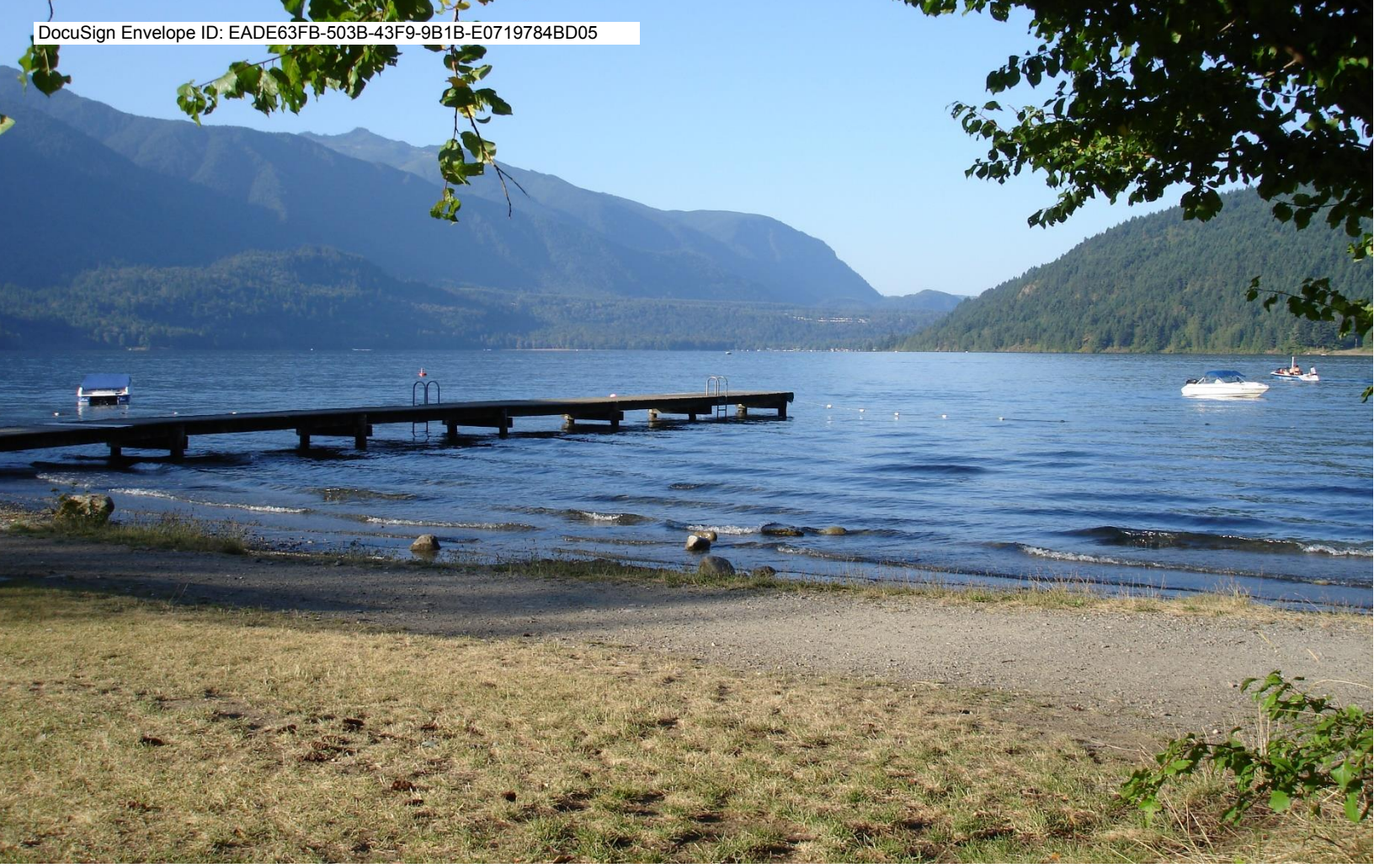

VALIDATION REPORT

North Cultus Wastewater Treatment Plant

PREPARED FOR:

Fraser Valley Regional District

May 2023

Fraser Valley Regional District

CHANDOS

URBAN SYSTEMS

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Glossary of Terms

Building Information Model (BIM) - A parametric, computable representation of the Project design developed by the Designers, their consultants, and any Design-Build Trades, and will include construction details developed by the Parties and their respective consultants and subcontractors. As used in this Agreement, references to Building Information Model, BIM, or the Model, include the primary design model or models and all linked, related, affiliated, or subsidiary models developed for the design, estimating, detailing, fabrication, or construction of the Project, or any portion or element of the Project. The portions of the BIM prepared by the Designers, their consultants, and subtrades' input, and those portions prepared by the Builders under the responsible control of a licensed design professional, are Implementation Documents. The portions of the BIM prepared by the Builders or subcontractors (other than Design-Build Trades) to illustrate means and methods for constructing, fabricating, or installing portions of the Construction Work are Submittals, which are not Contract Documents or Implementation Documents.

Integrated Project Delivery (IPD) - A project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of the project, from early design through project handover.

Project Management Team (PMT) - A team that includes a representative of the Owner, a Designer, and a Builder, and may include additional members as jointly agreed by the Parties, who will act in a collaborative manner to provide management level leadership during the design and construction process in a concerted effort to achieve the Project Requirements.

Senior Management Team (SMT) - A team that includes a senior executive member from each Party who will act in a collaborative manner to resolve any matters referred to it by the PMT either through consensus or, if a consensus is not reached, by a majority vote, subject to an Owner's Directive.

Project Implementation Team (PIT) - Interdisciplinary groups of Project Participants organized by the PMT. PITs are part of the collaborative process to develop the Implementation Documents and other deliverables and may be formed temporarily or for the duration of the Project.

Signatures

Fraser Valley Regional District

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Director of Engineering & Infrastructure

URBAN SYSTEMS

Steve Brubacher

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Acknowledgements

The Validation Team was initiated to deliver the best possible value to the community of Cultus Lake. The Validation Team is made up of representatives from the Fraser Valley Regional District, Chandos Construction Ltd. and Urban Systems Ltd.

The following individuals have contributed to the Validation Report, either in Big Rooms or supporting the project, in development of design, proposal writing and in estimating of costs. The team members are listed below, and identified by the company they represented at the time of their contribution.

BIG ROOM PARTICIPANTS	SUPPORT TEAM MEMBERS
Fraser Valley Regional District	
Tareq Islam	Beth Klein
Sterling Chan	Kelly Lownsbrough
David Roblin	Jennifer Kinneman
Brett Dyck	
Peter Chapman	
Melanie Jones	
Jessica Horn	
Chandos Construction	
Bodo Papke	
Kyle Strachan	
Derek Webster	
Ali Turkman	
Kienan Hamm	
Bryan Juan	
Aaron Baldwin	
Aleksi Makila	
Jen Hancock	
Urban Systems Ltd.	
Steve Brubacher	Connie Blair
Matt Smith	Murdo Smith
Aya Costa	Bob Briggs
Omni Industrial Ltd.	
Jason Pitts	
Absolute Mechanical Ltd.	
Brad Nipius	
Mike Pii	

1.0 Board Summary

This Validation Report is the culmination of the work completed to date on the North Cultus Wastewater Treatment Plant (WWTP) Project.

Validation is the initial phase of the Integrated Project Delivery (IPD) delivery model. The purpose of validation is to establish certainty and so, to validate that the project can be constructed within the given parameters developed by the Owner, Fraser Valley Regional District (budget, schedule, function).

For this project, the Validation phase was used to answer the following question:

"Can the IPD Team construct and commission the North Cultus WWTP Project by the end of May 2025, for $14.4M?"

The Validation process is designed to either prove or disprove whether the IPD team can meet these objectives. This report concludes that phase of the work and it summarizes the effort that was put forth by the team to get to this stage.

The IPD Team has determined the design, how to build it, how long it will take to build it, and how much it will cost. Validation is a go/no-go gate and through the submission of this report and the details contained within, the IPD Team is stating that we have proven that this project should be a "go". We have "validated" the project. This report allows FVRD to proceed with confidence knowing that the project is viable.

The Validation Phase has optimized the pre-existing WWTP design to meet the approved budget and schedule. The IPD team has collaboratively developed the North Cultus WWTP Project design to the degree necessary to achieve cost certainty. The team jointly assessed and quantified the risks to this project in "Big Room" sessions where the team had many sets of eyes looking at the project through different lenses of experience and perspective.

The goals for the project, established during completion of the Liquid Waste Management Plan (LWMP) (Urban Systems, 2016) are to:

- Prepare for future development in Cultus Lake north area including Cultus Lake Park, surrounding Electoral Area H, and Soowahlie First Nation and BC Parks, population growth, associated recreational and tourism growth and the potential effect of new sewage users on lake health and system capacity;
- Raise the local standard for wastewater treatment to protect lake health by ensuring there is greater effectiveness of existing systems, and to modernize sewer infrastructure to meet stringent regulations;
- Enhance watershed management through cumulative effects monitoring with regional partners and consider sewage treatment effectiveness, nutrient loading and long-term monitoring of the effects of upper watershed activities (typically anthropogenic) including logging, mining, agriculture and tourism;
- Establish financial sustainability for current and future infrastructure and services; and overall;

- Protect and enhance the lake.

The pages that follow summarize the work and effort completed by the IPD team. This has been a great experience in collaboration and alternative project delivery thus far! The team is excited to put energy into moving this project through the next phases to completion.

2.0 Project Overview

2.1 Project History (History, Title and Rights)

The North Cultus WWTP site is located within the unceded traditional territories of the Stó:lō Ppeoples, nearest the community of Soowahlie First Nation (SFN). The project team recognizes and respects the rights of Indigenous Peoples. Their input is an important part of this project that will enhance its deliverables. SFN has been engaged going back to the LWMP process and, as a result, service of Soowahlie First Nations lands is contemplated in future phases of the WWTP.

Along with residents, businesses, user groups, and federal and provincial agencies, the FVRD recognizes the value of Cultus Lake and the importance of protecting this sensitive environment with long-term solutions to ensure its sustainability. In 2015 and 2016 the FVRD went through an extensive community engagement process and established a LWMP, approved in 2019 by the Minister of Environment. The LWMP identified the need for a WWTP capable of producing Class A effluent as defined under the BC Municipal Wastewater Regulation plus additional phosphorus removal to meet the needs of the community and to protect Cultus Lake.

The purpose of this project is for the Fraser Valley Regional District to augment and eventually replace the community's aging septic tank and field with a Mechanical WWTP and rapid infiltration basins to support growth, evolving design criteria and level of service requirements for community.

The FVRD has begun some site works as part of the project and other collection system upgrades nearby. FVRD has also pre-purchased a significant amount of equipment. Detailed design was completed in 2019 – however the FVRD needed constructability and cost input, given the amount of market fluctuation and labour shortages. The project was put on hold due to lack of availability of funds which have now been secured.

The detailed design work completed in 2019 included the following unit processes:

1. Headworks – screening and grit removal
2. Secondary Treatment – Sequencing batch reactors (SBR)
3. Equalization
4. Tertiary filtration
5. Ultraviolet disinfection (UV)
6. Aerobic digesters
7. Dewatering centrifuge

Following the announcement of the grant funding, the FVRD issued a Request for Proposals (RFP) to select an Integrated Project Delivery (IPD) contractor. After receiving six proposals and interviewing the top three proponents, Chandos Construction LP was selected for this project. Urban Systems Ltd had previously been engaged, through a competitive process, to complete detailed design and was retained as the engineering consultant. With the IPD team in place, work on the Validation Phase started on Feb 23, 2023.

The site location is shown in Figure 1 on the following page.

Figure 1 - Site Location (Urban Systems, 2023)

2.2 IPD Overview

IPD is a construction project delivery method by which key parties involved in the design, fabrication, and construction aspects of a project are joined together under a single agreement. This allows for ongoing communication and collaboration throughout the project's phases which decreases waste while increasing efficiency, respect for team members, and project outcomes including profits (Lean Construction Institute 2023).

Each IPD team member is expected to engage as an integrated team of owner representatives, consultants, contractors, and trades representatives. The Validation team has taken the time to understand the goals of this project as a driver to provide the necessary infrastructure system to meet raised local wastewater treatment standards serving North Cultus, BC Parks, and Sunnyside Campground for Phase 1. In developing the target value design, the team considered specific values for this project, that guide that process.

2.2.1 WHY IPD?

To better control costs, mitigate risks, provide cost certainty and get the community what is needed, two things are key: true collaboration and innovation.

A conventional Design – Bid – Build approach closes the door on collaboration and innovation. There is little incentive for design teams to work in a truly collaborative way with the contractors (and vice versa) as both groups will try to protect their interests while transferring risk to each other whenever possible. In the end, costs go up and owners pay more, getting less value for the dollars spent.

Under a conventional Design – Bid – Build delivery model, the design team is selected first by the owner. Consultants are almost always chosen by municipalities based on lowest fee because the reality for them is that they have limited funds. This drives out innovation, forces the consultants to provide the "bare bones" in terms of design and to then transfer as much risk as possible to the contractor. That is the reality when lowest fee is the driver.

Design work is completed in a vacuum with little to no input provided by experienced contractors that can address constructability issues and help mitigate risk. Once the design work is completed, the hope is that all the risks are addressed and that the cost that comes back from the contracting community during the tender process fits the owner's budget.

Contractors, not having been involved in the design process, add risk mitigation to their costs for unforeseen items and issues. The contractual relationships under a conventional Design – Bid – Build approach are adversarial in nature as each group tries to protect their own interest. That goes for the Owner, the Consultant, and the Contractor. There are scope changes from the design team and change orders from the contractor for any deviation in the proposed work as the project unfolds. Conventional Design – Bid – Build is budgeting a design rather than designing to a budget. IPD is a better way.

2.2.2 WHAT IS IPD?

IPD has five significant benefits that directly address project complexity while also addressing the need for cost certainty (designing to a budget). Combined these benefits ensure there is value for the money that will be spent.

Benefit #1: Removes Waste

Wasted time, materials and resources all add up to unnecessary distraction on projects. With designers, constructors and operators all separated and separately pursuing the aspects of the delivery that only concern themselves, efficiencies are lost, for example, because designers are often separated from the people who order and assemble projects, there can be disconnects between solutions and real-life implementation in the field. The benefit of IPD then is that solutions are created in the same room with designers, as well as people who order and construct. In that way the whole process becomes connected and integrated. Team members become more aware of how decisions affect other members of the team, and it becomes easier to take advantage of that collective knowledge.

Benefit #2: Reduces Risk

With all design and construction comes some risk. Usually, the risk is associated with uncertainty or unknown variables. With an IPD Team, there is a much greater depth of knowledge from multiple disciplines and contractors all involved in an ongoing discussion. The IPD Team can holistically assess the impacts of schedule, material selection, and weather on other aspects of the project. The team can better understand the ramifications of these factors / decisions and identify risks more effectively. The more the IPD Team understands risks, the better the steps that can be taken to mitigate and eliminate them.

Benefit #3: Optimizes Value

One of the premises of IPD is designing to a target budget (not budgeting a finished design), validated by the full team. With base costs set for typical construction, the team can collectively work together to respond to key project issues. The team can design to the actual fabrication efficiencies of the suppliers. Not every trade or contractor has the same tools in their shop. This will result in the contractor being more efficient in some construction techniques or assemblies than others. Knowing the particular efficiency of contractors allows the Team to design to their strengths. This optimizes the value which in turn benefits the owner and benefactors.

Benefit #4: Enhanced Innovation

The environment that the IPD Team works in fosters true innovation. As technology has advanced, systems are more complex and inter-related. For example, there are relationships between process mechanical systems and the electrical and instrumentation controls that manage their operation. The designers and the construction teams can discuss the intricacies of these and determine mutually beneficial combinations of various technologies to enhance the system operation.

A traditional design approach keeps these designers and constructors somewhat separate. Although one consultant or contractor might think of an innovative solution, because they are compartmentalized, they might not choose to share that innovation if it impacted any other consultant or contractor. With IPD,

everyone shares in the potential risks or benefits. As a result, it breaks down these barriers to innovation. Innovation is incentivized.

Benefit #5: Optimizes Schedule

Because IPD can reduce waste in the schedule (and elsewhere), it means the project can be completed more quickly. With an optimized construction schedule, site overhead costs can be reduced. Saving time in the schedule equals more budget for other, longer lasting items. A second, subtler, advantage comes when you involve all the contractors in setting up the schedule. As they consider construction sequencing conditions that are necessary for each trade to complete their work, this can shorten the construction schedule. It also provides increased flexibility for decision makers.

Pull planning is an approach that determines when the last responsible moment is for a decision to ensure there is not a negative impact on schedule. Pull planning often results in additional time for decision making, and it allows the team to identify critical decisions that need to be made early in the process, thereby optimizing the schedule.

The FVRD and Urban Systems have decided to approach delivery of the project through IPD. Chandos Construction Ltd. was selected through a Qualification Based Selection process based on who will provide the most value to FVRD. The IPD team have determined to work together utilizing the IPD method to evaluate, plan and construct wastewater infrastructure required to achieve owner's goals and constraints.

Validation Phase

Validation is a critical part of the Integrated Project Delivery Process and allows the key executive decision-makers to be informed prior to approving any further works.

The IPD Team has generated this Validation Report to outline the following for consideration:

- What the IPD team intends to design and build
- How long it will take the IPD team to build it
- How much it is going to cost (with certainty)

Knowing the answers to these three questions will provide the FVRD with the confidence needed to be able to decide to move forward with this project and sign the required agreement.

Basic Project Structure

The North Cultus WWTP Project is broken into the following phases:

- Validation
- Detailed Design based on TVD ideas
- Construction
- Operations and Maintenance

2.3 Organization Chart

2.3.1 IPD Project Team

The key team members for the project are:

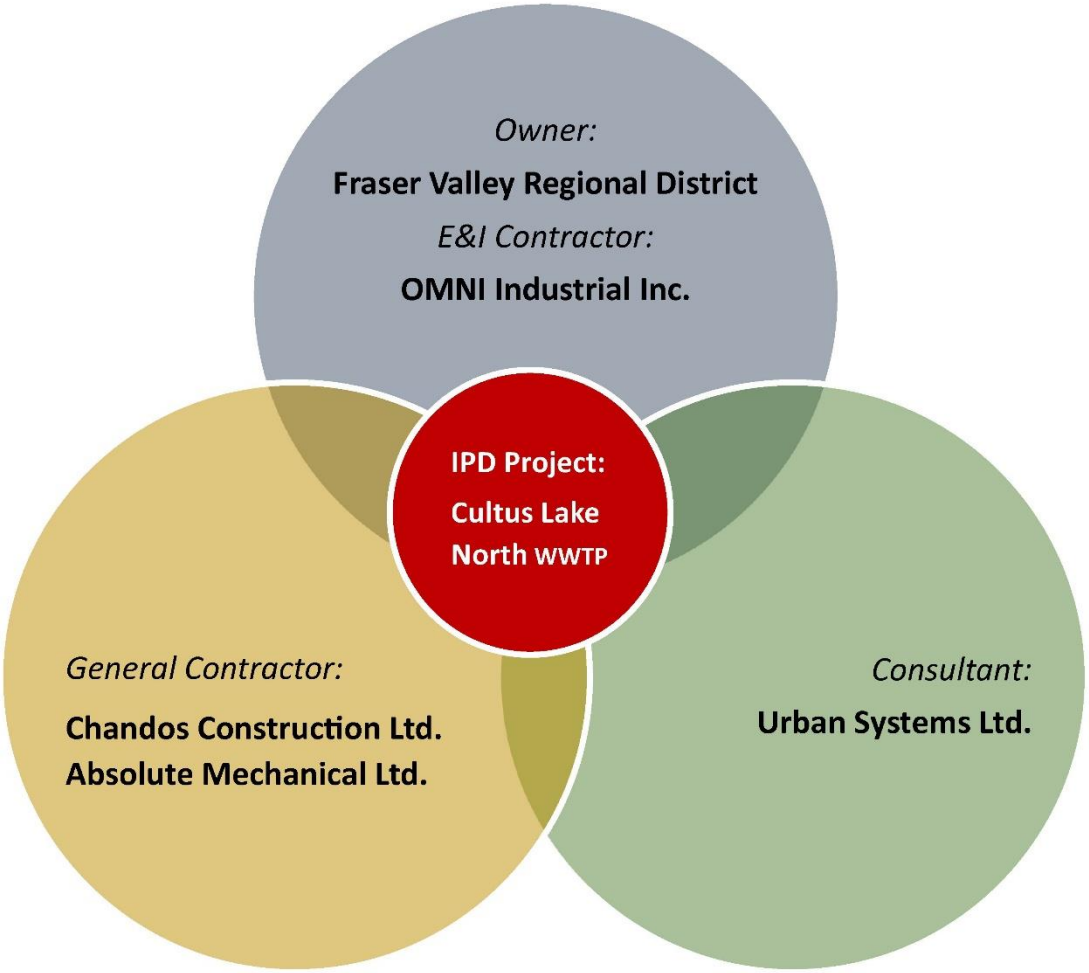
Fraser Valley Regional District: Tareq Islam, Sterling Chan, David Roblin, Peter Chapman, Brett Dyck, Melanie Jones, and Jessica Horn.

