels

Name	Default	Value

Calorific value of natural gas [BTU/lb]	20636	20636
Calorific value of heating fuel oil [BTU/lb]	18057	18057
Calorific value of diesel [BTU/lb]	19776	19776
Calorific value of custom fuel [BTU/lb]	13758	13758

Density of liquid heating fuels

Name	Default	Value
Density of heating fuel oil [lb/ft3]	56	56
Density of diesel [lb/ft3]	55	55
Density of custom fuel [lb/ft3]	49	49

Mass transfer

Name	Default	Value	
Kl for H2 [m/d]	17.0000	17.0000	1.0240
Kl for CO2 [m/d]	10.0000	10.0000	1.0240
Kl for NH3 [m/d]	1.0000	1.0000	1.0240
Kl for CH4 [m/d]	8.0000	8.0000	1.0240
Kl for N2 [m/d]	15.0000	15.0000	1.0240
Kl for N2O [m/d]	8.0000	8.0000	1.0240
Kl for O2 [m/d]	13.0000	13.0000	1.0240

Henry's law constants

Name	Default	Value	
CO2 [M/atm]	3.4000E-2	3.4000E-2	2400.0000
O2 [M/atm]	1.3000E-3	1.3000E-3	1500.0000
N2 [M/atm]	6.5000E-4	6.5000E-4	1300.0000

N2O [M/atm]	2.5000E-2	2.5000E-2	2600.0000
NH3 [M/atm]	5.8000E+1	5.8000E+1	4100.0000
CH4 [M/atm]	1.4000E-3	1.4000E-3	1600.0000
H2 [M/atm]	7.8000E-4	7.8000E-4	500.0000

Properties constants

Name	Default	Value
K in Viscosity = K e ^(Ea/RT) [Pa s]	6.849E-7	6.849E-7
Ea in Viscosity = K e ^(Ea/RT) [j/mol]	1.780E+4	1.780E+4
Y in ML Viscosity = H2O viscosity * (1+A*MLSS^Y) [-]	1.0000	1.0000
A in ML Viscosity = H2O viscosity * (1+A*MLSS^Y) [m3/g]	1.000E-7	1.000E-7
A in ML Density = H2O density + A*MLSS [(kg/m3)/(g/m3)]	3.248E-4	3.248E-4
A in Antoine equn. [T in K, P in Bar {NIST}]	5.2039	5.2039
B in Antoine equn. [T in K, P in Bar {NIST}]	1733.9260	1733.9260
C in Antoine equn. [T in K, P in Bar {NIST}]	-39.5	-39.5

Chemical precipitation rates

Name	Default	Value	
Struvite precipitation rate [1/d]	3.000E+10	3.000E+10	1.0240
Struvite redissolution rate [1/d]	3.000E+11	3.000E+11	1.0240
Struvite half sat. [mgTSS/L]	1.0000	1.0000	1.0000
HDP precipitation rate [L/(molP d)]	1.000E+8	1.000E+8	1.0000
HDP redissolution rate [L/(mol P d)]	1.000E+8	1.000E+8	1.0000
HAP precipitation rate [molHDP/(L d)]	5.000E-4	5.000E-4	1.0000

Chemical precipitation constants

Name	Default	Value
Struvite solubility constant [mol/L]	6.918E-14	6.918E-14
HDP solubility product [mol/L]	2.750E-22	2.750E-22
HDP half sat. [mgTSS/L]	1.0000	1.0000
Equilibrium soluble PO4 with Al dosing at pH 7 [mgP/L]	0.0100	0.0100
Al to P ratio [molAl/molP]	0.8000	1.6000
Al(OH)3 solubility product [mol/L]	1.259E+9	1.259E+9
AlHPO4+ dissociation constant [mol/L]	7.943E-13	7.943E-13
Equilibrium soluble PO4 with Fe dosing at pH 7 [mgP/L]	0.0100	0.0100
Fe to P ratio [molFe/molP]	1.6000	1.6000
Fe(OH)3 solubility product [mol/L]	0.0500	0.0500
FeH2PO4++ dissociation constant [mol/L]	5.012E-22	5.012E-22

Pipe and pump parameters

Name	Default	Value
Static head [ft]	0.8202	0.8202
Pipe length (headloss calc.s) [ft]	164.0420	164.0420
Pipe inside diameter [in]	19.68504	19.68504
K(fittings) - Total minor losses K	5.0000	5.0000
Pipe roughness [in]	0.00787	0.00787
'A' in overall pump efficiency = A + B*Q + C*(Q^2)[-]	0.8500	0.8500
'B' in overall pump efficiency = A + B*Q + C*(Q^2)[[-]/(mgd)]	0	0
'C' in overall pump efficiency = A + B*Q + C*(Q^2)[[-]/(mgd)^2]	0	0