Chandos Construction Ltd: Bodo Papke, Kienan Hamm, Bryan Juan, Ali Turkman, Jen Hancock, Kyle Strachan, Aleksi Makila, and Derek Webster.

Urban Systems Ltd: Steve Brubacher, Matt Smith, Aya Costa, Connie Blair.

OMNI Industrial Ltd: Jason Pitts.

Absolute Mechanical Ltd: Brad Nipius, Mike Pii



2.3.2 VALIDATION TEAM STRUCTURE

The organizational chart (Figure 2) shows the roles of the team members and the overall project governance structure that will be used throughout the phases of the project. The summary is as follows:

Senior Management Team (SMT)

- Each member of the IPD agreement has representation on the SMT.

Project Management Team (PMT)

- Each member of the IPD agreement has representation on the PMT. The Owner usually has two PMT members, or two votes.

Project Implementation Teams (PIT's)

- Each PIT has a delegated PIT Captain as the overall team leader.
- The captains are responsible for reporting to the PMT and ensuring the PIT Records are filled out and up to date.
    - Structural/Building PIT
        - Captained by Aya Costa.
        - Focused on identifying, optimizing, and efficiencies related to the building and structural value engineering.
    - Process Mechanical/Electrical PIT
        - Captained by Bryan Juan.
        - Focused on identifying, optimizing, and efficiencies related to process mechanical/electrical value engineering.
    - Owner's PIT
        - Captained by Brett Dyck.
        - Focused on dealing with funding, governmental and local stakeholders, ensuring that provincial and federal regulatory, environmental and public interests are respected and followed.
    - Costing PIT
        - Captained by Ali Turkman
        - With input from each PIT and with estimating effort from the design and construction partners, focused on ensuring the team is kept abreast of costs related to the build-out of the new water infrastructure so that Target Value is optimized.

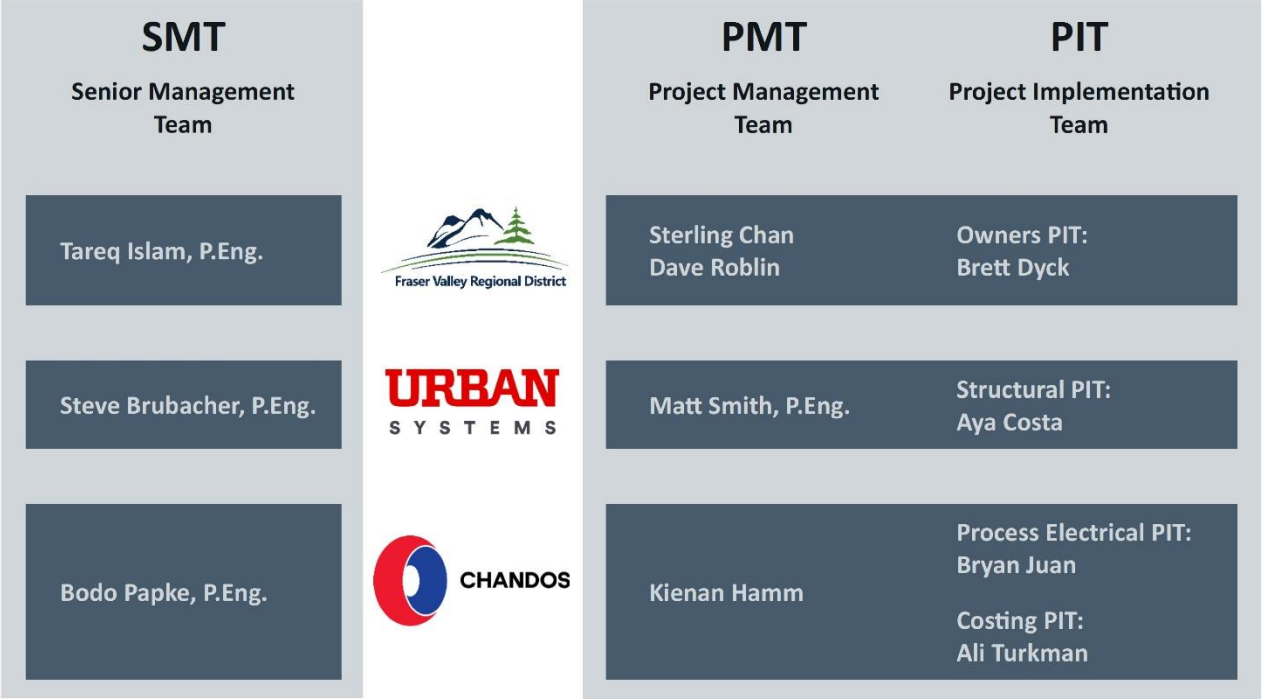


Figure 2 - Validation Team Structure

2.4 IPD Project Phases

2.4.1 Target Value Design

During validation a number of design changes have been selected to achieve the project target value. The team will update the detailed design drawings and specifications to incorporate the selected changes. The design will be updated sequentially to afford the team the flexibility to deliver structural and utility works, and to commence procurement activities, as outlined in the construction schedule. The team will retain geotechnical, structural, buildings, electrical, instrumentation & control subconsultants to complete the work.

2.4.2 Construction

Chandos Construction will function as the General Contractor and the Prime Contractor representing the IPD Partnership. Scopes of work required to complete the project include civil excavation, structural concrete, building envelope systems, building mechanical and HVAC, process mechanical, electrical and instrumentation and controls. The target construction activities and procurement will commence during or shortly after the detailed design phase as portions of the design are completed.

2.4.3 Operations & Maintenance

Operational support during the start-up, testing and commissioning phases will be provided by the project team working together, lead by FVRD Operations team with 50% project coordination assistance from Chandos for 6 weeks. Responsibility for ongoing Operations and Maintenance during the Operational phase (i.e., post commissioning and post-confirmation that the project is meeting minimum performance requirements), will rest with the FVRD.

3.0 Project Objectives

The overall project objectives were originally determined during completion of the Cultus Lake area LWMP. The specific objective of the current phase is to design, construct and commission the Phase 1 wastewater treatment and disposal facilities within the established budget and timeframe.

3.1 Regulatory / Law Requirements

Wastewater from the North Cultus Lake area is currently treated in four septic tanks before disposal to ground under existing Permit 5526 issued by the BC Ministry of Environment and Climate Change (BC MoE). The Cultus Lake Liquid Waste Management Plan (LWMP) (Stage 2-3) (Urban Systems 2016) outlined a plan to raise the treatment level to protect local environmental health, including Cultus Lake. A tertiary level WWTP with disposal of Class A+ (MWR Class A with phosphorus removal to ≤2mg/L) was designed to align with the LWMP.

3.1.1 Permitting Summary

A law list trigger review was prepared for the North Cultus Treatment Facility in 2018 (Urban Systems, 2018).Table 1 shows a summary of reviewed laws, as well as the status of work required to address each law.

Table 1 - Summary of Laws and Triggers

Name of Law	Comments	Status
Local Government Laws		
Cultus Lake Park Plan Bylaw No. 1080, 2016	Identifies endangered species for the Cultus Lake Park and watershed, and that upgrades to the sewer system are an immediate priority. Endangered species were addressed by the EIS.	No further action.
Cultus Lake Park Zoning Regulations No. 1375, 2016	Subject site is zoned P-2 Conservation Areas. The FVRD and Cultus Lake Parks Board agree with the selected site.	No further action.
FVRD Building Bylaw No. 2299, 2013	BC Building Code has changed since the last building permit application was made. Structural design will be updated in detailed design and the building permit application will be resubmitted.	To be submitted after detailed design.
Provincial Government Laws		
BC Municipal Wastewater Regulation (MWR)	A Section 40(b) application was made to request that construction be able to commence prior to registration under the MWR. A Section 40 (b) application was made	MWR registration pending (MWR approval is required prior to operation).

Name of Law	Comments	Status
	in February 2019. Approval under Section 40(b) was granted. An MWR application was submitted in April 2019.	Section 40 approval for MWR has been received to permit construction.
BC Environmental Assessment Act – Reviewable Projects Regulation	Due to serviceable population being < 10,000, the facility is not reviewable under the Reviewable Projects Regulation.	No further action required.
BC Contaminated Sites Regulation	A Site Profile may be required if soil removal is required. A Site Profile is not expected to result in further action since the property has not previously been developed or used in any way that could result in contamination.	No further action required (given that existing soil remains on site).
BC Heritage Conservation Act	The FVRD engaged a professional archaeologist to provide guidance on the protection of heritage resources. An Archaeological Impact Assessment (AIA) was completed prior to breaking ground in 2019.	Be aware of potential finds during construction.
BC Wildlife Act	A Qualified Environmental Professional (QEP) should be retained prior to any land clearing to determine the presence of active nests.	Clearing is complete. Bird nest survey is recommended prior to the start of construction (if within nesting window, March – August). Retain QEP if further land clearing is required.
BC Forest Act	Private timber mark required to transport logs from privately owned land on provincial roads.	No further action (given that there is no further tree clearing).
Federal Government Laws		
Federal Wastewater Legislation	Does not apply as effluent will be discharged to ground, rather than to fisheries water. There is no federal legislation for discharge to ground.	No action required.

Name of Law	Comments	Status
Migratory Birds Convention Act	Timing windows for land clearing and tree removal should be recommended by a QEP to minimize potential impacts to migratory birds and their nests. Preliminary review indicates that clearing should not be conducted from early March to late August.	Clearing is complete. Bird nest survey is recommended prior to the start of construction (if within nesting window, March – August).

3.1.2 Wastewater Treatment/Disposal Regulatory Framework

The new facility will be authorized by registration under the MWR. ENV requires that the new treatment facility be registered under the MWR, as it is no longer possible to update the existing operational discharge Permit. A MWR application package was prepared and submitted to ENV in April 2019, with a Discharge to Ground supplemental form. An application was made under Section 40(b) of the MWR to gain permission to begin construction of the facility prior to registration under the MWR.

The federal Wastewater Systems Effluent Regulation (WSER) does not apply for discharge to ground. However, a WSER registration will be required if a future phase includes discharge to fisheries waters.

3.1.3 Wastewater Discharge Options and Selected Option

Effluent from a wastewater treatment process can be discharged to ground, to water, or re-used. The North Cultus plant will produce Class A+ (including phosphorus removal), which will be discharged to ground. The requirements of Class A+ Effluent as per the LWMP are:

1. CBOD5: ≤ 10 mg/L
2. TSS: ≤ 10 mg/L
3. Fecal coliform: ≤ 2.2 MPN/100 mL (median), ≤ 14 MPN/100mL (maximum)
4. Turbidity: ≤ 2 NTU (average), < 5 NTU (maximum)
5. Nitrate-N: ≤ 10 mg/L
6. Total Nitrogen: ≤ 20 mg/L
7. Plus (+) indicates phosphorus removal to ≤ 2mg/L (maximum)

The selected discharge option and Class of effluent emerged from the LWMP, which was completed in three stages, which are summarized by two reports – Stage 1 and Stage 2-3 Urban Systems, 2015) (Urban Systems, 2016).

The Stage 2-3 LWMP included stakeholder input which indicated a strong preference for discharge to ground, with suitable setbacks to neighboring properties, local well and surface water (over discharge to lake).

The LWMP determined that effluent should treated to Class A+ quality and discharged to ground. All subsequent design and assessment work was completed on this basis.

3.1.4 REDUNDANCY

The MWR defines specific requirements for treatment process redundancy depending upon the reliability category of a facility. The intent of reliability categories is to protect public health and the environment through the inclusion of process redundancy at a wastewater treatment facility. The reliability categories as defined by the MWR with respect to discharge to ground are as follows:

- Reliability Category I relates to wastewater facilities which could result in permanent or unacceptable damage to the receiving environment during a short period of time when poor quality effluent occurs. This category includes discharges which are located near drinking water sources, shellfish waters or recreational waters in which direct human contact with the water occurs.
- Reliability Category II relates to wastewater facilities which could result in permanent or unacceptable damage to the receiving environment during a prolonged period of time when poor quality effluent occurs.
- Reliability Category III relates to treatment works not otherwise designated as Category I or Category II.

Redundancy requirements specific to each reliability category can be found in Section 35(2) Table 1 of the MWR.

The necessary reliability category is established through an Environmental Impact Study (EIS). The Discharge EIS competed for the North Cultus Treatment Facility recommended that design be completed to meet category II redundancy requirements.

3.2 Owners Requirements, Goals and Constraints

The owner's requirements were developed by the FVRD in February of 2023. These requirements were used to guide the IPD development team through validation for the North Cultus Wastewater Treatment Plant Validation process.

1. Project Cost
    a. The Maximum (all-in) cost of the project excluding GST is $14.4M The Maximum cost is based on a fiscally responsible (cost-effective) project that meets the owner's requirements.
2. Environmental Sustainability
    a. The WWTP must produce Class A effluent (as defined under the BC Municipal Wastewater Regulation) plus Nitrogen and Phosphorous removal.
    b. The WWTP must be designed to meet Category II reliability (as defined under the BC Municipal Wastewater Regulation).
    c. The WWTP must be designed to meet all other permitting requirements of its registration under the BC Municipal Wastewater Regulation.

d. The WWTP must be designed in such a way that the operation does not contribute to the further degradation of Cultus Lake.

e. The treated final effluent should allow for a high-quality effluent that could be used for re-use in the future if needed.

3. Solids Management

   a. Solids management should be a cost-effective operation and allow for the acceptance of activated sludge from other FVRD sites.

   b. Solids management must have the ability to dewater solids on site.

   c. The WWTP must have minimal impact on the surrounding community, this includes noise and odour.

4. Future Resilience

   a. The WWTP layout and design allow for ease of expansion for future phases.

   b. The materials selected for construction will be durable and long-lasting with low operations and maintenance costs.

   c. The WWTP operations and maintenance cost must be made efficient so that the costs are minimized as much as possible.

   d. FVRD staff working on this project will gain knowledge in WWTP construction as to help with the operation of the plant.

5. Schedule

   a. The project is to be completed by December 31, 2025 at the latest.

   b. Construction is to commence in summer 2023.

   c. The schedule is to be improved on during the validation phase with probable start-up in May 2025.

6. Safety

   a. The WWTP will be a safe place for employees to work. This includes meeting WorkSafeBC and other all provincial and federal regulatory requirements, as well as all FVRD policies for a safe work environment.

   b. The WWTP is operator friendly to promote staff satisfaction, operator retention and proper facility operation.

7. Transparency

   a. All information is to be shared transparently and freely at the IPD Senior Management Team Level. Any information distributed beyond this level is done with careful consideration in regards to the BC Freedom of Information and Protection of Privacy Act.

   b. Any information provided to the public will be done so by the FVRD Communications Department.

c. The public sees the importance of the WWTP and how it is being constructed.

d. The First Nations have been consulted on this project and they will continue to be properly engaged throughout the process.

e. All decisions made throughout the project's validation relating to the design of the WWTP should be well documented and take into account cost, operations, environmental and community impacts.

3.2.1 Project Phasing/Staging WWTP

The North Cultus Wastewater Treatment Facility may be completed in as many as three phases. The timing of subsequent phases will be dependent on the need for servicing to support development as well as the need to connect non-serviced portions of the community. Phase 1 will include the currently serviced residences and commercial/institutional customers within the Cultus Lake Park Board, the Lakeside resort, the Main Beach washrooms, all of Sunnyside campground, the currently unserviced Park and Mountainview residential area within the Cultus Lake Park Board and also allow for limited connections to facilitate development within the Parkview neighbourhood.

Future phases may support additional development within Cultus Lake Park Board, the Parkveiw Neighbourhood, Soowhalie First Nation as well as BC Parks customers at Entrance Bay, Clear Creek, Delta Grove and their day users.

Constructing the plant in multiple phases allows the FVRD greater flexibility in connecting users and sustainably funding the treatment plant over time. Phasing the facilities allows for appropriate service levels without the risk and cost of initially oversizing the plant. Until the second phase is built, a portion of the existing disposal system will be retained to serve as an emergency backup.

3.3 Project Values

Early in validation the project values were established by the team. The following project values were then used as the fundamental metrics for decision making:

Operational Excellence

We will provide a facility that is safe, efficient and the FVRD is proud to operate. The facility will be robust, reliable, and cost effective to own and maintain.

Sustainability and Community Impact

The treatment facility sustainably meets the long-term needs of the community; it has a positive impact on the surrounding area.

Key Performance Indicators

- Schedule (for success)

  The team will mitigate and plan for risks in the project schedule. The facility will be commissioned and operational on or ahead of schedule.

- Budget

  The project is successfully validated and constructed on budget. We maximize value for budget.

- Quality (for your #2)

  We build quality. Built the right way, the first time. Functional and built to last.

- Safety is our #1

  We build a strong safety culture and environment. We design for safe operation and construction. Everyone goes home at the end of the day safe. Safety is everyone's #1.

Behaviours

- Personal Development

  We challenge ourselves and learn new skills. We grow and leave this project better than when we started.

- Synergy (1+1=3)

  We work in a team environment where all those involved want to work together again. We build trust through effective, concise communication. We are not afraid to have tough conversations. Our joint mission is to create an environment where team members can contribute at their best.

- Influencers For Industry Change:

  Our collective success is evident beyond our project team. Our actions assist in creating pride and achievement for our stakeholders.

3.4 Project Funding Summary

In 2018, the Cultus Lake community approved construction of the project and authorized the anticipated $6.5M loan. However, it became apparent that the project could no longer be completed within the available budget, and work was put on hold while the FVRD sought out additional funding sources.

In February of 2020 the FVRD made an application under the Investing in Canada Infrastructure Program (ICIP) - Green Infrastructure – Environmental Quality grant program for this project and on Dec 1, 2022 the Province announced that the FVRD was being awarded the grant for a total shared cost of $13.6M.

The Cultus Lake North Wastewater Treatment Plant has a total available funding of $14.6 million for the completion of Phase 1 of this project. Of this, $13.6 million is available through a combination of grant funding and long-term borrowing. In addition, the Fraser Valley Regional District would be making an additional $1.0 million in funding available for this project for a total of $14.6 million, pending Board approval in May 18, 2023.

The total budget available is $14.6M, with $0.2M dedicated to completing the required off site ancillary works, and the remaining **$14.4M** assigned to the work WWTP which is within the scope of the IPD team.

The Fraser Valley Regional District shall satisfy its portion of the Shared Cost Agreement through $3.5 million of previously authorized long-term borrowing and $136K of service area funds. The public referendum for this borrowing has already been performed and the borrowing will occur following project validation The funding secured for this project is for Phase 1 of a potential multi phase WWTP. Future phases will be funded independently of Phase 1 by development in the area when needed.

Lifecycle Operations and Asset Management

When developing the Owners Requirements and Conditions of Satisfaction, it was identified that this facility must be robust, reliable, and cost effective to own and maintain. With the overall goal of ensuring the long-term financial sustainability of the FVRD's North Cultus Sewer System Service Area.

As part of the Target Value Design (TVD) process, the long-term operation and maintenance cost was evaluated in each TVD Decision Matrix. Additionally, with the assistance of the Process and Electrical PIT a preliminary operating budget was developed for this facility.

4.0 Communication Plan

4.1 Communications Objectives

1. To educate, inform, and update the public on the project scope, schedule and milestones.
2. Provide transparency of the FVRD's fiscal responsibilities.
3. Celebrate and detail project partnerships.
4. To encourage community comments and conversation of the long-term benefits of the Class A+ WWTP during the 14-month construction period through the Have Your Say site.

4.2 Audience

1. FVRD Board
2. Soowahlie First Nation
3. People of the River Referrals Office
4. City of Chilliwack
5. Cultus Lake Parks Board
6. BC Parks
7. Province of British Columbia
8. Government of Canada
9. Taxpayers
10. Area residents
11. Local business owners

12. FVRD departments (SLT, Engineering, Operations, Communications, Finance)
13. Tourism Chilliwack
14. Tourists and area visitors
15. Event organizations

4.3 Plan

The FVRD Communications team will:

1. Develop in collaboration with the FVRD Engineering and Utilities Department all communication materials including:
   .1 notices and mailers
2. Management of website, social media, and Have Your Say site
3. Facilitation of public events
4. Provide media updates (progress reports, media questions)

All project related issues that affect the public will require a collaborative approach between the FVRD Communication and the Engineering and Utilities Departments.

4.4 SWOT Analysis

4.4.1 STRENGTHS

1. IPD model
2. Grant funding
3. Team collaboration
4. Environmental stewardship

4.4.2 WEAKNESSES

1. Weather delays
2. Supply chain delays
3. Duration of project
4. Existing system is at the end of its life expectancy

4.4.3 OPPORTUNITIES

1. Building of public knowledge and awareness
2. Eliminate seasonal odour issues from Sunnyside Campground
3. Prevention of emergency repairs
4. Protection of the sensitive environment of Cultus Lake

5. Sustainability

4.4.4 THREATS

1. Failure of existing system
2. Service disruptions
3. Emergency repairs

4.5 Key Messages

1. The building of a new Class A+ WWTP is critical to meet the needs of the Cultus Lake community.
2. The current sewage disposal system has reached its life expectancy .
3. The FVRD is dedicated to the importance of protecting the sensitive environment of Cultus Lake.
4. The onsite project works estimated to take 14-months to complete.
5. The project funding is in part by the FVRD, the Province of British Columbia and the Government of Canada.
6. The 2018 Referendum authorized borrowing up to $6.5M for this project.
7. The repayment of the funds borrowed is collected through a parcel tax. From 2019-2022 this was based on $3.0M that was initially borrowed. Starting in 2023, the parcel tax will increase to reflect an additional $3.5M borrowing.
8. No additional borrowing will be required beyond the $6.5M authorized by the 2018 Referendum.
9. User fee rates reflect operating costs of the existing system. Residents can expect that the new system will be more costly to operate. User fees (utility bills) are billed each year in arrears. This means the 2023 operations will not be billed until January 2024.

4.6 Strategies

4.6.1 ONGOING UPDATES

1. Social media (Facebook, Twitter)
    1. Progress photos
    2. Reference to project milestones
    3. Reminders to subscribe to Have Your Say site for project updates
2. FAQ
    1. Ongoing updates as questions come forward

4.6.2 PUBLIC EDUCATION

1. Have Your Say site
    1. Progress photos

2. FAQ
3. Project Scope
4. Ask us a question
5. Project timeline
6. Subscribe for project updates
7. Newsletter

2. Tax insert (mailer)
    1. Project updates
    2. Reminder to visit the project page on the Have Your Say site and explain how to receive updates.
3. Onsite signage
    1. Showcase funding partners, type of project, project length

4.6.3 MEDIA

1. News Release

    All Joint Communications material to be approved by the Government of Canada, the Province of British Columbia, and the FVRD prior to release.

5.0 Basis of Design

The expected 20 year wastewater flows would include North Cultus, BC Parks, Sunnyside Campground, day use visitors, and Soowahlie First Nation. The new facility is expected to be constructed in multiple phases. The first phase will treat North Cultus residential and commercial wastewater and the Sunnyside campground wastewater flow to the Class A+ standard with phosphorus removal. Future phases will include plant expansion to treat wastewater flows from additional existing and new service areas.

The phase 1 facility was sized with future phases in mind, with the intention of having four equally sized treatment trains; this arrangement provides the most efficient way to provide the 75% redundancy required by the MWR. Consequently, the phase 1 facility provides only 50% redundancy for the maximum day flow (MDF). To mitigate this risk the FVRD will retain the existing community septic tank/field system to provide additional redundancy until the next phase is constructed.

5.1 Design Parameters

The service areas in each phase are outlined in Table 2. The current project will provide service for Phase 1 only.

Table 2 - Serviced Areas Summary

	Existing	Phase 1	Phase 2
Cultus Lake Park – Currently Serviced Residential/ Commercial/ Institutional	X	X	X
Cultus Lake Park – Park and Mountainview		X	X
Cultus Lake Park – Sunnyside Existing Trucked Sewage		X	X
Cultus Lake Park – Sunnyside Existing Remainder		X	X
Cultus Lake Park – Sunnyside Expansion			X
Main Beach Washrooms		X	X
Lakeside Resort		X	X
East Cultus Residential/Commercial + Sleep Hollow		X*	X
Soowahlie IR			X
BC Parks (Entrance Bay, Clear Creek, Delta Grove and Day Users			X

*Limited connections to previously approved locations

Sewage flow and loads for all phases of the project were developed previously; the Design Flows and Loads technical memo is provided in the reference section (Urban Systems, 2019). The Phase 1 design flows are summarized in Table 3.

Table 3 - Phase 1 Design Flows

		Winter	Shoulder	Summer
Average Daily Flow	m^3/d	260	420	570
Max 30-d/Avg Day PF		1.50	1.40	1.20
Maximum 30-d Average Flow	m^3/d	390	590	690
Maximum Day Peak Factor		2.3	1.70	1.60
Maximum Daily Flow		600	720	920
Peak Hour Factor				3.4
Peak Hour Infiltration	m^3/d			211
Peak Hour Flow	L/s			25

5.2 WWTP Treatment System Summary

The facility design incorporates the following treatment unit processes:

1. Preliminary Treatment:
    a. Screening
    b. Grit separation
2. Secondary Treatment:
    a. Sequencing Batch Reactors (SBR)
    b. Chemical addition for pH control
    c. Chemical addition for phosphorous removal
    d. Equalization
3. Tertiary Treatment:
    a. Filtration
    b. Ultraviolet (UV) disinfection
4. Solids Management:
    a. Aerobic digestion
    b. Solids dewatering
5. Effluent disposal to ground through Rapid Infiltration Basins (RIB)
6. Odour control

A Process Flow Diagram (PDF) is provided by Figure 3.

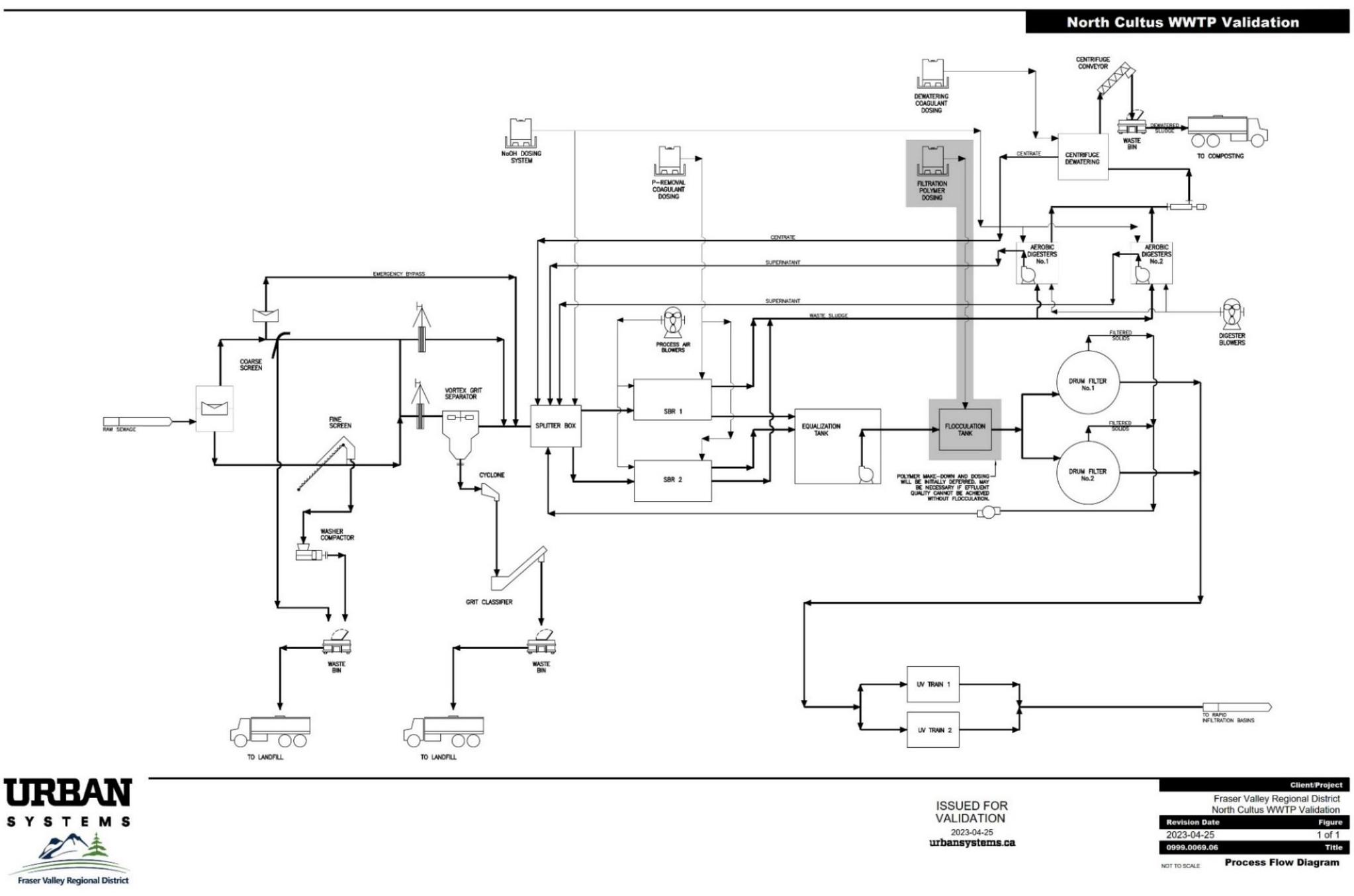


Figure 3 - Process Flow Diagram (urban Systems, 2023)

5.3 Unit Process Descriptions

Preliminary Treatment

Screening

A 6mm screening system is provided upstream of the SBR to remove garbage and other coarse material that would not be treated in the biological process or could cause damage downstream. The design incorporates a perforated basket shaftless auger screen contained in a prefabricated channel to reduce concrete works. A washer/compactor is provided integral to the screen which reduces the organic and water content in the screens for odour control and weight reduction. After the screenings have been washed, they are compacted with the integral auger, and deposited into a garbage bin. A manual bar screen in parallel with the mechanical screen has been included for redundancy.

Grit Separation

Grit removal is provided downstream of the screen to prevent sand/grit accumulation in the SBRs and damage to downstream equipment. The design incorporates a grit vortex, contained in a steel tank. A grit pump used to pump grit from the vortex to the grit classifier for dewatering. Grit will be discharged to a bin and disposed of offsite.

Secondary Treatment

SBRs

Secondary treatment is a biological process that uses microorganisms to convert dissolved pollutants from the water to cellular biomass that is removed from the system as waste activate sludge (WAS). In this design secondary treatment is achieved by two SBRs. The SBRs operate by providing treatment cycles in tanks to remove BOD, TSS, and ammonia-nitrogen. An anoxic mixing step is included in the SBR design for nitrogen removal.

To deliver air, each SBR is fitted with a fine bubble diffused aeration system, installed at the bottom of the basin. The purpose of the aeration system is to supply air required for the treatment process and to sufficiently mix the basin contents during aerobic treatment periods. Each basin is equipment with a decanter to convey clarified effluent to the downstream equalization tank. Submersible pumps installed in the basins pump WAS to the aerobic digesters for further stabilisation.

Chemical Addition for pH Control

Nitrification will occur in the SBRs – this is a beneficial process and the first step in total nitrogen reduction – but nitrification can cause the pH to drop which can lead to biomass death or out of compliance effluent. To control the pH sodium hydroxide will be added upstream of the SBRs and to the aerobic digesters.

Chemical Addition for Phosphorous Removal

Alum for phosphorus removal is added to the SBR during the last period in the react phase. Alum also aids in flocculating suspended solids in the reactor, clarifying the effluent and improving the effectiveness of tertiary filtration.

Equalization

Downstream equalization is beneficial due to the batch nature of an SBR system, where the decant rate is over four times the maximum day design flowrate. Due to the decant rate, an EQ tank is beneficial to limit the size of downstream equipment including the filtration and UV systems. The design incorporates an EQ tank spanning the west side of the SBRs and digesters. The EQ tank is fitted with three submersible pumps (2 duty, 1 standby) to convey secondary effluent to the filtration building. The EQ tank and pumps are sized so that the system can match the influent rate to the plant as closely as possible and provide steady flows to the filtration system.

Tertiary Treatment

Filtration

Filtration is required to meet Class A requirements for TSS and turbidity. Secondary effluent will be directed from the EQ tank to two of drum filters.

Alum addition in the SBRs (primarily for phosphorus removal) will assist in flocculating suspended solids in the reactor. The design also includes the ability to add polymer (i.e., coagulant) to the influent stream upstream of the filters to strengthen any remaining flocs. However, the polymer system is not included in the current design and will only be installed if needed to accommodate higher flows in a future phase.

Ultraviolet (UV) Disinfection

UV disinfection is the final step prior to discharge. The UV system is designed to reduce fecal coliform levels to meet Class A effluent quality criteria. Disinfection is achieved by two UV trains, each containing 24 low pressure UV lamps (6 modules per channel and 4 lamps per module). Each UV system is contained in a stainless steel channel, complete with a fixed serpentine weir for level control in the channel.

Rapid Infiltration Basins

Following UV disinfection, treated effluent is conveyed by gravity to two RIBs for discharge. Control valves are included to direct flow to each basin sequentially. Each RIB will be fitted with a splash pad to dissipate flows, and a layer of sand will be placed at the bottom of the basin to act as a filter to protect the native soil below. The northernmost RIB will have two inlets and splash pads, one for regular operation, and a second for overflows from the SBR and aerobic digesters.

Waste Solids Management

Aerobic Digestion

The waste activated sludge (WAS) must be stabilized to the Class B standards as defined in the BC Organic Matter Recycling Regulation (OMRR) for the most cost effective disposal means. Two aerobic digesters will be provided. The digesters are intended to operate in anoxic/aerated mode cycles, using mechanical mixing and aeration. This cycling will recover alkalinity and reduce operating costs associated with chemical addition for pH control.

Solids Dewatering

A centrifuge is included for dewatering digested sludge to approximately 18% solids. Dewatering is needed to reduce hauling costs as well as to be acceptable to the planned beneficial reuse recipient. Sludge from the digesters is pumped directly to the centrifuge by a progressive cavity pump located in the dewatering room. Polymer is added to condition the digested sludge prior to centrifuging. The system includes a conveyor to transport the dewatered cake to a solids bin, located adjacent to the centrifuge.

Offsite Disposal/Reuse of Biosolids

The dewatered cake will accumulate in a bin. Once full, the bin is removed and transported offsite.

Odour Control

An odour control system is included to manage odours generated from various parts of the treatment process, particularly the headworks. The odour control system consists of two fans (duty/standby) and a vessel filled with activated carbon. The fans are located indoors in the odour control room and the vessel is placed outside, adjacent to the fan room. Odour treatment technologies are not capable of completely eliminating odour nuisance; therefore, some dispersion and dilution is expected to occur before odours reach the property line. A tree buffer left around the site will also assist with dispersion and dilution.

Basis of Design Electrical Instrumentation Controls (EIC) Design Basis

Power Distribution

A 347/600V, 800A utility service has been sized to accommodate Phase 1 and Phase 2 of the wastewater treatment plant. A 250kW standby generator has been sized to accommodate Phase 1 of the wastewater treatment plant.

The utility service entrance and primary distribution will be in the main building electrical room Motor Control Centre (MCC). The main building electrical room MCC will feed the main building electrical loads, and vendor package control panels from the MCC. A transformer and 120/240V panelboard will be included in the MCC for distribution. A 600V subfeed to the filter building will be provided from the main building MCC. The filter building will have a 600V distribution panelboard, as well as a transformer and panelboard for 120/240V distribution.

Controls and Communications

The WWTP will be controlled locally by redundant PLCs. The primary PLC and HMI used for plant controls will be located in the main building electrical room MCC control cabinet. Remote PLC IO modules will be located in the filter building electrical room for local connection of the filter building local controls and vendor package control panels. The remote IO PLC will have a network connection with the primary PLC.

For monitoring and control capabilities, vendor supplied equipment will be integrated with the PLC via a local area network. An ethernet gateway will be used for vendor packages communicating with Modbus TCP/IP protocol. Standalone equipment will be controlled by the primary PLC via network or hardwire connections.

The wastewater treatment plant will be monitored by the Fraser Valley Regional District's (FVRD) SCADA system.

The SCADA system software will follow FVRD's standard utilizing the existing master server.

The system will provide for the following functionality:

- Capability to view in real time operational data for site equipment.
- Capability to remotely control equipment and program device operational setpoints.
- Capability to log historical data and provide visual trends for forensic investigation purposes and reporting.
- Capability to send email-based alarms.

Third Party Utilities

The wastewater treatment plant will require three-phase electrical utility distribution. A new BC Hydro utility distribution will be extended from Columbia Valley Road to the wastewater treatment plant via the entrance road.

The electrical utility installation will involve the construction of underground utility lines installed in Contractor supplied and installed conduit. The underground distribution will follow the water and gas corridor to the main building.

Telecommunications services may be provided by either local service provider, Telus or Shaw.

Natural gas service will be provided for building heat. The gas service has been extended to the edge of the property ready for a new service.

5.4 Design Wish List

If sufficient cost savings are realized during the project the FVRD would like to add the following items to the project. These items are not listed in order of priority and will be included based on cost and available funds as the project progresses.

1. Skid steer loader for site handling/snow clearing, etc.
2. Concrete pads at doors
3. Full sized separate washroom and shower
4. Laboratory
5. Site paving
6. Spare equipment (pumps, UV bulbs, sensors, blower filters)
7. Blower room build out for phase 2
8. Automatic chemical cleaning system for drum filters
9. Xylem grit pumps in headworks

10. Purchase centrifuge cake bins.

5.5 Target Value Design Summary

The Target Value Design Process was approached in multiple steps:

- Initial key activities informed all Big Room participants about the goals and current status of the project. This included state of design, equipment previously procured, site constraints and works completed on site. The design available to the team early in the Validation process was more developed level than is commonly seen on IPD projects, which allowed the team to reach cost certainty in a relatively short period of time. Typical validation periods are at least six months, this validation has been undertaken in approximately half that time.

- Early Big Room sessions were used to brainstorm ideas for improving the project design and identifying cost saving ideas. The most promising ideas were selected for further development and assessment.
- After each idea was developed, the key potential design changes were grouped in to decision matrix (DM) categories and assessed utilizing a Project Values Decision Matrix tool to ensure there was net positive value to the project for each change to the design. Only changes that have a positive effect on the project were advanced.
- Not all decisions required complete decision matrices, these were recorded in the PIT logs and in the decision log.

Table 4 outlines the changes made to the design as part of project validation. Supporting drawings for target value design are included in Appendix F. The changes were made to maximize the available budget, while staying within the project constraints. Complete Decision Logs and Decision Matrices can be found in Appendix B. Assumptions logs are provided in Appendix C.