Fittings and loss coefficients ('K' values)

Name	Default	Value
Pipe entrance (bellmouth)	0.0500	1.0000
90° bend	0.7500	5.0000
45° bend	0.3000	2.0000

Butterfly value (open)	0.3000	1.0000
Non-return value	1.0000	0
Outlet (bellmouth)	0.2000	1.0000

Aeration

Name	Default	Value
Surface pressure [kPa]	101.3250	101.3250
Fractional effective saturation depth (Fed) [-]	0.3250	0.3250
Supply gas CO2 content [vol. %]	0.0350	0.0350
Supply gas O2 [vol. %]	20.9500	20.9500
Off-gas CO2 [vol. %]	2.0000	2.0000
Off-gas O2 [vol. %]	18.8000	18.8000
Off-gas H2 [vol. %]	0	0
Off-gas NH3 [vol. %]	0	0
Off-gas CH4 [vol. %]	0	0
Off-gas N2O [vol. %]	0	0
Surface turbulence factor [-]	2.0000	2.0000
Set point controller gain []	1.0000	1.0000

Blower

Name	Default	Value
Intake filter pressure drop [psi]	0.5076	0.5076
Pressure drop through distribution system (piping/valves) [psi]	0.4351	0.4351
Adiabatic/polytropic compression exponent (1.4 for adiabatic)	1.4000	1.4000
'A' in blower efficiency = A + B*Qa + C*(Qa^2)[-]	0.7500	0.7500
'B' in blower efficiency = A + B*Qa + C*(Qa^2)[[-]/(ft3/min (20C, 1 atm))]	0	0
'C' in blower efficiency = A + B*Qa + C*(Qa^2)[[-]/(ft3/min (20C, 1 atm))^2]	0	0

Diffuser

Name	Default	Value
k1 in C = k1(PC)^0.25 + k2	1.2400	1.2400
k2 in C = k1(PC)^0 25 + k2	0.8960	0.8960
Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	0.8880	0.8880
Area of one diffuser [ft2]	0.4413	0.4413
Diffuser mounting height [ft]	0.8202	0.8202
Min. air flow rate per diffuser ft3/min (20C, 1 atm)	0.2943	0.2943
Max. air flow rate per diffuser ft3/min (20C, 1 atm)	5.8858	5.8858
'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2 [psi]	0.4351	0.4351
'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2[psi/(ft3/min (20C, 1 atm))]	0	0
'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2[psi/(ft3/min (20C, 1 atm))^2]	0	0

Surface aerators

Name	Default	Value
Surface aerator Std. oxygen transfer rate [lb O /(hp hr)]	2.46697	2.46697
Maximum power per rotor [hp]	26.80965	26.80965

Modified Vesilind

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [ft/min]	0.387	0.387
Vesilind hindered zone settling parameter (K) [L/g]	0.370	0.370
Clarification switching function [mg/L]	100.000	100.000
Specified TSS conc.for height calc. [mg/L]	2500.000	2500.000
Maximum compactability constant [mg/L]	15000.000	25000.000

Double exponential

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [ft/min]	0.934	0.934
Maximum (practical) settling velocity (Vo') [ft/min]	0.615	0.615
Hindered zone settling parameter (Kh) [L/g]	0.400	0.400
Flocculent zone settling parameter (Kf) [L/g]	2.500	2.500
Maximum non-settleable TSS [mg/L]	20.0000	20.0000
Non-settleable fraction [-]	0.0010	0.0010
Specified TSS conc. for height calc. [mg/L]	2500.0000	2500.0000

Emission factors

Name	Default	Value
Carbon dioxide equivalence of nitrous oxide	296.0000	296.0000
Carbon dioxide equivalence of methane	23.0000	23.0000

Biofilm general

Name	Default	Value	
Attachment rate [g / (m2 d)]	80.0000	80.0000	1.0000
Attachment TSS half sat. [mg/L]	100.0000	100.0000	1.0000
Detachment rate [g/(m3 d)]	8.000E+4	8.000E+4	1.0000
Solids movement factor []	10.0000	10.0000	1.0000
Diffusion neta []	0.8000	0.8000	1.0000
Thin film limit [mm]	0.5000	0.5000	1.0000
Thick film limit [mm]	3.0000	3.0000	1.0000
Assumed Film thickness for tank volume correction (temp independent) [mm]	0.7500	0.7500	1.0000
Film surface area to media area ratio - Max.[ ]	1.0000	1.0000	1.0000
Minimum biofilm conc. for streamer formation [gTSS/m2]	4.0000	4.0000	1.0000