Table 4 - Changes to Process Design Through Validation

Change No.	Description	Comments	Decision Matrix (if applicable)
Process Changes			
P1	Delete reclaimed water (i.e., effluent reuse)	Effluent reuse was eliminated to reduce cost. Process water will be provided from the potable system.	-
P2	Splitter box modifications	The SBR splitter was moved outside to reduce the number of pipe penetrations from the building.	DM3
P3	Process piping schedule reduced upstream of grit removal	All stainless steel process piping revised to Schedule 10.	-
P4	NaOH tank	NaOH tank eliminated, replaced with totes.	DM5
P5	Chemical containment – NaOH room	Secondary containment revised to simplify foundation – requires use of totes identified in P4.	DM5
P6	Chemical containment – Alum room	Secondary containment revised to simplify foundation.	-
P7	WAS line instruments removal	The flow meter and TSS analyzer on the WAS line (SBR to digesters) was deleted.	-

Change No.	Description	Comments	Decision Matrix (if applicable)
P8	Delete return lift station	Use elevated pumps within digesters for decant.	-
P9	Filter building return sump	Waste flows from the filter building, including filter backwash, filter overflow, and safety shower flow, is directed to a small sump. The sump is fitted with two pumps (duty/standby) that return the splitter box.	-
P10	Valve access walkway across digester	Relocate valves to tank edge to reduce walkway required.	-
P11	Aerobic digester decant optimization	Eliminate the return lift station and all associated valves and access manholes. Use submersible pumps to directly pump the decant back to the splitter box.	DM6/7
P12	Aerobic digester overflow	Simplify piping.	-
P13	Delete sludge day tank	The sludge day tank deleted. Waste sludge directly from the digesters to the centrifuge.	DM6/7
P14	Centrifuge mezzanine	Delete centrifuge mezzanine. Place centrifuge on ground level adjacent to bin.	DM6/7
P14	Foul air piping	All foul air ducting was changed from Sched 40 PVC to Fabco Instaduct.	-
Structural/Building Changes			
S1	Move EQ tank	The EQ tank was previously located beneath the filter building suspended slab. EQ tank was relocated to share a common wall with the SBRs/aerobic digesters.	DM1
S2	Delete second floor of Operations Building	With the centrifuge on the floor the 2nd floor of the building was deleted. The building will one roof height to simplify construction.	DM1
S3	NaOH Room slab	Secondary containment revised to simplify foundation.	-
S4	Filter Building Foundation	EQ tank moved and effluent ruse deleted allows simple raft slab for filter building.	-
S5	Remove Jogs in Building Exterior	Delete inside corners in building to simplify construction.	DM1
S6	Reduce Blower Room Size	The blower room area was reduced to the area required for Phase 1 only. Defer cost to future phase.	DM1
S7	Consider Pre-Eng vs Tilt-up Building	Tilt up concrete panel system as per the original design retained.	DM2
S8	Optimize Access Walkways Over Tanks	Area of walkways over tanks was reduced by adjusting waste activated sludge discharge line valve locations.	-
Electrical & Instrumentation Changes			
E1	Backup power	Backup power generator loads optimized.	-
E2	Engage PBX as Electrical Engineer	PBX was engaged to work with Omni in progressing the electrical detailed design.	-
E3	Instrumentation removed from chemical totes	Instrumentation (level sensors) on all chemical totes were removed. The Operators will check the chemical levels daily.	-
HVAC Changes			
H1	Updates for One Story Headworks	Optimise HVAC and plumbing.	-

Change No.	Description	Comments	Decision Matrix (if applicable)
Architectural Changes			
A1	Concrete Floor Coating Optimization	Optimise concrete coating selections.	-
	Ceiling Finish Optimization	Ceiling finish optimisation checked. Original system retained.	-

6.0 Project Execution Plan

6.1 Work Completed to Date

Prior to IPD validation stage, the design was advanced to a point where construction could begin. FVRD started the early works in 2019 before work was put on hold due to funding. The following activities were completed before validation (Figure 4):

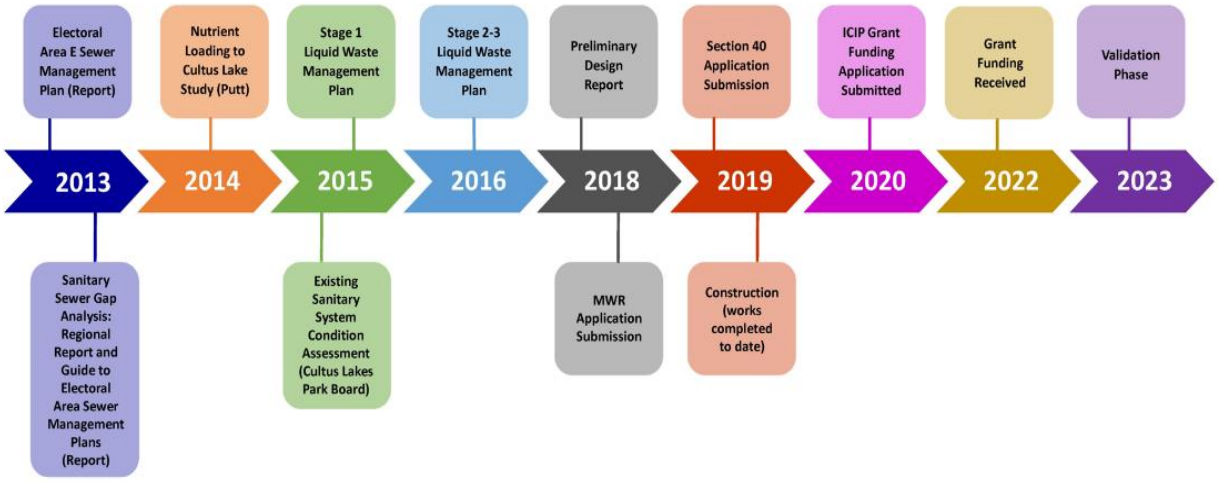


Figure 4 - Project Timeline (2013-2023)

Detailed Design and IFC Drawings

Detailed Design was advanced to a point where construction for Phase 1 could start, including:

- Existing site conditions and investigation
- Civil and Yard Piping
- Structural and Architectural Design
- Process Mechanical
- Building Mechanical (Plumbing & HVAC)
- Electrical Layout within the Plant

Electrical and controls design was not completed before validation.

Procurement, Submittals Process and Major Equipment Delivery

Some major process equipment items were pre-purchased. However, several key pieces of equipment remain, including: aerobic digester blowers (x2), centrifuge (x1),tertiary filters (x2), screen and grit dewatering (x1 each), and electrical equipment. A list was created to track the status of each piece of equipment pre-purchased by the FVRD. Shop drawings submissions and review has been advanced.

Major equipment delivered and stored near the site, includes:

- SBR Equipment
- UV Systems
- Odour Control Unit
- Pumps/Mixers. etc.

Some critical equipment such as electrical panels were taken out of the storage and stored at OMNI's facility for testing to confirm if they are in good working condition. Appendix I includes a complete tracking list of preordered equipment.

Site Works Completed by the FVRD

Work completed on site includes:

1. Clearing, grubbing, and delineation in preparation for excavation. Gas/Electrical/communication conduits advanced to the site from across the road.

Figure 5 - Gas/Electrical/Communications Conduits for Road Crossing (FVRD, 2019)

2. Site Surveying.

Figure 6 - Site Surveying (FVRD, 2019)

3. Site excavated to subgrade – the site roads still need to be graded with final layers, and the rest of site needs to be brought back to grade.

Figure 7 - Site Excavation to Subgrade (Urban Systems, 2019)

4. RIB excavation started, but not complete. Sand layer and splash pads to be added.

Figure 8 - RIB Excavation (FVRD, 2019)

5. Trenching for yard piping. Some lengths of HDPE pipe fused to complete forcemain (lengths stored on site).

   Offsite works, including forcemain to site.

Figure 9 – Trenching for Forcemain to Site (FVRD, 2019)

6. Manifold Chamber works

Figure 10 - Influent Manifold Chamber Works (Urban Systems, 2019)

7. Confirmation of Stockpiled Materials

Surveying of the remaining stockpile on site to determine quantity for accurate estimating.

6.2 Safety & Environment

A core team value is that every person on the project has the right to work in a safe and healthy environment, this includes not only physical safety but psychological and social well-being.

The IPD model requires all participants to work collaboratively in the execution of the work, this allows the operations team to provide safety input during design, and the construction can provide design input that may improve safety during construction. The alignment of safety and production promotes improved schedule, value and quality workmanship.

As the validation team moves from design to construction, site work will be thoughtfully planned to meet safety requirements.

A comprehensive, Project Specific, Safety Plan will be completed during the Design/ Procurement Phase of the project.

A safer worksite reduces waste in the field and improves quality as it minimizes time lost and rework as a result of incidents.

Health and Wellbeing

We empower a culture of safety, for both physical and mental wellbeing, with the goal of reporting all near misses and achieving zero lost time injuries (LTI).

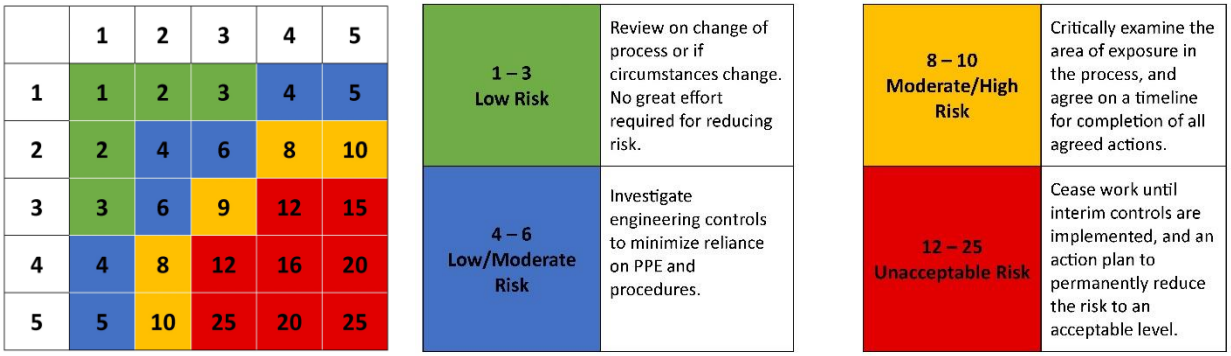
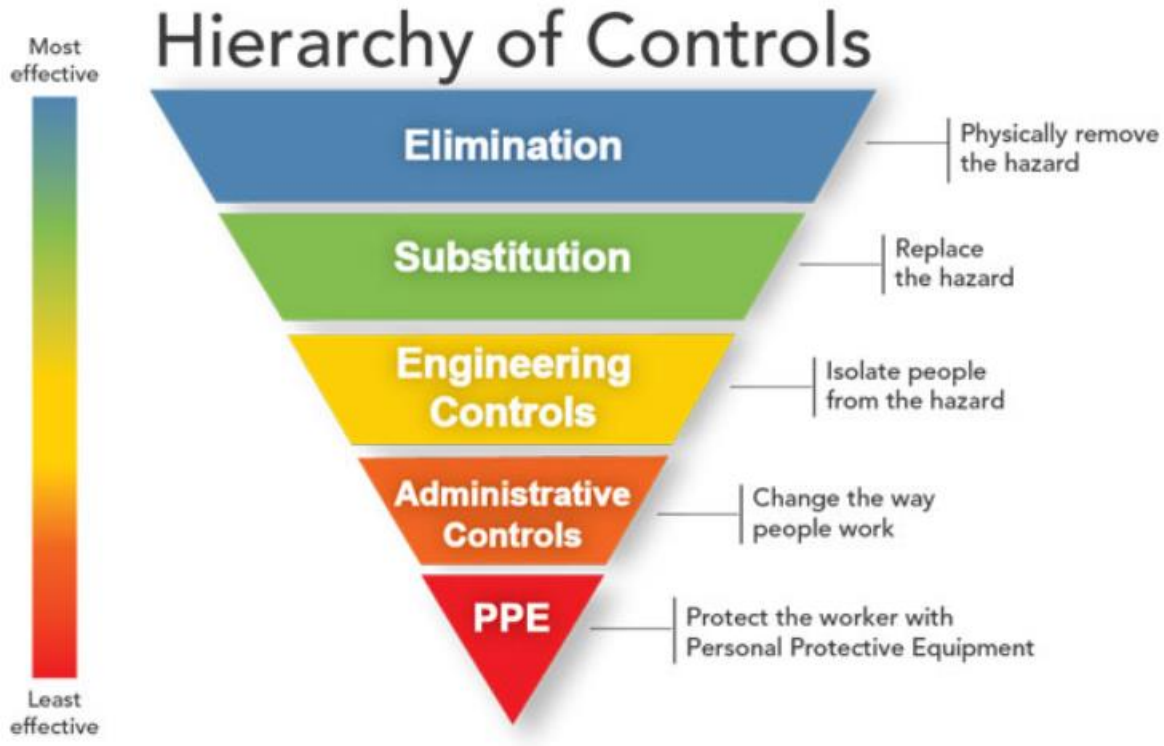


Figure 11 – Risk Matrix

One of the stated values of the Validation Team is to have a project where Safety is No.1 and everyone gets to go home at the end of the day safely. The IPD team will ensure that there is communication of the goals and activities set out for the project. Goals, like recordable, total, and lost time injury frequency, (RIF, TRIF, LTIF) targets will outline what is expected of all participants. Alignment with these goals will be managed by having regular inspections, safety meetings, tailgate meetings, safety milestone celebrations, and other similar practices.

Job Hazard Analysis will be completed and enforced. Risks will be documented and reviewed in practicable intervals and mitigation measures will be introduced and tracked.



Engineering hazards out of the project will provide the highest degree of control. The next level of hazard control will be to create Safe Job Procedures, Safe Job Practices, policies and rules. If we cannot control the hazards using these strategies, we will employ Personal Protective Equipment (PPE) as the last line of defense. All workers on site will be required to wear PPE as stipulated in the Project Specific Safety plan.

Safe work and positive safe behaviours are to be recognized and rewarded. To this end the IPD team will develop a Positive Incentive Program to reinforce safe behaviours.

Environmental responsibilities are also taken seriously, and we are committed to following sound environmental management practices and executing this project so that the environment is not adversely affected.

The work will be routinely assessed to identify potential hazards well before any work takes place. Job Hazard Analysis will be completed and enforced during this project by all IPD members. Risks will be documented, reviewed in practicable intervals. Mitigation measures will be introduced and tracked by construction supervision and the appointed health and safety representative. The most recent reports will be posted onsite as well as made available to the team via an online reporting program. Field Level Hazard Assessments (FLHA) will be used to endorse the critical thinking process and encourage all workers to be part of the safety solution. FLHA's are critical to assess the safety risks on a rolling basis and ensure the ream is clear on emergency procedures.

The goal during detailed design is to identify and mitigate hazards, providing the highest degree of certainty. The next level of hazard control will be to create Safe Job Procedures, Safe Job Practices, policies, and rules. If we cannot control the hazards using these strategies, we will employ Personal Protective Equipment as the last line of defense. All workers on site will be required to wear all the minimum . Absolute safety rules and management need to be established during the Design/ Procurement Phase.

Environmental Considerations

Environmental responsibilities are critical to the success of the project. We are committed to following sound environmental management practices and executing the project so that the environment is not adversely affected.

We will develop environmental management plans during construction coupled with proactive environmental investigation and permitting during detailed design. A core tenet of the IPD team's values is to ensure that all government regulations are met, and reasonable measures are taken to identify and control conditions that may cause adverse environmental impact.

The development of an environmental incident response plan will facilitate immediate response to any incidents that may occur during construction. This will support worker and public safety, in addition to minimizing damage to property and the environment.

Proactive planning with respect to the potential impact of construction activities on the environment is a critical component of effective environmental protection. Accordingly, we will develop an Environmental Emergency Response Plan prior to commencement of construction activities.

6.3 Procurement Strategy

Project Procurement Background

Upon approval of the IPD method for the North Cultus Lake WWTP by the FVRD Board of Directors, the FVRD entered into a contract with Chandos Construction Ltd. to provide General Contractor services for the Validation Period of the construction of the project. Chandos Construction was selected through the RFP process of procurement aligned with the FVRD's procurement policy.

As the head project consultant, Urban Systems was also engaged in the validation phase of the project. Their services for this project were procured in 2018 through the RFP process, where they were awarded the contract to provide detailed design services for the North Cultus Lake Wastewater Treatment Plant.

Project Procurement

With the decision to use the IPD method of delivery for the project, it was understood that the FVRD's Procurement Policy would require interpretation. A legal review was performed, which clarified that only the procurement of the participants in the CCDC30 Contract would require adherence to the FVRD's procurement policy and sub-contractors contracted under the General Contractor (Chandos Construction) or Consultant (Urban Systems) would fall outside of the FVRD's procurement obligations. It was also confirmed that this procurement approach met the requirements of the project's funding agreements.

The spirit of the FVRD's procurement policy will continue to be honoured and the IPD Team's approach to procurement will remain committed to ensuring all labour, equipment, and material are procured at the correct time in the project lifecycle and ensure contracts are awarded in a fair, transparent, competitive, and consistent way with value-for-money principles.

Procurement Implementation

A Procurement PIT (Project Implementation Teams) will be established at the start of the Detailed Design/ Procurement Stage to engage with subcontractors and identify long lead time equipment suppliers. Long lead items such as the pre-cast wall panels, process valves and select electrical and instrumentation equipment will be procured early in the project lifecycle to avoid adversely affecting the overall project schedule, and reduce associated financial risks.

The Procurement PIT will also address the following:

- Sorting or prioritizing longest lead or critical path items.
- Finalizing pre-purchased and pre-selected equipment in accordance with lead times.
- Obtain written commitments from key sub-trades and suppliers.
- Strategize on securing services (i.e. Deposit for procurement, retaining fee, holdback, warranty coverage, etc.).
- Coordinate samples for product finishes or hardware.
- Optimize submittal/Shop Drawing review timelines.
- Coordinate equipment and material storage requirements.
- Review contract terms and conditions to understand recourse and legal requirements.
- Ensure contract terms are specific enough to for proper and timely transfer of ownership, title, and warranty requirements.

The activities mentioned above will continue to be reviewed and approved by the PMT (Project Management Team) throughout the construction phase of the project. It is expected that tendering will occur concurrently to secure long lead time key process equipment, electrical equipment, and any buried materials once the project has been validated and approved.

If bids or proposals received through a procurement process exceed the amount budgeted for on the validation estimate, consultation, and approval with SMT (Senior Management Team) will be required.

Subcontract bonding will be required for all subcontracts awarded with a contract value over $200,000.00 with some exceptions. PMT to discuss and get an approval from SMT regarding the need of bonding subcontractors before finalizing subcontracts. Hard copies of bonds will need to be given to accounting for safekeeping.

6.4 Insurance and Project Surety

Project specific insurance policies will be obtained for:

- Errors and Omissions
- Commercial General Liability
- Equipment Breakdown
- Builders Risk
- Wrap-Up Liability

The cost of one standard claim deductible will be carried in the risk register. Part of the IPD Contract agreement is that the parties agree not to sue each other. Project specific insurance policies that name each team member mean that insurance claims are team based and don't result in court action by one party's insurer against another. This is fundamental to the relationship based nature of the IPD contract.

Insurance will be carried individually by each member of the Design/ Construction Team and what project insurance will be provided, maintained and paid for will be decided by the Project Management Team (PMT). Insurance coverage has been discussed and expected to be $14,400,000 except for Professional Liability $2,000,000 coverage the Integrated Project Delivery Team sourced during validation period. Further discussion on insurance coverage amount will be required prior to receipt of Notice to Proceed, if needed.

The Owner is electing to forgo requiring the General Contractor to provide bonding for this project. In an IPD arrangement, the coordinated focus on the common interest of the project diminishes the risk of the General Contractor defaulting. In this instance the Owner has concluded that the costs to provide bonding outweigh this risk. Bonding will be required of all major subcontractors on the project. At a minimum bonding will be required on all subcontracts over $200k however in some instances a lower threshold value may be deemed appropriate. In certain situations, a letter of credit may be accepted in lieu of a bond from subcontractors.

Construction Execution

The IPD Team has worked together to develop a project schedule based on available information and key subtrades input. While developing this schedule we considered critical drivers such as duration of detailed design, procurement of equipment, and weather to determine the best start date for construction. The construction schedule prepared during validation is provided in Appendix E. Below shows the preliminary milestone schedule developed from the construction schedule. Milestones highlighted in red are identified as risk pool release milestones upon successful completion Dates can be finalized during Design and Procurement phase.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Successors
1		**Cultus Lake Wastewater Treatment Plant**	**500 days?**	**Tue 23-01-10**	**Wed 25-01-22**		
2		**RFP specified Milestones**	**125 days?**	**Tue 23-01-10**	**Tue 23-07-04**		
12		**Proposed Construction**	**375 days**	**Wed 23-07-05**	**Wed 25-01-22**		
13		Project Start	1 day	Wed 23-07-05	Wed 23-07-05	10,11	17,20,24,36,38,
14		**Procurement**	**300 days**	**Thu 23-07-06**	**Tue 24-09-24**	**7**	
35		**Construction**	**374 days**	**Thu 23-07-06**	**Wed 25-01-22**		
36		Mobilize	5 days	Thu 23-07-06	Wed 23-07-12	13	15
37		**Earthworks**	**214 days**	**Thu 23-07-06**	**Wed 24-05-22**		
45		**SBR**	**171 days**	**Thu 23-07-27**	**Thu 24-04-11**		
58		**Headworks Building**	**197 days**	**Thu 23-11-23**	**Mon 24-09-16**		
79		**Filtration Building**	**100 days**	**Tue 24-03-05**	**Thu 24-07-25**		
91		***Startup & Commissioning***	***124 days***	***Mon 24-07-15***	***Wed 25-01-22***		

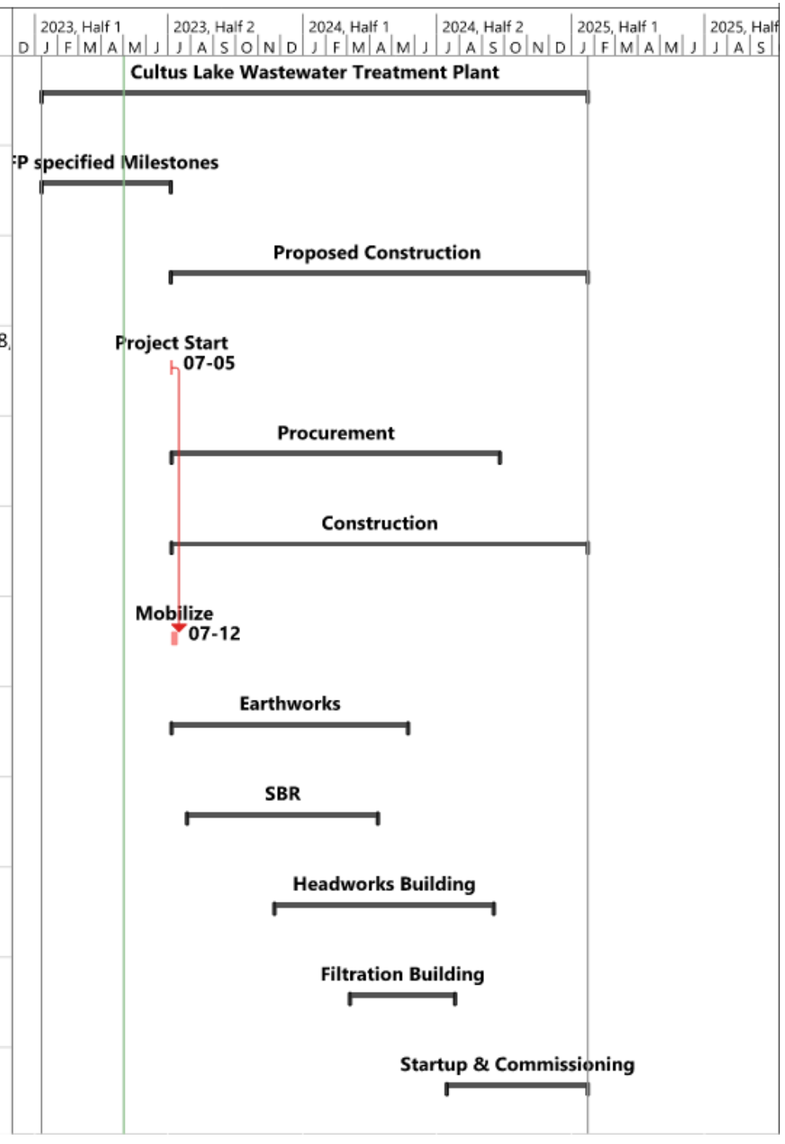


Figure 12 – Cultus Lake WWTP Preliminary Construction Schedule (Chandos, 2023)

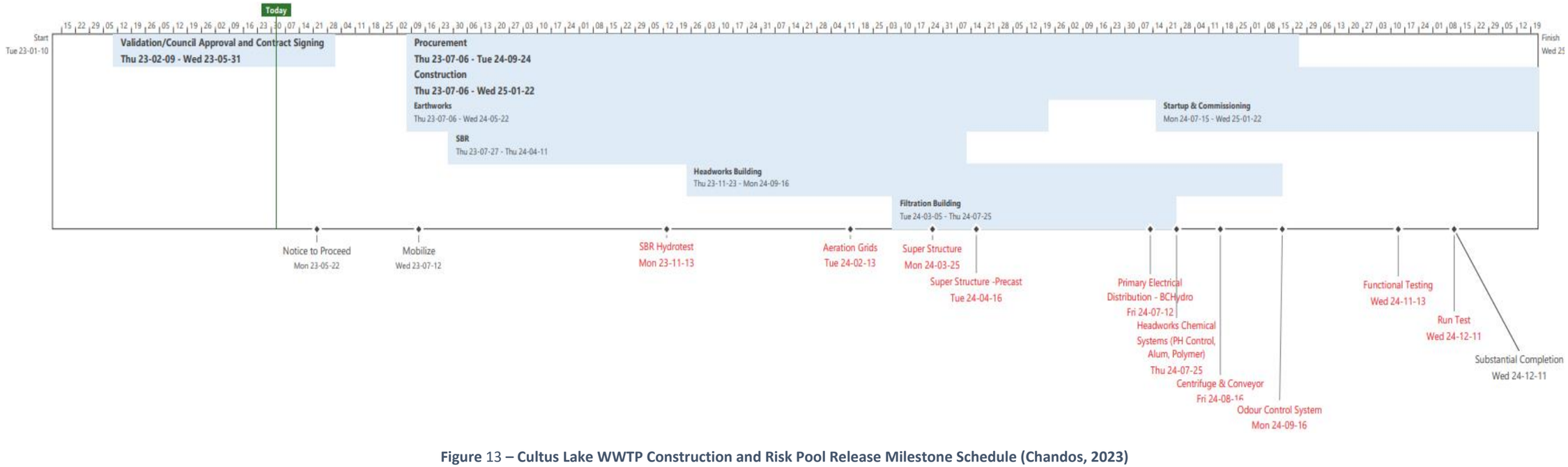


Figure 13 **– Cultus Lake WWTP Construction and Risk Pool Release Milestone Schedule (Chandos, 2023)**

Construction Mobilization and Construction Major Works – Summer 2023 – Fall 2024

Q3 of 2023 was determined to be the target time to start construction based on equipment lead times and achieve efficiency, given has provided the notifications to proceed. Confirmation of detailed excavation for structural slab, SBR, and buildings concrete works will occur immediately after mobilization. This will allow all Phase 1 concrete works to be completed before winter conditions.

Shortly after site mobilization and confirmation of detailed excavation, critical tasks to construct the project are:

- Pre-purchased Equipment Inspection and Verification
- Excavation Confirmation
- Yard Piping and Buried Utilities Works
- Buildings Concrete Works
- SBR Construction
- Buildings Watertight
- Buildings HVAC and Plumbing
- RBI Construction
- Process Piping and Mechanical Installation
- Electrical and Instrumentation
- Testing, Start-up, and Commissioning
- WWTP Construction Completion Milestone

Testing, Commissioning, and Handover – Q4 2024 /Q1 2025

Since operations staff are involved in the IPD process, operators will support the construction team during commissioning. The commissioning team will ensure that the commissioning process is accomplished and that operational needs are met. The commissioning process ensures the system is operating as desired, and that maintenance and servicing needs of the equipment are understood. Commissioning details are discussed below.

After successful commissioning of the equipment, and prior to handover to plant operators, an inspection or site walkthrough with the engineers, contractors, and plant operators will be conducted to identify and address any deficiencies noted. Deficiencies will be quickly addressed to ensure the facility can be put in service.

Operations and Maintenance Manual

The FVRD will receive one printed copy and a digital copy of the Operations and Maintenance Manual for the WWTP site. Digital files will be bookmarked, tagged, searchable, and easily updated. The manual will also list the actual equipment installed which is annotated, and not the generic documents typically provided by the vendor.

The documentation required for the manual will include the following:

- O&M for Mechanical and Pumping Systems
- Vendor Equipment Data Manuals
- All Technical Data Sheets
- Spare Parts Lists
- Maintenance Schedules

Preventative Maintenance Schedules and Operating Procedures

Preventative maintenance schedules for individual pieces of equipment will be outlined within the schedule, preferably based on run time intervals. A manual laid out using images and words in the form of a Standard Operating Procedure (SOP) provides the most benefit to operators in terms of refresher training and a step-by-step guide. This is where items such as maintenance instructions, competency sheets, general operational guidelines, and troubleshooting guides would be included. Printable instruction sheets and guidelines on the required lubrication/parts required would enable operators to effectively access the necessary information and provide consistent servicing to the installed equipment. An online/digital database of these types of information would be most appropriate.

6.5 Process Certainty and Warranty

Process Certainty

Urban Systems and its partnering sub-consultants are corporate members of Engineers and Geoscientists of British Columbia (EGBC). As such, all designers on the project are bound by the laws and ethics of EGBC to use good engineering practice and to understand and apply the relevant codes and standards to the work. Each firm is required to maintain and implement a Professional Practice Management Plan (PPMP) which includes quality management requirements intended to provide high quality design information.

Where systems include proprietary processes/equipment process warrantees will be sought from the technology providers to ensure proper operation under the design conditions.

The IPD process fosters close collaboration between designers, operators and constructors resulting in enhanced review of the system designs; this is expected to help catch conflicts early in the process and improve the project outcome.

Warranty

The IPD Team will warrant that the Work, including all workmanship, labour, materials, and equipment supplied by the Design/Construction Team or commodity trades, either directly or indirectly, and incorporated into the Work, shall comply in all respects with this project and shall be free from deficiencies and defects for a period of 1 year.

Warranty period of newly purchased individual pieces of equipment will commence from the date of equipment commissioning.

Pre-purchased equipment that was delivered to site prior to this contract commencement will have expired manufacturer's warranty by the time of commissioning; as such the IPD team will provide warranty for the installation of this equipment, but not for the equipment itself.

Quality Assurance/Quality Control

The project team will prepare a Project Specific Quality Management Plan (QMP) for detailed design and construction of the project. Quality workmanship is a critical component of delivering the new WWTP to meet the long-term resiliency.

The Quality Management Plan (QMP) will incorporate and integrate the various quality procedures that are routinely utilized by the team members in their day-to-day business with customization for the North Cultus WWTP. Each key company member of the IPD Team operates under their unique company Quality Management System (QMS), and these systems are the foundations from which the Project The Quality Management Plan (PQMP) will be crafted early in the Detailed Design phase of the work, post validation. Specifically, the Quality Management Plan will apply elements of:

1. Urban Systems and its subconsultants have OQMS procedures for design checking and review, complying with new EGBC guidelines for engineering professionals and engineering company practice. These practices have already been applied through the initial stages of project validation and design work completed.
2. Chandos Quality Management Systems: Chandos has well-developed Quality Management Systems that will be customized for the project.

Any trade partner retained for work will either be required to follow the requirements of the Project Quality Management Plan (applying the Chandos QMS) or provide an

equivalent QMS that satisfies the PMT and ensures the trade partner's in-house system meets or exceeds the quality expectation requirements of the IPD Team.

Inspection and Testing Plans (ITP) will be key components of the Project Quality Management Plan. Through the design and construction phase of the project, Quality Control (QC) and Quality

Assurance (QA) resources will be active on all aspects of the project ensuring that all necessary quality checks are completed.

Post project validation, and with approval to proceed from the FVRD, a final Commissioning Plan will be updated for the project. This Commissioning Plan will confirm that the new WWTP is performing as designed. Documentation from the commissioning activities will form a key component of the project quality records.

6.6 Commissioning and Operator Training

Commissioning

A Commissioning plan was completed and submitted to ENV as part of the MWR application package. In general, commissioning will include the following five steps:

1. Preparation
2. Individual equipment testing
3. System testing
4. Adjustments and deficiency correction
5. Introduction of sewage

Preparation will involve inspecting the equipment to confirm that it is installed properly and is ready for testing. A commissioning form (form 101) will be completed at this stage.

Individual equipment testing will involve testing each piece of equipment individually. Testing must demonstrate that the item is in perfect operating condition, complies with specified requirements, and is ready for operation. A commissioning form (form 102) will be completed at this stage.

System testing will involve wet testing to confirm that each system and sub system performs as specified. Once each system or sub system is tested with water, the entire plant will be operated with water with all pieces together as intended. Electrical (including backup power) and HVAC systems will also be tested at this stage.

Adjustments and Deficiency Correction will involve making any adjustments recommended by the Supplier's Representatives and/or correcting any deficiencies observed during testing. This step will be completed prior to introducing any sewage to the plant. Any process chemicals will be delivered to site at this time.

Introduction of Sewage will be completed once it is demonstrated that the entire plant functions properly. The plant will be operated by Chandos at this time, and the operators will be trained. Equipment handling solids (I.e., headworks and centrifuge) will be fully tested once sewage has been introduced.

Training

Training will commence early in the project to ensure that FVRD Operators understand the treatment process correctly and the efficiencies incorporated in the design. The key goals of training will be to solidify the theory of wastewater treatment and the design, and to shadow the construction team throughout the Construction Phase. The objective of this approach is to minimize operational costs, unforeseen events and equipment damage. During operator training, the FVRD WWTP staff will learn valuable information about the treatment process, maintenance, and servicing needs of the equipment.

Three streams of training will be incorporated into the training program:

1. In-classroom equipment addressing specific subject matter.
2. Site-visits to other EOCP facilities which are operating Sequencing Batch Reactor-based systems (i.e. Morris Valley WWTP /City of Chilliwack Wolfe Road)
3. Temporary engagement of a trainer during commissioning – The trainer would be able to work side by side with our current operators at the new facility, explain their actions taken operating the process and the scenarios that come up with the initial commissioning and operation of the facility.

Operations Setup

The FVRD Operators will have input on the configuration of data trends, SCADA screens and any plant layout modelling. Appropriate documentation on the interpretation of these trends will be developed to create consistency in operation and the information disseminated regarding key plant and operational indicators.

The provision of documentation and training on what the trends indicate removes some of the potential for interpretation errors and misunderstanding, and should be a critical portion of both the training for and operation of the new WWTP.

Certification

The Ministry of Environment requires that the operation, repair and maintenance of a sewage works is under the direction of an operator that holds a certificate equivalent to or greater than the classification of the facility. The rating of the new facility is yet to be determined but depending upon the assessment of the bio-solids management method, the new WWTP may be a Level III facility.

One Level II Operator currently works at the FVRD current facility. Additional education, as well as two years of Directly Responsible Charge (DRC) experience at a Class III or higher facility will be required.

An application will be submitted to EOCP, to instill confidence in the FVRD's existing Operator's ability to run the facility, as well as a plan for attaining Level III certification. Commitments of the Operator's involvement during design and commissioning of the New WWTP will be critical in providing the regulator with the confidence that the FVRD has the staff and skills to operate, repair and maintain the new facility.

Success Measures

It has been attested to by the FVRD's Operators, and USL, that the most successful training programs have consisted primarily of hands-on operating experience and the physical operation of equipment on-site during start-up and commissioning. This supports the engagement of an experienced trainer, as one of the most beneficial and valuable training steps. This will also promote and highlight any necessary safety measures required to operate the new equipment. Engaged Operators will also be a key element of successful operation of the new facility, as operators must be able to understand terminology and be willing to engage in any of the training products/videos/courses/manuals provided by the equipment suppliers.

Engagement will also be important in assuring and providing confidence to EOCP and MOE that the FVRD Operating staff are competent to operate the facility and are working to attain the necessary certifications.

Preventative Maintenance Schedules

Preventative maintenance schedules for individual pieces of equipment will be outlined within the schedule, preferably based on run time intervals. Discussions have been held for interactive and live update modelling software, which would allow operators to access service logs, equipment specifications, lubrication instructions, reference numbers that vendors can recognize, and equipment manuals by

clicking on a selected piece of equipment. This can hopefully be implemented in conjunction with the Building Information Modelling program, costs permitting. Although there could be significant costs due to creation of a database of this size and scope, this would eliminate the management and upkeep of many Word and Excel files. The database would also provide an element of consistency, as all operators would have simple access to any equipment specific forms and maintenance instructions.

Operating Procedures

A manual laid out using images and words in the form of a Standard Operating Procedure (SOP) provides the most benefit to the WWTP operators in-terms of refresher training and a step-by-step guide. This is where items such as maintenance instructions, competency sheets, general operational guidelines and troubleshooting guides would be included. Printable instruction sheets and guidelines on the required lubrication/parts required would enable operators to effectively access necessary information and provide consistent servicing to the installed equipment. An online/digital database of these types of information would be most appropriate.

7.0 Base Target Cost

The base target cost (BTC) informs the overall redesign and construction costs. A detailed cost estimate summary is provided in Appendix D. The cost estimate attached provides the estimated cost to construct the optimized design, incorporating decisions and assumptions made during validation.

The BTC includes line items for “Profit at risk” for both Chandos and Urban Systems. The profit at risk forms the “Risk Pool” as defined in the CCDC30 IPD contract – this Risk Pool is separate from, and must not be confused with the Risk Register. The Risk Register represents known or anticipated risks and provides a contingency to be used to mitigate the events at risk. The Risk Pool is the profit at risk from the IPD team. At the end of the warranty phase if the actual cost of the project is less than the final target cost then the Risk Pool is increased by 50% of the difference (FVRD would retain the other 50%) – and if the actual cost is higher than the final target cost then the Risk Pool is depleted by the full amount of the excess until the Risk Pool is fully depleted.

Information used to develop the BTC is included in in Appendix B – Decision Log and Matrices and Appendix C – Assumptions Log. A cash flow forecast is provided in Appendix G.

The IPD Team has estimated the capital cost for Phase 1 design and construction, with an expectation that this work can proceed in the coming 4 weeks.