Maximum biofilm concentrations [mg/L]

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	5.000E+4	5.000E+4	1.0000
Methylotrophs	5.000E+4	5.000E+4	1.0000
Ammonia oxidizing biomass (AOB)	1.000E+5	1.000E+5	1.0000
Nitrite oxidizing biomass (NOB)	1.000E+5	1.000E+5	1.0000
Anaerobic ammonia oxidizers (AAO)	5.000E+4	5.000E+4	1.0000
Polyphosphate accumulating organisms (PAO)	5.000E+4	5.000E+4	1.0000
Propionic acetogens	5.000E+4	5.000E+4	1.0000
Methanogens - acetoclastic	5.000E+4	5.000E+4	1.0000
Methanogens - hydrogenotrophic	5.000E+4	5.000E+4	1.0000
Endogenous products	3.000E+4	3.000E+4	1.0000
Slowly bio. COD (part.)	5000.0000	5000.0000	1.0000
Slowly bio. COD (colloid.)	4000.0000	4000.0000	1.0000
Part. inert. COD	5000.0000	5000.0000	1.0000
Part. bio. org. N	0	0	1.0000
Part. bio. org. P	0	0	1.0000
Part. inert N	0	0	1.0000
Part. inert P	0	0	1.0000
Stored PHA	5000.0000	5000.0000	1.0000
Releasable stored polyP	1.150E+6	1.150E+6	1.0000
Fixed stored polyP	1.150E+6	1.150E+6	1.0000
Readily bio COD (complex)	0	0	1.0000
Acetate	0	0	1.0000
Propionate	0	0	1.0000
Methanol	0	0	1.0000
Dissolved H2	0	0	1.0000
Dissolved CH4	0	0	1.0000
Ammonia N	0	0	1.0000
Sol. bio. org. N	0	0	1.0000
Nitrous Oxide N	0	0	1.0000
Nitrite N	0	0	1.0000
Nitrate N	0	0	1.0000

Dissolved N2	0	0	1.0000
PO4-P (Sol. & Me Complexed)	1.000E+10	1.000E+10	1.0000
Sol. inert COD	0	0	1.0000
Sol. inert TKN	0	0	1.0000
ISS Influent	1.300E+6	1.300E+6	1.0000
Struvite	8.500E+5	8.500E+5	1.0000
Hydroxy-dicalcium-phosphate	1.150E+6	1.150E+6	1.0000
Hydroxy-apatite	1.600E+6	1.600E+6	1.0000
Magnesium	0	0	1.0000
Calcium	0	0	1.0000
Metal	1.000E+10	1.000E+10	1.0000
Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Total CO2	0	0	1.0000
User defined 1	0	0	1.0000
User defined 2	0	0	1.0000
User defined 3	5.000E+4	5.000E+4	1.0000
User defined 4	5.000E+4	5.000E+4	1.0000
Dissolved O2	0	0	1.0000

Effective diffusivities [m2/s]

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	5.000E-14	5.000E-14	1.0290
Methylotrophs	5.000E-14	5.000E-14	1.0290
Ammonia oxidizing biomass (AOB)	5.000E-14	5.000E-14	1.0290
Nitrite oxidizing biomass (NOB)	5.000E-14	5.000E-14	1.0290
Anaerobic ammonia oxidizers (AAO)	5.000E-14	5.000E-14	1.0290
Polyphosphate accumulating organisms (PAO)	5.000E-14	5.000E-14	1.0290
Propionic acetogens	5.000E-14	5.000E-14	1.0290
Methanogens - acetoclastic	5.000E-14	5.000E-14	1.0290
Methanogens - hydrogenotrophic	5.000E-14	5.000E-14	1.0290
Endogenous products	5.000E-14	5.000E-14	1.0290