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Appendix A

Risk Analysis / Risk Register

												Totals	$ 1,639,165	$ 398,800				
RISK ITEM #	PIT	STATUS: Active Dormant Retired	DATE POSTED	POTENTIAL RISK	DETAILED DESCRIPTION	RISK TRIGGER	AFFECTS (Environmental, Health, Safety, Costs / Schedule, Relationships, Tendering, Logistics)	PROBABILITY Low = <33% Medium <66% High >66%	IMPACT Low = <1%, Medium <2%, High >2%	Risk Matrix	POTENTIAL COST RANGE	RISK AMOUNT CARRIED	RISK STRATEGY: Avoidance, Transfer, Mitigation, Acceptance	RISK STRATEGY DESCRIPTION	RISK MITIGATION PLAN MILESTONE CHECKS	RISK MITIGATION PLAN DATE UPDATED
1	Permitting / Enviro	Retired	05-Jan-23	Major archeological artifacts are found	Site shutdown and equipment downtime. Probability is low as the site has been excavated already	Chance find or AIA	Health / Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigate	Site excavation almost entirely complete. Mitigated by previous excavation and AOA.		2023-04-27
2	Geo/Struct	Retired	05-Jan-23	Unsatisfactory soil conditions encountered	Need foundation upgrades (piling, raft slab, soil densification)	If sub-surface varies from what was assumed during design.	Costs / Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Site has been excavated. Soil conditions are known and subgrades were previously approved by geotech.		2023-04-27
3	Permitting / Enviro	Dormant	05-Jan-23	Environmental habitat restrictions (bird, nesting, species at risk)	During work species at risk are found on the worksite causing delays and requirement for environmental permitting engagement.	Prior to start of Work at any locations required	Costs / Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Plan the work in the appropriate time of year for clearing / grubbing work. Complete the required sweeps in advance of the work.		2023-04-27
4	Cost/Constructability	Retired	05-Jan-23	Material shortages/ supply chain issues.	Material and equipment does not arrive to the site on time requiring re-design of materials or lost time onsite.	Availability does not meet schedule and unable to address with sequence change.	Costs / Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Design is 75% complete and equipment Vendors have been engaged. Biggest risk now would be electrical equipment delays. Evaluate early and pre-order.		2023-04-27
5	PMT	Active	21-Mar-23	Labour Escalation. Allow for 5% increase in estimate. Extra in risk register.	With a high inflation rate and labour shortages, costs for LOA and / or travel may be incurred. Labour cost assumption of $2,500,000@3% = $75,000. Risk is only that over 5% escalation in estimate.	Labour cost escalation beyond 5%.	Costs	Low	Low	PROB. / IMPACT	$ 75,000	$ 8,333	Acceptance.	Carry cost in risk register.		2023-04-27
6	Cost/Constructability	Active	05-Jan-23	Material cost escalation from validation to execution.	Cost increase for equipment between validation pricing and ordering. Assume 10% on remaining $1.9M equipment.	Higher cost on ordering.	Costs	Low	Medium	PROB. / IMPACT	$ 190,000	$ 42,222	Mitigation	Engage subcontractors and order materials early in the project and avoid unforeseen material increases.		2023-04-27
7	Owners Expectations	Retired	05-Jan-23	Stakeholder Expectations vs funding available.	Project costs have escalated and after 4+ years of planning and multiple Tenders may still have financial challenges	Project budget trending over $13.4M ceiling	Costs/Schedule	Medium	High	PROB. / IMPACT	$ -	$ -	Avoidance	Facility projected to meet community needs within budget.		2023-04-27
8	Owners Expectations	Dormant	05-Jan-23	Stakeholder Expectations - Changes.	Owner and/or Stakeholders require changes to the current design due to permit issues or community requests.	Variance requests from current design by Owner / Stakeholder .	Costs/Schedule	Medium	Low	PROB. / IMPACT	$ -	$ -	Avoidance.	Clearly Define Scope and be prepared for potential scope changes. Clearly define scope in Validation report.		2023-04-27
9	Cost/Constructability	Active	05-Jan-23	Theft & looting from the jobsite or other insurance claim causes loss of deductible value of $50,000.	Theft of fuel and tools in the Lower Mainland have increased and become a 'normal' risk. Site is isolated. Assumed Deductible of $50,000 allow for single occurrence.	Theft from site.	Costs	Medium	Medium	PROB. / IMPACT	$ 50,000	$ 27,778	Mitigation	Site fencing and lighting. Mitigate with security measures.		2023-04-27
10	Cost/Constructability	Retired	05-Jan-23	Adverse weather conditions.	Adverse weather conditions cause delays to the project.	Delay days due to weather.	Costs/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Accounted for in lines 40 and 63		2023-04-27
11	Civil	Retired	05-Jan-23	Utility conflicts.	Conflicts with existing utilities or underground telephone/power line strike.	Construction	Costs/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Site is isolated and utility locations are well known. Proper Ground Disturbance Protocols should assist in mitigation. No work outside site that could impact other utilities.		2023-04-27
12	Mech/Elec	Retired	05-Jan-23	3rd party utility delays	Power to site delays. Two issues: Construction Power and permanent power.	1 month before construction and no clear timeline from them	Costs/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Duplicate.		2023-04-27
13	Mech/Elec	Active	05-Jan-23	SS Quality Assurance/ Production	Poor stainless steel fabrication.	Shop Drawings review	Costs/Schedule	Medium	Low	PROB. / IMPACT	$ -	$ -	Transfer	Use only certified welding shops (e.g. Absolute Mechanical)- Transfer to subcontractor.		2023-04-27
14	All	Active	05-Jan-23	Workplace Safety Incident	Accident could cause work delay or shut down. Potential for major accidents are elevated	Construction	Costs/Schedule	Low	Low	PROB. / IMPACT	$ 25,000	$ 2,778	Mitigation	Safety is our #1 priority, Consistent safety inspections and proper site management		2023-04-27
15	All	Retired	05-Jan-23	Covid Shutdowns	Given the current state of the world, could face a short term shut and escalated rapid testing required sites	Positive covid case on site leads to lost time	Health / Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Duplicated below.		2023-04-27
16	Mech/Elec	Retired	05-Jan-23	Insufficient power supply for the site	if the power requirements are more than what are assumed during validation resulting in more significant electrical system upgrades to service the site	hydraulic analysis indicates higher horsepower requirements	Cost	Low	Low	PROB. / IMPACT	$ -	$ -	Transfer	Deleted		2023-04-27
17	Permitting	Active	05-Jan-23	Environmental Permit Delays. $20,000 for additional cost of supplier trips, etc.	Environmental Permit may be delayed due to changes required to meet budget or long permit duration for current design	Commissioning Delayed by MWR approval	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 20,000	$ 2,222	Mitigate	Mitigate with early communication with ENV.		2023-04-27

												Totals	$ 1,639,165	$ 398,800				
RISK ITEM #	PIT	STATUS: Active Dormant Retired	DATE POSTED	POTENTIAL RISK	DETAILED DESCRIPTION	RISK TRIGGER	AFFECTS (Environmental, Health, Safety, Costs / Schedule, Relationships, Tendering, Logistics)	PROBABILITY Low = <33% Medium <66% High >66%	IMPACT Low = <1%, Medium <2%, High >2%	Risk Matrix	POTENTIAL COST RANGE	RISK AMOUNT CARRIED	RISK STRATEGY: Avoidance, Transfer, Mitigation, Acceptance	RISK STRATEGY DESCRIPTION	RISK MITIGATION PLAN MILESTONE CHECKS	RISK MITIGATION PLAN DATE UPDATED
18	Permitting	Retired	05-Jan-23	Local Building Permit	Changes required to meet local aesthetic requirements in an opulent neighbourhood	Municipal review	Cost	Low	Medium	PROB. / IMPACT	$ -	$ -	Transfer	Owner has confirmed that permit costs will not be charged to project.		2023-04-27
19	Cost/Constructability	Active	05-Jan-23	Tankage fails hydrostatic testing	Tanks continue to leak after initial commissioning	Failed hydrostatic test	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Transfer	See item 28.		2023-04-27
20	Geo/Struct	Retired	05-Jan-23	Construction delays require winter construction, or summer construction experiences extreme hot weather	Heating & hoarding concrete pours, ripping frozen ground. Hot weather delays concrete pours.	Hot or cold weather	Cost	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Duplicated Below		2023-04-27
21	Civil	Retired	05-Jan-23	2 Year Warranty Period	Costs for IPD team to deal with warranty items. Subtrades: $0 Urban: $10,000 Chandos: $20,000	Warranty item requires a return to site and consultant time	Cost	Medium	Medium	PROB. / IMPACT	$ -	$ -	Acceptance	Cost directly carried in estimate. (Verify with Estimating PIT)		2023-04-27
22	Process Equipment	Active	05-Jan-23	Escalation of Cost	Existing quotes are up to 4 years old. Inflation has been assumed at a total of 20%. And included in estimate	Request of cost update	Cost/Schedule	Low	Medium	PROB. / IMPACT	$ -	$ -	Avoidance	Equipment supply costs updated. Ordering to follow shortly after validation. Some escalation expected and included in BTC.		2023-04-27
23	Startup	Active	05-Jan-23	Startup & Commissioning issues	Startup and Commissioning of plant does not yield proper effluent	Effluent testing	Cost/Schedule	Low	Medium	PROB. / IMPACT	$ -	$ -	Transfer	If design errors are realized then E&O claim may be made. IPD process has included additional review by constructors and operators, reducing likelihood of errors.		2023-04-27
24	All	Active	09-Jan-23	Failed Inspections/rework	cost would vary greatly depending on report required. Assume probability of this is low due to IPD style delivery mode.	Construction	Cost/schedule	Low	Low	PROB. / IMPACT	$ 10,000	$ 1,111	Acceptance			2023-04-27
25	PMT	Active	20-Mar-23	Poly Party disagreements on scope changes /additional costs - resulting schedule delays	Project stops work in part or whole because project issue cannot be resolved. Assumed 2 weeks of lost Time @$25,000/wk = $50K	Additional costs incurred by any party due to delay or dispute.	Costs/schedule/relationships	Low	Low	PROB. / IMPACT	$ 50,000	$ 5,556	Avoidance	Open and clear communication from the team. Team project planning.		2023-04-27
26	PMT	Active	17-Jan-23	Change Management for non-polyp arty members	Cost, schedule increases from non-polyp arty members. Scope creep, RFI's.	Procurement	Cost	Low	Medium	PROB. / IMPACT	$ 217,500	$ 48,333	Accept	Allow for 1.5% of total value. (SMT /Estimating to Review)		2023-04-27
27	All	Dormant	25-Jan-23	Unknow Permitting Requirements	depends on permit required - could impact schedule. Highly unlikely due to proficiency of team that has worked on this project.	Construction	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation			2023-04-27
28	Structural	Active	20-Mar-23	Concrete tanks watertightness	Concrete tanks are not watertight and result in delays. Costs: repair, delays in construction. Would not be able to start building filter building until tanks are constructed and water tested. Hydrostatic test is 3-4 weeks total. Assume 1 month extra GCs. - assume 100K for now	Construction	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 100,000	$ 11,111	Acceptance	Risk transferred to concrete contractor. Risk associated with IPD team effort to correct.		2023-04-27
29	Structural	Active	20-Mar-23	Performance specs where vendor needs to supply engineering – pipe supports, seismic restraints	would result in estimate escalations for construction budget to manage unforeseen risks (i.e.. seismic)	Construction	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 10,000	$ 1,111	Acceptance	Communicate requirements clearly with pricing subcontractors.		2023-04-27
30	Structural	Active	20-Mar-23	Temp Works (requiring engineering)	formwork will be largest risk.	Construction	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 5,000	$ 556	Acceptance			2023-04-27
31	Structural	Active	20-Mar-23	Deliverables cause delays.	for building structure materials/panels. will come down to GC costs due to schedule extension.	Construction	Cost/Schedule	Medium	High	PROB. / IMPACT	$ -	$ -	Acceptance	Duplicate line accounted in other items.		2023-04-27
32	PMT	Active	20-Mar-23	Traffic incidents, single access route. Traffic causing inefficiencies, delays, pushing or delaying the schedule	Risk of timed out concrete trucks during July and August for traffic accidents.	Truck time out or similar due to traffic, etc.	cost	High	Low	PROB. / IMPACT	$ 6,000	$ 4,667	Avoidance	Plan work around high traffic times in area and avoid major holidays. etc. Use of FN road if required.		2023-04-27
33	PMT	Retired	20-Mar-23	Safety concerns- needing security for evenings/weekends.	permanent fencing will be installed at onset of project instead of renting temp fence. Have budgeted for full time security. have backup option	Construction	Safety/Costs	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Site Security for all off hours planned and in estimate.		
34	PMT	Active	20-Mar-23	Potential theft	Not likely. would be more damage to equipment than theft. Mitigated by full time security.	minor theft or vandalism	Safety/Costs	Low	Low	PROB. / IMPACT	$ 10,000	$ 1,111	Mitigation	Site Security for all off hours planned and in estimate.		

											Totals	$ 1,639,165	$ 398,800				
RISK ITEM #	PIT	STATUS: Active Dormant Retired	DATE POSTED	POTENTIAL RISK	DETAILED DESCRIPTION	RISK TRIGGER	AFFECTS (Environmental, Health, Safety, Costs / Schedule, Relationships, Tendering, Logistics)	PROBABILITY Low = <33% Medium <66% High >66%	IMPACT Low = <1%, Medium <2%, High >2%	Risk Matrix	POTENTIAL COST RANGE	RISK AMOUNT CARRIED	RISK STRATEGY: Avoidance, Transfer, Mitigation, Acceptance	RISK STRATEGY DESCRIPTION	RISK MITIGATION PLAN MILESTONE CHECKS	RISK MITIGATION PLAN DATE UPDATED
35	PMT	Active	20-Mar-23	Miss target start up date	GC extension. Late delivery of electrical equipment or similar . or coming back for season deficiencies. Assume 4 weeks @ $15K/wk. reduced GCs = $60,000	Late delivery of equipment, etc.	Costs/Schedule	Medium	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Early procurement plan, planned GC reductions if delivery delays are known		2023-04-27
36	PMT	Active	20-Mar-23	Construction Delays - Construction Phase Cost Increase Required	GC extension. Major building production or other unknown schedule lead times mid project. Extends duration in the middle of project. 4 weeks delay @ $26K/wk. = $104,000	Major mid project schedule delay	Costs/Schedule	Medium	Low	PROB. / IMPACT	$ -	$ -	Mitigation	See item 55.		2023-04-27
37	PMT	Active	20-Mar-23	Union strikes.	GC extension. $26,000 x 2wk = $52,000	Union Strike or similar	Costs/Schedule	Low	Low	PROB. / IMPACT	$ 52,000	$ 5,778	Acceptance			2023-04-27
38	PMT	Retired	20-Mar-23	Somebody is badly hurt or other major safety incident during construction.	GC extension. 2 Days GC Cost @ $5,200/day	Major incident. Job site standdown	Safety/Costs	Low	Low	PROB. / IMPACT	$ -	$ -	Avoidance	Duplicated Above		2023-04-27
39	Structural	Retired	20-Mar-23	Localized coordinate system – survey compatibility	not an issue. FVRD has mitigated.	Construction	Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Acceptance	Retain existing survey company.		2023-04-27
40	PMT	Active	20-Mar-23	Inclement Weather – How does that effect ability to work safely and schedule	GC extension of 1 week Schedule slow down due to localized heavy rain or snow and additional costs of abnormal snow removal or access road rebuild. $26,000 + $20,000	Construction	Schedule	Medium	Low	PROB. / IMPACT	$ 46,000	$ 20,444	Acceptance			2023-04-27
41	Structural	Retired	20-Mar-23	Seasonal weather cost - Heating and Hoarding	issue if need to move an entire scope due to scheduling impacts. must be reviewed with schedule. Concrete work scheduled for winter, costs already in estimate	Construction	Schedule	Medium	Low	PROB. / IMPACT	$ -	$ -	Acceptance	Planned in estimate		2023-04-27
42	Process	Active	21-Mar-23	Pieces of equipment do not function properly after years of being in storage. - SBR	Cost is percentage of overall cost. SBR Control panel and blowers will be the greatest risk (subject to moisture presence in the seacan. May also include pumps, decanters, etc. Carrying 30% of total SBR cost - assuming ~30% of equipment may have been impacted by time stored. **this should be addressed early on in construction to leave time for re-ordering equipment if needed.	Energization (i.e.. startup)	Cost/Schedule	Low	Medium	PROB. / IMPACT	$ 140,469	$ 31,215	Acceptance	Reach out to manufacturer to pre-verify received equipment prior to install, based on leadtime and can potentially energize system if it suggested.		2023-04-27
43	Process	Active	21-Mar-23	Pieces of equipment do not function properly after years of being in storage. - UV	Concerns with ballast. There is more than 1 ballast and likely not going to have all malfunction. No maintenance perform while in storage. 91K is cost of UV system.	UV system does not function at energization (i.e.. startup)	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 91,450	$ 10,161	Acceptance	Reach out to manufacturer to pre-verify received equipment prior to install, based on leadtime and can potentially energize system if it suggested.		2023-04-27
44	Process	Active	21-Mar-23	Pieces of equipment do not function properly after years of being in storage. - Odour Control	Concerns with blower and motor exposed to moisture during storage. Issue would be with fan blowers and not activate carbon unit. No maintenance perform while in storage.	Odour Control does not function at energization (i.e.. startup)	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 35,000	$ 3,889	Acceptance	Manufacturer to pre-verify received equipment prior to install, based on leadtime and can potentially energize system if it suggested. Maybe worthwhile sending to motor shop to verify locally.		2023-04-27
45	Process	Active	21-Mar-23	Pieces of equipment do not function properly after years of being in storage. - EQ	Submersible pumps being stored in uncontrolled environment. Cost is 2023 contract price of EQ pumps.	Equipment inspection or during install	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 57,856	$ 6,428	Acceptance	Pumps been stored in seacan and meant to be installed and placed in a corrosive environment.		2023-04-27
46	Process	Active	21-Mar-23	Pieces of equipment do not function properly after of being in storage.	Same rationale as SBRs. Only includes digested sludge pumps (to be repurposed to decant pump). Aeration equipment and blower not delivered yet.	Energization (i.e.. startup)	Cost/Schedule	Medium	Low	PROB. / IMPACT	$ 6,889	$ 3,062	Acceptance	Check critical electrical items prior to installation.		2023-04-27
47	Process	Active	21-Mar-23	Class A effluent cannot be achieved due to process malfunctions.	GC extension. $26,000 x 2wk = $52,000	Commissioning on track and class A effluent is not achieved	Cost/Schedule	Low	Low	PROB. / IMPACT	$ 52,000	$ 5,778	Mitigation	Well known processes and equipment specified in design. Integrated team included in commissioning.		2023-04-27
48	Process	Retired	21-Mar-23	Performance guarantees on equipment. Not Delivered.	GC extension. $26,000 x 2wk = $52,000	Equipment does not work as required.	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	See item 47		2023-04-27
49	Process	Active	21-Mar-23	Mechanical breakdowns/equipment failures shortly after commissioning (outside of warranty)		During or After Commissioning	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Transfer	Some equipment delivered to site are not covered under warranty. Risk transferred to Owner.		2023-04-27
50	Process	Retired	21-Mar-23	Integration problems. (communication). SCADA issues/PLC programming.	Includes SCADA commissioning & development (PBX time)	Manufacturers devices not integrating	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	See item 47.		2023-04-27
51	Process	Active	21-Mar-23	Permanent power source Delay	If permanent power source is not available, then the plant cannot be connected to. Plant could be commissioned with Temporary power source/generator. Assumed owner risk.	Construction	Cost/Schedule	Low	Low	PROB. / IMPACT	$ -	$ -	Mitigation	Temporary generator owned by FVRD can be used.		2023-04-27
52	Process	Active	21-Mar-23	Construction Power - BC Hydro Temp Drop	BC Hydro lead times have been 30-60 days, and diesel generator can be used until then (FVRD has one). Cost if price of fuel. Start of project will require less power.	Delay in temp power drop and construction must commence with generator.	Cost	Low	Low	PROB. / IMPACT	$ 10,000	$ 1,111	Acceptance	Prioritize during procurement		2023-04-27

												Totals	$ 1,639,165	$ 398,800				
RISK ITEM #	PIT	STATUS: Active Dormant Retired	DATE POSTED	POTENTIAL RISK	DETAILED DESCRIPTION	RISK TRIGGER	AFFECTS (Environmental, Health, Safety, Costs / Schedule, Relationships, Tendering, Logistics)	PROBABILITY Low = <33% Medium <66% High >66%	IMPACT Low = <1%, Medium <2%, High >2%	Risk Matrix	POTENTIAL COST RANGE	RISK AMOUNT CARRIED	RISK STRATEGY: Avoidance, Transfer, Mitigation, Acceptance	RISK STRATEGY DESCRIPTION	RISK MITIGATION PLAN MILESTONE CHECKS	RISK MITIGATION PLAN DATE UPDATED
53	Process	Active	21-Mar-23	If the polymer makedown and dosing system (for filtration) is needed to achieve effluent quality.	covers cost of equipment: equipment includes: polymer tank, metering pump, aging tank, and dosing pumps. Note that FVRD owns most of equipment and the carried amount is meant to be to fill in any remaining costs.	Class A effluent cannot be achieved without polymer addition upstream of filters.	Cost/Schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 40,000	$ 4,444	Acceptance	Get process warranty from equipment supplier.		2023-04-27
54	Process	Retired	21-Mar-23	Electrical equipment delays hold up project commissioning.	Issue would be delays. and premium time for Omni/GC. risk strategy is to order asap and follow up with suppliers to track deliveries. Assume schedule pushed out for 2 extra months. GC extension. $26,000 x 8wk = $208,000	Electrical equipment is delayed.	Cost/Schedule	Medium	Medium	PROB. / IMPACT (X: Medium / Medium)	$ -	$ -	Mitigate	See item 55.		2023-04-27
55	Process	Active	21-Mar-23	Equipment Delay limited to 4 weeks	for vendor supplied equipment. and premium time for Omni/GC. risk strategy is to order asap and follow up with suppliers to track deliveries. Assume schedule pushed out for 1 extra months. GC extension. $26,000 x 4wk = $104000	vendor supplied equipment is delayed	Cost/Schedule	High	Low	PROB. / IMPACT (X: High / Low)	$ 104,000	$ 80,889	Acceptance	Up to 4 week delay in risk register. Owner risk beyond 4 weeks.		2023-04-27
56	PMT	Active	21-Mar-23	Performance specs where vendor needs to supply engineering – pipe supports, seismic restraints	for process pipe support design- this should potentially be included in the cost est. instead.	Testing	Cost/Schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ -	$ -	Transfer	Costs to be built into Estimate and project validation budget.		2023-04-27
57	PMT	Active	21-Mar-23	Project Closeout incomplete	Additional Engineering and Construction Staff Document Close out Efforts. $20000 Construction/Engineering Staff	Commissioning	Cost/Schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 20,000	$ 2,222	Mitigate	Additional support (co-op students) to help with closing commissioning		2023-04-27
58	PMT	Active	21-Mar-23	Operator Training Fails	Additional operator training / equipment manuals required. Re-do operating training @ $5,000	Operators unable to operate equipment after plant is commissioned	Cost/Schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 5,000	$ 556	Mitigate	Training Program will be responsibility of all parties to come up with training plans.		2023-04-27
59	PMT	Active	21-Mar-23	Bankruptcy of vendors/contractors	subcontracted sub or vendor becomes insolvent and costs are incurred to pull bonds and replace with alternate contractor. Major supplier deposit/payment of approximately $200,000.	Construction	Cost/Schedule	Low	Medium	PROB. / IMPACT (X: Low / Medium)	$ 200,000	$ 44,444	Acceptance	Bonds in place. PMT/PIT to be diligent regarding financial standing of company.		2023-04-27
60	PMT	Dormant	21-Mar-23	COVID Shutdown	Site Closure due to pandemic flare up and associated health risks on site	Outbreak On Site	Safety/Schedule/Costs	Low	Low	PROB. / IMPACT (X: Low / Low)	$ -	$ -	Acceptance	Duplicated above		2023-04-27
61	PMT	Active	21-Mar-23	Cyber Security	Project Data Loss/Ransom cost $5,000	Data Loss	Costs	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 5,000	$ 556	Mitigation	Employer cyber security training and programs. Data backup on cloud based servers.		2023-04-27
62	PMT	Active	21-Mar-23	Localized Survey Coordinate System Errors or Lost Data	Potential Cost due to lost survey benchmarks or survey rework due to errors. $5,000 Additional Survey Costs/minor rework costs	Information Rework	Costs	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 5,000	$ 556	Avoidance	Protection of benchmarks		2023-04-27
63	PMT	Dormant	28-Mar-23	Cannot access site – Access Cut Off is Under Water	Major Flood Risk - Force Majeure	Information Rework	Costs	Low	Low	PROB. / IMPACT (X: Low / Low)	$ -	$ -	Acceptance	See item 40.		2023-04-27
64	PMT	Active	28-Mar-23	Wildlife Species at Risk	Nesting of bird or species at risk. Causes buffer zone or noise restrictions to prevent nesting disturbances. Assume risk of two day stand down @ $5200/day	Information Rework	Costs, schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 10,400	$ 1,156	Acceptance	See item 40.		2023-04-27
65	PMT	Active	28-Mar-23	Additional Tree Clearing Required	Site requires more tree clearance for access or Danger Trees	Information Rework	Costs, schedule	Low	Low	PROB. / IMPACT (X: Low / Low)	$ 1,500	$ 167	Acceptance	See item 40.		2023-04-27
66	PMT	retired.	30-Mar-23	Opportunity - FVRD labour on external works, pipes etc. at no cost to project at direction of Chandos. Equipment/material would still be cost to project.	FVRD would provide labour for specific items at no cost to project. Equipment and materials billed to project.	FVRD completes specific work scope items.	Cost schedule	High	Medium	PROB. / IMPACT (X: High / Medium)	$ -	$ -	Acceptance	FVRD scope of works identified and incorporated into BTC.		2023-04-27
67	Process	Active	26-Apr-23	BCH Hydro cost 50% more than $98k quote.	BCH quote is +50% or -25%	Hydro cost is higher	Cost	Medium	Low	PROB. / IMPACT (X: Medium / Low)	$ 49,000	$ 21,778	Acceptance			2023-04-27
68	Process	Active	26-Apr-23	BCH Hydro cost 25% less than $98k quote.	BCH quote is +50% or -25%	Hydro cost is lower	Cost	Low	Low	PROB. / IMPACT (X: Low / Low)	-$ 24,500	-$ 2,722	Acceptance			2023-04-27

Appendix B

Decision Log and DM's

DM1 – Building Efficiencies

DM-1

Efficiencies in the Dewatering WWTP and Filter Bldg

Opportunity / Option

To determine how the buildings can be optimized based from TVD ideas and brainstorming session held during Big Room#02.

Opportunity Analysis

Optimization the IPD team identified to explore are the following:

1. Reduce height to two levels by removing dewatering room and admin room mezzanine and also have a common roof height.
2. Make squares/rectangles where can (for ex. make electrical/mechcanical room aerea wider to be flush with NaOH room width).
3. Reduce room's footprint by optimization
   a. Move NaOH Room to the west side building where Sludge tank is planned.
   b. Reduce size of the blower room.
   c. Relocate blowers or blower building - tie in blower building to UV disinfection and filtering room.
   d. Consider combining electrical and mechnical rooms, and combine with admin room.
6. Combine the two buildings into 1.
4. Remove sunken area/base. Flatten bfottom slab and bench in EQ tank. Reduce elevation and increase size for unused portion. Reduce building size likely possible.
5. Reduce number of washrooms and associated plumbing/HVAC
7. move EQ tank to share common wall with SBR or SBR+digester

Further Action Required	Costs	Individual Responsible	Complete Y' if Yes	Due Date	Email sent
3a, 3c, 6 - enter into the Decision Log	N/A	Bryan		03/07/2023	
	$0.00				

Implementation Actions Required (After Approval)	Costs	Individual Responsible	Complete 'Y' if Yes	Due Date	Email sent
Provide pertinent information to estimating PIT to obtain quotation applicable to the project.	$				
	$0.00				

Please indicate if Decision was to "Accept", "Reject" or "Under Review"

Reject

Decision Made

Values Alignment

Project values will be used to guide the team in decision making. Use this matrix on any major decision document that grades the decision on its affect (red,yellow,green) on the overall project values. Where there is a conflict between values, the document should discuss how the conflict will be resolved. If a decision doesn't affect a value, the team should question the necessity of the action.

	POS	NEU	NEG	N/A
Operations Excellence				
Community Impact				
Schedule and Cost				
Quality				
Safety				
Personal Development + Synergy + Influencers for Industry Change				

Conditions of Satisfaction?

Attachment

Impact to Budget

Hard Costs	Soft Costs	Total
		$0.00

Impact to Schedule

Last Responsible Moment for Implementation — **Date**

Title

TEAM	CHAMPION	COLLABORATORS
All Team		All PITs
	PMT Review Date: 03/07/2023	

1- REDUCE BULDING HEIGHT

Decision Outline	**Make building one height at lowest possible height - governed by headworks height**
NOTES	Base case: vs Existing Design; P-340 For reducing builiding height consideration - keep the height (elevation of the roof height at the same level with the level governed by headworks height. Process impact is negligible.

PITs involved in decision: Structural/Bldg

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**0**	no impact to operations or maintenance
Community Impact	-5 to +5	**0**	no impact to community
Schedule and Cost	-5 to +5	**5**	100-150K Savings to lower the roof. Schedule is also shortened, as construction is simplified.
Quality	-2 to +2	**2**	single roof line, less building to heat in long term, less issues with potential leakage with less joints.
Safety	-5 to +5	**2**	safer for future access (no stairs)
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**1**	this was a win for the team & project. team is aligned on decision.
Team Alignment	-2 to +2	**2**	
EFFECT ON DECISION:		12	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved decision to lower building height.

COMPLETED BY: All

DATE: 03/07/2023

2 -ADJUSTMENT BUILDING FOOTPRINT and OPTIMIZE ROOM SPACE

Decision Outline	**Make building square/rectangular as possible**
NOTES	Base case: Existing Design, Add more real estate by increasing the electrical room space, A01
PITs involved in decision:	Structural/Bldg

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**4**	increasing space of electrical room to better fit equipment. All equipment on single floor.
Community Impact	-5 to +5	**0**	no community impact
Schedule and Cost	-5 to +5	**0**	minor negative due to extra roof and slab extension. Due to extra area, there are gains in fitting electrical equipment.
Quality	-2 to +2	**2**	Quality impact for electrical design.
Safety	-5 to +5	**4**	the larger the electrical room, the safer. All electrical cabinets will fit into one room.
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**1**	Likely would not do this without electrical gains.
Team Alignment	-2 to +2	**1**	Overall positive impact and team alignment on decision.
EFFECT ON DECISION:		12	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved decision to simplify building and remove jogs.

COMPLETED BY: All

DATE: 03/07/2023

3 - REDUCE BUILDING FOOTPRINT

Decision Outline

NOTES

Reduce the size of the blower building by 2/3 - Blower room space and sized for Phase 1 - Buidling of the blower room to be phased.

PITs involved in decision:

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	0	Blower room impact will not have negative impacts on operation.
Community Impact	-5 to +5	-1	Small community impact as portion of phase 2 costs are being deferred by reducing blower room size to fit phase 1 blowers only.
Schedule and Cost	-5 to +5	4	area of building is being reduced (by ~52 ft2), which impacts building materials. ~$100K +
Quality	-2 to +2	0	no impact to quality
Safety	-5 to +5	0	no impact to safety during construction or opertations.
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	0	na.
Team Alignment	-2 to +2	2	team is aligned on decision.
EFFECT ON DECISION:		5	POSITIVE

DECISION (+ ANY BACKUP) The team has approved the decision to minimize the blower room footprint to Phase 1 only.

COMPLETED BY: All

DATE: 03/07/2023

4 - MOVE EQ TANK

Decision Outline | **move EQ tank from under filter building to share common wall with SBR or SBR+digester**

NOTES

pumps are not changing, but pump discharge run is shortened.
will need to excavate more on the digester/SBR side. will potentially be a backfull requirement.
eliminate process piping between filter building and SBR/digester tanks.
will need some input from structural on having one long EQ tank vs one wider and shorter length EQ tank. Not good to split EQ tank, otherwise would need two sets of pumps.
would need some slight grade with a pump sump. Solids collection was a greater issues when was under the filter building. With EQ tank outside, can clean easily from above.

PITs involved in decision: ALL

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**3**	less valves, less yard piping, easier access space. Operations team is keen on option.
Community Impact	-5 to +5	**0**	no impact to community.
Schedule and Cost	-5 to +5	**4**	increase in cost due to fill that will need to placed into existing excavation under filter building ($50K potential). Benefit to cost by removing site piping between filter building and SBRs, valves. Also removing suspended slab in filter building. This also opens up potential to hydrostatically test all three tanks as once (if checking each individual tank is not neccessary) - this would be a positive schedule impact. Therefore, the net effect would likely be a cost decrease.
Quality	-2 to +2	**2**	will make life easier during construction, which can have a positive impact on quality.
Safety	-5 to +5	**3**	eliminates difficult confined space (note this is still a confined space, but is much more accessible)
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**1**	overall made the design safer and more practical to build.
Team Alignment	-2 to +2	**1**	team is aligned on decision.
EFFECT ON DECISION:		14	**POSITIVE**

DECISION (+ ANY BACKUP) | The team has approved the decision to move EQ tank.

COMPLETED BY: All

DATE: 03/07/2023

DM2 – Building Materials

DM-02	Further Action Required	Costs	Individual Responsible	Complete Y' if Yes	Due Date	Email sent
Headworks Building main structure materials decision						
Opportunity / Option						
To determine how the buildings can be optimized based from TVD ideas and brainstorming session held during Big Room#02.						
Opportunity Analysis						
-tilt up vs pre-eng building						
		$0.00				
	Implementation Actions Required (After Approval)	**Costs**	**Individual Responsible**	**Complete 'Y' if Yes**	**Due Date**	**Email sent**
		$0.00				

Values Alignment	POS	NEU	NEG	N/A
Project values will be used to guide the team in decision making. Use this matrix on any major decision document that grades the decision on its affect (red,yellow,green) on the overall project values. Where there is a conflict between values, the document should discuss how the conflict will be resolved. If a decision doesn't affect a value, the team should question the necessity of the action.				
Operations Excellence				
Community Impact				
Schedule and Cost				
Quality				
Safety				
Personal Development + Synergy + Influencers for Industry Change				

Conditions of Satisfaction?

Attachment

Impact to Budget		
Hard Costs	**Soft Costs**	**Total**
		$0.00

Impact to Schedule

Last Responsible Moment for Implementation	Date
	2022-10-14

Title

Please indicate if Decision was to "Accept", "Reject" or "Under Review"	Decision Made	TEAM	CHAMPION	COLLABORATORS
Accept	Precast will be the material of choice selected for the headworks building.	All Team	Matt Smith	All PITs
		PMT Review Date:	04/27/23	

1-Building Materials (Building)

Decision Outline		**Pre-cast (tilt up) vs pre eng building.**

NOTES

-precast is competative in the lower mainland.
-pre eng may save some money (~50K) but would require futher redesign (as current design is based on the pre-eng building manufactuer spec).
-pre-eng would likely also require a thicker foundation to support the pre-eng building, which would increase concrete costs.
-comparable construction schedule. However procurement period for precast panels will not require major design.
-base for comparison is pre-cast option
-pre eng is ~30 years and pre cast is 50+ years life expenctancy.
-roofing on pre eng will be metal (standing seam). Roof on precast will be flat (TPS). Standing seam roof is more resistant to leakage. Therefore precast roof will have more maintenance.
-pre eng metal building is less asthetic than concrete (impact to community)

PITs involved in decision: Structural/ Estimating

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**-1**	Pre-Eng building has a shorter lifespan than concrete panel and require additional maintenance. Membrane Roofing system for precast requires maintenance.
Community Impact	-5 to +5	**-1**	Visual of concrete structure is preffered
Schedule and Cost	-5 to +5	**0**	Assumed cost neutral between material savings and redesign costs. Presumed neutral on overall schedule affect.
Quality	-2 to +2	**0**	no impact to quality
Safety	-5 to +5	**0**	no impact to safety
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**0**	na
Team Alignment	-2 to +2	**0**	
EFFECT ON DECISION:		-2	**NEGATIVE**

DECISION (+ ANY BACKUP)	Pre-cast has been selected by the team.

COMPLETED BY: All

DATE: 2023-04-04

DM3 – Piping Layout and Materials

DM- 3

Optimize piping layouts and materials

Opportunity / Option

To determine if splitter box can be moved outside to avoid pipe penetrations.

Opportunity Analysis

Optimization the IPD team identified to explore are the following:

1. splitter box outside intead of inside with pipe penetrations

Further Action Required	Costs	Individual Responsible	Complete Y' if Yes	Due Date	Email sent
	$0.00				

Implementation Actions Required (After Approval)	Costs	Individual Responsible	Complete 'Y' if Yes	Due Date	Email sent
Provide pertinent information to estimating PIT to obtain quotation applicable to the project.	$				
	$0.00				

Please indicate if Decision was to "Accept", "Reject" or "Under Review"

Accept

Decision Made

Values Alignment

Project values will be used to guide the team in decision making. Use this matrix on any major decision document that grades the decision on its affect (red,yellow,green) on the overall project values. Where there is a conflict between values, the document should discuss how the conflict will be resolved. If a decision doesn't affect a value, the team should question the necessity of the action.

	POS	NEU	NEG	N/A
Operations Excellence				
Community Impact				
Schedule and Cost				
Quality				
Safety				
Personal Development + Synergy + Influencers for Industry Change				

Conditions of Satisfaction?

Attachment

Impact to Budget

Hard Costs	Soft Costs	Total
		$0.00

Impact to Schedule

Last Responsible Moment for Implementation	Date

Title

TEAM	CHAMPION	COLLABORATORS
All Team	Structural PIT	All PITs
PMT Review Date:	04/23/23	

1- SBR SPLITTER BOX OPTIMIZATION

Decision Outline	splitter box outside intead of inside with pipe penetrations

NOTES

Small concrete box.
need heavy rubber mat for odour containment
may need to include a small FA line
consist of box with weir to split flows between SBRs
stub outs for future phase SBRs
positive safety impact - there will be adjustable weir plates to control flows to each SBR, and will have a stop gate at dischagre to isolate splitter box from SBR. this is a blind (double block and blead), which WSBC requires.

PITs involved in decision: Structural/Bldg Process/electrical

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**0**	
Community Impact	-5 to +5	**0**	potential impact due to outdoor SBR splitter box, but will have heavy rubber mat and FA piping to manage odours.
Schedule and Cost	-5 to +5	**5**	
Quality	-2 to +2	**2**	
Safety	-5 to +5	**2**	
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**1**	
Team Alignment	-2 to +2	**2**	
EFFECT ON DECISION:		12	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved the decision to move the splitter box outside to reduce building penetrations.

COMPLETED BY: All

DATE: 03/07/2023

DM4 – FOA System – Not Used

DM5 – Chemical Systems

DM-5

NaOH Room Optimization

Opportunity / Option

Replace NaOH tank with totes.

Opportunity Analysis

Optimization the IPD team identified to explore are the following:

1. NaOH room optimization (tank to totes)
need to look at operational cost increase of using totes vs tanks (ie. losing deposit on totes and having higher frequency of deliveries)
use 4-6 totes instead of one large NaOH tank
reduces containment area to 110% of one 1100L totes
significantly reduces containment area size
eliminates need for one large NaOH tank
include small day tank (instead of just drawing from totes)

Further Action Required	Costs	Individual Responsible	Complete Y' if Yes	Due Date	Email sent
	$0.00				

Implementation Actions Required (After Approval)	Costs	Individual Responsible	Complete 'Y' if Yes	Due Date	Email sent
Provide pertinent information to estimating PIT to obtain quotation applicable to the project.	$				
	$0.00				

Values Alignment

Project values will be used to guide the team in decision making. Use this matrix on any major decision document that grades the decision on its affect (red,yellow,green) on the overall project values. Where there is a conflict between values, the document should discuss how the conflict will be resolved. If a decision doesn't affect a value, the team should question the necessity of the action.

	POS	NEU	NEG	N/A
Operations Excellence				
Community Impact				
Schedule and Cost				
Quality				
Safety				
Personal Development + Synergy + Influencers for Industry Change				

Conditions of Satisfaction?

Attachment

Impact to Budget

Hard Costs	Soft Costs	Total
		$0.00

Impact to Schedule

Last Responsible Moment for Implementation	Date

Title

Please indicate if Decision was to "Accept", "Reject" or "Under Review"

Accept

Decision Made

TEAM	CHAMPION	COLLABORATORS
All Team	Structural PIT	All PITs

PMT Review Date: 04/24/23

1 -NaOH ROOM OPTIMIZATION

Decision Outline	**use totes instead of tank to reduce secondary containment area and eliminate sump in NaOH room.**
NOTES	need to look at operational cost increase of using totes vs tanks (ie. losing deposit on totes and having higher frequency of deliveries) use 4-6 totes instead of one large NaOH tank reduces containment area to 110% of one 1100L totes significantly reduces containment area size eliminates need for one large NaOH tank include small day tank (instead of just drawing from totes)
PITs involved in decision:	Structural/Bldg

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**0**	more frequency of exposure but less maintenance with totes
Community Impact	-5 to +5	**0**	no impact to community.
Schedule and Cost	-5 to +5	**3**	cost benefit for eliminating tank and most of sump area for containment. no platform for pumps/operator.
Quality	-2 to +2	**0**	no impact to quality.
Safety	-5 to +5	**0**	safer than tank due to eliminating drop down area.
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**0**	not applicable.
Team Alignment	-2 to +2	**0**	not everyone is on board.
EFFECT ON DECISION:		3	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved the decision to use totes instead of a tank (NaOH)

COMPLETED BY: All

DATE: 03/07/2023

DM6/7 – Sludge Day Tank, Digester and Sludge

DM-6/7

Optimize Sludge Day Tank and Digester

Opportunity / Option

To determine how SDT and Digester can be optimized based from TVD ideas and brainstorming session held during Big Room#02.