Slowly bio. COD (part.)	5.000E-14	5.000E-14	1.0290
Slowly bio. COD (colloid.)	5.000E-10	5.000E-12	1.0290
Part. inert. COD	5.000E-14	5.000E-14	1.0290
Part. bio. org. N	5.000E-14	5.000E-14	1.0290
Part. bio. org. P	5.000E-14	5.000E-14	1.0290
Part. inert N	5.000E-14	5.000E-14	1.0290
Part. inert P	5.000E-14	5.000E-14	1.0290
Stored PHA	5.000E-14	5.000E-14	1.0290
Releasable stored polyP	5.000E-14	5.000E-14	1.0290
Fixed stored polyP	5.000E-14	5.000E-14	1.0290
Readily bio. COD (complex)	6.900E-10	6.900E-10	1.0290
Acetate	1.240E-9	1.240E-9	1.0290
Propionate	8.300E-10	8.300E-10	1.0290
Methanol	1.600E-9	1.600E-9	1.0290
Dissolved H2	5.850E-9	5.850E-9	1.0290
Dissolved CH4	1.963E-9	1.963E-9	1.0290
Ammonia N	2.000E-9	2.000E-9	1.0290
Sol. bio. org. N	1.370E-9	1.370E-9	1.0290
Nitrous Oxide N	1.607E-9	1.607E-9	1.0290
Nitrite N	2.980E-9	2.980E-9	1.0290
Nitrate N	2.980E-9	2.980E-9	1.0290
Dissolved N2	1.900E-9	1.900E-9	1.0290
PO4-P (Sol. & Me Complexed)	2.000E-9	2.000E-9	1.0290
Sol. inert COD	6.900E-10	6.900E-10	1.0290
Sol. inert TKN	6.850E-10	6.850E-10	1.0290
ISS Influent	5.000E-14	5.000E-14	1.0290
Struvite	5.000E-14	5.000E-14	1.0290
Hydroxy-dicalcium-phosphate	5.000E-14	5.000E-14	1.0290
Hydroxy-apatite	5.000E-14	5.000E-14	1.0290
Magnesium	7.200E-10	7.200E-10	1.0290
Calcium	7.200E-10	7.200E-10	1.0290
Metal	4.800E-10	4.800E-10	1.0290
Other Cations (strong bases)	1.440E-9	1.440E-9	1.0290
Other Anions (strong acids)	1.440E-9	1.440E-9	1.0290
Total CO2	1.960E-9	1.960E-9	1.0290

User defined 1	6.900E-10	6.900E-10	1.0290
User defined 2	6.900E-10	6.900E-10	1.0290
User defined 3	5.000E-14	5.000E-14	1.0290
User defined 4	5.000E-14	5.000E-14	1.0290
Dissolved O2	2.500E-9	2.500E-9	1.0290

EPS Strength coefficients [ ]

Name	Default	Value	
Ordinary heterotrophic organisms (OHO)	1.0000	1.0000	1.0000
Methylotrophs	1.0000	1.0000	1.0000
Ammonia oxidizing biomass (AOB)	5.0000	5.0000	1.0000
Nitrite oxidizing biomass (NOB)	25.0000	25.0000	1.0000
Anaerobic ammonia oxidizers (AAO)	10.0000	10.0000	1.0000
Polyphosphate accumulating organisms (PAO)	1.0000	1.0000	1.0000
Propionic acetogens	1.0000	1.0000	1.0000
Methanogens - acetoclastic	1.0000	1.0000	1.0000
Methanogens - hydrogenotrophic	1.0000	1.0000	1.0000
Endogenous products	1.0000	1.0000	1.0000
Slowly bio. COD (part.)	1.0000	1.0000	1.0000
Slowly bio. COD (colloid.)	1.0000	1.0000	1.0000
Part. inert. COD	1.0000	1.0000	1.0000
Part. bio. org. N	1.0000	1.0000	1.0000
Part. bio. org. P	1.0000	1.0000	1.0000
Part. inert N	1.0000	1.0000	1.0000
Part. inert P	1.0000	1.0000	1.0000
Stored PHA	1.0000	1.0000	1.0000
Releasable stored polyP	1.0000	1.0000	1.0000
Fixed stored polyP	1.0000	1.0000	1.0000
Readily bio. COD (complex)	0	0	1.0000
Acetate	0	0	1.0000
Propionate	0	0	1.0000
Methanol	0	0	1.0000

Dissolved H2	0	0	1.0000
Dissolved CH4	0	0	1.0000
Ammonia N	0	0	1.0000
Sol. bio. org. N	0	0	1.0000
Nitrous Oxide N	0	0	1.0000
Nitrite N	0	0	1.0000
Nitrate N	0	0	1.0000
Dissolved N2	0	0	1.0000
PO4-P (Sol. & Me Complexed)	1.0000	1.0000	1.0000
Sol. inert COD	0	0	1.0000
Sol. inert TKN	0	0	1.0000
ISS Influent	0.3300	0.3300	1.0000
Struvite	1.0000	1.0000	1.0000
Hydroxy-dicalcium-phosphate	1.0000	1.0000	1.0000
Hydroxy-apatite	1.0000	1.0000	1.0000
Magnesium	0	0	1.0000
Calcium	0	0	1.0000
Metal	1.0000	1.0000	1.0000
Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Total CO2	0	0	1.0000
User defined 1	0	0	1.0000
User defined 2	0	0	1.0000
User defined 3	1.0000	1.0000	1.0000
User defined 4	1.0000	1.0000	1.0000
Dissolved O2	0	0	1.0000