Opportunity Analysis

Optimization the IPD team identified to explore are the following:

1. splitter box outside intead of inside with pipe penetrations

Further Action Required	Costs	Individual Responsible	Complete Y' if Yes	Due Date	Email sent
	$0.00				

Implementation Actions Required (After Approval)	Costs	Individual Responsible	Complete 'Y' if Yes	Due Date	Email sent
Provide pertinent information to estimating PIT to obtain quotation applicable to the project.	$				
	$0.00				

Values Alignment

Project values will be used to guide the team in decision making. Use this matrix on any major decision document that grades the decision on its affect (red,yellow,green) on the overall project values. Where there is a conflict between values, the document should discuss how the conflict will be resolved. If a decision doesn't affect a value, the team should question the necessity of the action.

	POS	NEU	NEG	N/A
Operations Excellence				
Community Impact				
Schedule and Cost				
Quality				
Safety				
Personal Development + Synergy + Influencers for Industry Change				

Conditions of Satisfaction?

Attachment

Impact to Budget

Hard Costs	Soft Costs	Total
		$0.00

Impact to Schedule

Last Responsible Moment for Implementation — **Date**

Title

TEAM	CHAMPION	COLLABORATORS
All Team	Structural PIT	All PITs
	PMT Review Date:	04/23/23

Please indicate if Decision was to "Accept", "Reject" or "Under Review"

Decision Made

Accept

1A - CENTRIFUGE TO LOWER LEVEL

Decision Outline	**Move centrifuge to lower level.**
NOTES	**Will need a conveyor for dewatered solids to discharge to solids bin.** **redundancy is in digester now (ie rationale for not having two centrifuges)** **use a smaller bin in phase 1 so that do not have to spread the solids around in the bin - in phase 2, add in another centrifuge and then put in a horizontal conveyor to spread the cake throughout a larger bin, or have two centrifuges discharging to different ends of the larger bin, or have a taller bin (20 yard = 15m3) instead of roll off bin.** **centrate will flow by gravity to the SBR splitter box (to be placed outside).**
PITs involved in decision:	Structural/Bldg Process/electrical

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**1**	requires inclined auger (which can be an issue with wetter cake), but easier for maintenance. impacts rest of building significantly (ie. one level vs two), opens up ore floor space on first floor due to stairwells. Bin removal frequency is not significant.
Community Impact	-5 to +5	**0**	no impact to community.
Schedule and Cost	-5 to +5	**5**	saved cost and time as do not need to build mezzanine and all items related to second floor of building.
Quality	-2 to +2	**0**	no impact to quality
Safety	-5 to +5	**2**	less stairs, headworks is more accessible.
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**1**	not applicable.
Team Alignment	-2 to +2	**2**	all members aligned on decision.
EFFECT ON DECISION:		11	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved the decision to move the centrifuge to the lower level, eliminating the need for a second story.

COMPLETED BY: All

DATE: 03/07/2023

1A - DELETE SLUDGE DAY TANK

Decision Outline	**eliminate sludge day tank (and use centrifuge feed pumps to draw WAS from digester)**

NOTES

currently waste sludge is pumped from digesters to sludge holding tank (on timers to waste sludge on a continual basis).
flooded suction from tank for PC pumps that pump to centrifuge.
plan is to use PC pumps to pump directly from digester to centrifuge. can function with suction, but would need to have a method of priming the pump.
eliminates concrete tank for sludge holding.
plan is to use the digester pumps for digester decanting.
in phase 2 would need a pump closer to the digester at the suction lift might be too much from the phase 2 digesters to the centrifuge.
centrifuges require constant flow to operate properly, which is why the PC pumps are being used.
process: turn off mixers and blowers when full, allow to settle, take decant off, pump out WAS.
sluge from offsite sources would be added to aerobic digester.

PITs involved in decision: All

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**0**	one less enclosed tank with mixer to maintain. flooded suction is gone but the priming method should work but could be operationally more challenging to operate. Operationally need to coordinate digester with centrifuge operation which could increase effort.
Community Impact	-5 to +5	**0**	no community impact
Schedule and Cost	-5 to +5	**4**	no stairs, door, handrail, pumps, concrete tank --> is in the $70-100K
Quality	-2 to +2	**0**	no concerns.
Safety	-5 to +5	**1**	less stairs to slip on in the winter
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**0**	na
Team Alignment	-2 to +2	**1**	team is aligned on decision
EFFECT ON DECISION:		6	**POSITIVE**

DECISION (+ ANY BACKUP) The team has approved the decision to delete the sludge day tank.

COMPLETED BY: All

DATE: 03/07/2023

1A - AEROBIC DIGESTER DECANT OPTIMIZATION

Decision Outline	**Aerobic digester decant (eliminate decant wet well/pumps/flow meter/valve vaults, and use digester sludge pumps to pump centrate to splitter box)**

NOTES

plan is to move the function of the wet well pumps to within the tank.
have two lines that go directly to the splitter to avoid valve chamber.
plan is to use the digester pumps for digester decanting. need to find a way to mount pump just below water surface to extract decant only from digester.
need to think about where overflow will discharge to.

PITs involved in decision: All

Project Value	Rating Range	Score	Comments
Operation Excellence	-5 to +5	**1**	eliminates confined spaces of manholes. achieves same result with less components.
Community Impact	-5 to +5	**0**	no impact to community.
Schedule and Cost	-5 to +5	**4**	huge win to valves, piping, transition couplings, manholes, etc.
Quality	-2 to +2	**0**	not applicable.
Safety	-5 to +5	**1**	safety is increased due to eliminating confined spaces.
Personal Development + Synergy + Influencers for Industry Change	-2 to +2	**0**	not applicable.
Team Alignment	-2 to +2	**1**	team is aligned on decision
EFFECT ON DECISION:		7	**POSITIVE**

DECISION (+ ANY BACKUP)	The team has	approved the decision to pump aerobic digester decant directly to the spitter box instead of to a return lift station.

COMPLETED BY: All

DATE: 03/07/2023

DM – HVAC – Not Used

Cultus Lake Waste Water Project
Decision Log

DM Number	From which PIT ?	PITs involved in Decision	Decision Outline	Champion	Status	Notes
DM-1	Structrural/Bldgs	All PITs	Overall Bldg Optimization (reduce jogs, reduce height to one floor, reduce footprint, etc.)	All	Approved	
-	All PITs	All PITs	effluent reuse removal	All	Approved	
DM1	Structrural/Bldgs	All PITs	Move EQ tank to SBR/Digester location	Aya/Matt	Approved	
-	Process/Electrical	Process/Electrical	Remove valve access walkway over digester	Aya/Matt	Approved	Remove platform area over aerobic digesters by pulling back valves that control WAS inlet to digesters.
-	Costing/Procurment	Process/USL	FOA Piping Material Change from PVC Sched40 to Fabco Instaduct	Bodo Papke	Approved	We have reviewed the Fabco Instaduct product and it appears to be suitable for use in the FOA system at Cultus Lake. Dampers appear to be all plastic construction and suitable for corrosive environments.
-	PMT	PMT	Engage PBX as electrical engingeer.	Matt Smith	Approved	Obtained proposal, reviewed with PMT, Omni. Accepted.
DM3	Process/Electrical	All PITs	Move SBR splitter box outside	Aya/Matt	Approved	move to outside and simplify building penetrations to one
DM6/7	Process/Electrical	All PITs	Move centrifuge to lower level	Aya/Matt	Approved	move centrifuge and delete second floor mezzanine
DM6/7	Process/Electrical	All PITs	Delete sludge day tank	Aya/Matt	Approved	remove sludge day tank and pump from aerobic digester directly to centrifuge used PC pump in dewatering building.
DM6/7	Process/Electrical	All PITs	Aerobic digester Decant Optimization	Aya/Matt	Approved	Delete return pump station and digester decant system. Repurpose sludge pumps to pump digester decant to the SB
DM6/7	Process/Electrical	All PITs	NaOH room optimization	Aya/Matt	Approved	delete sunken sump area and raise TOC to same level as adjacent rooms. Include short concrete containment wall. D
-	Process/Electrical	Process/Electrical	P-removal room optimization	Aya/Matt	Approved	delete sump and replace with short concrete containment wall. Remove separate totes that si connected and connec
-	Process/Electrical	All PITs	EQ tank length and width	Aya/Matt	Approved	Opt for longer/narrower EQ tank to span entire length of SBR and digesters, instead of a shorter/wider EQ tank to spa
-	Process/Electrical	Process/Electrical	Filter Building Sump	Aya/Matt	Approved	Add small sump in filter building to return filter backwash, filter overflow and water from safety showers.
-	Process/Electrical	Process/Electrical	Parallel lines from digesters to SBR splitter box	Aya/Matt	Approved	Opted for two parallel lines from digesters to splitter box to avoid valve chamber (for check valves)
-	Process/Electrical	Process/Electrical	Aerobic digester to overflow to manhole S02	Aya/Matt	Approved	Convey digester overflow to manhole S02 instead of to SBRs. Eliminates excess pipe penetrations
-	Process/Electrical	Process/Electrical	Parallel lines from filter building sump to aerobic digesters	Aya/Matt	Approved	Opted for two parallel lines from filter building sump to aerobic digesters avoid valve chamber (for check valves)
-	Process/Electrical	Process/Electrical	SBR Decant flow path	Aya/Matt	Approved	SBR decanters to direct all flow from both SBRs to north cell of planned EQ tank. Cells of EQ tank to be separated by
-	Process/Electrical	Process/Electrical	Remove low level switches/alarms on all chemical containment totes.	Aya/Matt/Dave	Approved	Operator confirmed that operations teams work 7 days per week and will visually check tote is use daily.
-	Process/Electrical	Process/Electrical	Remove flow meter and TSS analyzer on WAS line (SBR to digesters)	Aya/Matt/Dave	Approved	This is considered a nice to have and is not essential for operations.
-	Process/Electrical	Process/Electrical	Switch pipe upstream of grit votexes from SCH 40 SS to SCH 10 SS	Aya/Matt	Approved	may impact long term design life due to thinner pipe
-	Process/Electrical	Process/Electrical	eliminate backup power for the following systems: digesters, dewatering	Aya/Matt	Approved	will not impact effluent quality of the digester or dewatering systems are offline during a power outage.
DM2	Structural/Building	All PITs	Pre eng vs tilt up building	Aya/Ali	Approved	see DM2 sheet

FVRD Cultus Lake Wastewater Treatment Plant
Potential Cost Savings Ideas

Description	PIT Responsible	Comments	Pursuit Further (Yes /No)	Decision Date	CBA/DM or Decision Log	Cost Savings Potential ($, $$, $$$) $: <10,000 $$: 10-100K $$$: >100K	Design Rework Effort ($, $$, $$$) $: <10K $$: 10-50K $$$: >50K	Priority Score (1, 2, 3) Priority 1 - Savings $$$, Effort $ (or 0); Priority 2 - Savings $$$ Effort $$ or Savings $$ Effort $ (or 0), Prioirty 3 Savings $$ Effort $$,
EFFLUENT QUALITY	-	-	-	-	-	-	-	-
Is Ground Disposal/Class A a must?	Process/Electrical	Optimize. Came from LWM Plan from community. Probably locked in	No	03/02/2023	-	0	0	-
	-	-	-	-	-	-	-	4
GENERAL BUILDING (contructuion material, roof, flooring, interior finishes)	-	-	-	-	-	-	-	**4**
Flat roof/Q deck with insulation and awning.	Structural/building	*if go with flat roof, don't need awning adder on east side of building. Would also help to eliminate overall height.	Yes	03/02/2023	DL (check with architect)	$$	$	2
reduce height to two levels by removing dewatering room and admin room mezzanine. AND common roof height.	Structural/building	*consider delete admin area	Yes	03/02/2023	DM1	$$$	$$	2
insulated metal panels for building	Structural/building	*poor interior finish, but can use plywood *$35-45/ft2 *if go with this, need full stuctural steel. so need structural design. **to be a CBA	-	-	-	$$	$$	3
delete plywood interior finishing	Structural/building	*removal of this. leave as exposed metal decking or concrete. Review headworks - at minimum remove from non-hazardous areas	Yes	03/02/2023	DM2	$$	$	2
use drywall for roofing membrane instead of plywood.	Structural/building	-	yes	03/02/2023	DM2	$	$	3
changing interior walls to painted steel stud plywood	Structural/building	*need to understand rating requirements before this change is made. *$ effort if not load bearing	yes	03/02/2023	DM2	$$	$	2
can we remove wall between odour control room and headworks?	Structural/building	No, rooms have different classification.	No	2023-03-02	-	$$	-	4
make squares/rectangles where can (for ex. make electrical/mechcanical room aerea wider to be flush with NaOH room width).	Structural/building	*electrical room likely needs to be increased anyways.	yes	03/02/2023	DM1	$	$	3
finished concrete floors with membrane in containment areas only	Structural/building	-	No	-	-	$$	0	2
only paint admin area. everything else left not painted.	Structural/building	*if deleting admin area in headworks building, then this is not relevant.	-	-	-	$$	0	2
Open building portions where enclosure not needed.	Structural/building	*operator preference	NO	-	-	0	0	-
Reduce building height	Structural/building	To minimum clearances required by code (cable tray 300mm) *can save ~$10,000/ft in height reduction; see #14	yes	03/02/2023	DM1	$$	$	2
Architectural is calling up a waterproof membrane on inside of structure (refers to tanks). Change to concrete add mixture.	Structural/building	*run by structural eng *not currently in estimate	Yes	-	DL(talk to structural)	$$	0	2
change door from coil up to standard overhead door.	Structural/building	*look at this on a door by door basis	-	-	-	$$	0	2
delete rain water leader and just go to splash pads	Structural/building	-	No	-	-	$$	0	2
Is a perimeter drain required?	Structural/building	*question for structural	-	-	-	$$	0	2
	-	-	-	-	-	-	-	4
GENERAL CONSTRUCTION	-	-	-	-	-	-	-	**4**
Hydrostatic testing sequence given tanks at different height	Structural/building	Optimize to prevent delay of backfill	Yes	-	DL	$	0	3
simplify backfill requirements with changes to structure foundations	Structural/building	-	yes	-	DL	$	0	3
	-	-	-	-	-	-	-	4
HEADWORKS ROOM	-	-	-	-	-	-	-	**4**

Move headworks outdoors with a cover. -including automatic bagging system on screenings and dewatered grit augers (for odour control), and covered bins. -include cold weather protection packages (by veolia) for screens. -include cold weather protection packages (by veolia) for cyclone auger. -grit vortex to include elevated walkway and grit pump encasment heater options from Veolia. -eliminates foul air piping draw from entire headworks room. -include odour control connections option on screen, grit classifier and grit cyclone (could be connected to odour control now or in the future, depending on FVRD preference).	Structural/building	potential cons: -this option would result in more underground piping, and insulation for any aboveground process piping. -increased odour potential	No (because of security concerns) No (practicality and operations will not work)	03/02/2023	-	$$$	$$	2
Headworks - Alternate by pass piping option arrangement?	Process/electrical	Rearrange by pass piping arrangement to reduce pipe runs	Yes	03/02/2023	DM3	$$	$$	3
Simplify headworks - combine manual screen and weir	Process/electrical	Pg. I-110	No	03/02/2023	-	$	$	3
Simply piping into headworks - piping efficiency sizes etc	Process/electrical	Have a look at the piping sizing/routing/ schedule etc.	Yes	03/02/2023	DM3	$$	$$	3
Odour control in optimize	Process/electrical	Optimize blower piping arrangement as well; Determine air exchange requirements	Yes	03/02/2023	DM4	$$$	$$	2
Review piping sizes headworks - common sizes as possible	Process/electrical	-	Yes	03/02/2023	DM3	$$	$	2
SRS piping to SBR. Can this been a single run out and then a header inside the SBR? Instead of running individual pipes? Use the pre-react zone as a splitter?	Process/Electrical	Redesign the headworks headers to outside w/ splitter box	Yes	03/02/2023	DM3	$$$	$$	2
Can we delete T-1000?	Process/electrical	Can't delete but can be modified	No	03/02/2023	-	$	$	3
FOA piping in the headworks	Process/Electrical	minimize FOA piping; pulling off equipment instead of the room. To confirm	Yes	03/02/2023	DM4	$$	$	2
-	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
ADMIN ROOM	-	-	-	-	-	-	-	**4**
Washroom x1 only	Structural/building	*unisex washroom ok	yes	03/02/2023	DM1	$	$	3
reduce admin area and move into electrical room	Structural/building	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
ODOR CONTROL ROOM	-	-	-	-	-	-	-	**4**
Differ odour control carbon scrubber and use a biofilter	Process/Electrical	*activated carbon scrubber is already purchased	No	-	-	-	-	4
Review odour control foul air volume exchange	Process/Electrical	see line 37; consider review as a complete package	yes	03/02/2023	DM4	$$	$	2
Piping optimization FOA	Process/Electrical	-	yes	03/02/2023	DM4	$$	$	2
	-	-	-	-	-	-	-	4
pH CONTROL ROOM (NaOH)	-	-	-	-	-	-	-	**4**
consider deferring actual install of tank to future phase. with totes in phase 1. (NaOH)	Structural/building	*need to confirm tote volumes ok with process team *could defer tank to future - possibly use totes for now *operators are happy with totes.	yes	03/02/2023	DM5	$$	$	2
remove rating on room?	Structural/building	*cannor remove rating because of H2 gas concerns.	No	-	-	0	0	-
remove sump area/sunken base	Structural/building	totes or containment curbs	yes	03/02/2023	DM1	$	$	3
Move NaOH tank to west side of building (near planned sludge tank)	Structural/building	*would help with electrical cable tray length	yes	03/02/2023	DM1	$$	$	2
	-	-	-	-	-	-	-	4
DEWATERING ROOM	-	-	-	-	-	-	-	**4**
attempt to remove mezzanine to reduce number of floors in dewatering room to 1. (in this case centrifuge would be on first floor) may result in centrate not being able to gravity flow back to headworks. Convey centrate from centrfuges to sanitary pump station located in headworks building.	Structural/building	*see item in building section	-	-	-	0	0	-
move biosolids bins outside of dewatering room to make room for centrifuges on one level? (would need to check that there is sufficient area outside)	Structural/building	*odour is an issue	No	-	-	0	0	-
Explore switching from Geotubes instead of centrifuge	Process/electrical	need to explore; remove	No	03/02/2023	-	0	0	-
SLUDGE DAY TANK	-	-	-	-	-	-	-	**4**
consider reducing size and using fiberglass or steel pre-fab tank for sludge day tank instead of concrete	Structural/building	refer to Process PIT comments re: daytank deletion	yes	03/02/2023	DM6	$$	$	2
Change digester operations and relocate outlets; remove daytank P250. -> opereation will be turn off air and mix only; remove piping related. 1 pump only. Cutback on south stairway and relocate valves	Process/electrical	Reroute outlets to reduce piping. Operations will be turn off air and mix only; remove overflows; 4 pumps only. Cutback on south walkway;	Yes	03/02/2023	DM7	$$$	$$	2
Can the sludge day tank be incorporated into the digester structure?	Process/Electrical	-	Yes	03/02/2023	DM6	$	$$	4
	-	-	-	-	-	-	-	4
BLOWER ROOM	-	-	-	-	-	-	-	**4**

consider using Aerzen blowers that are front opening and don't require space between blowers for removal. In this case the blower building could be shortened.	Structural/building	*blowers have already been purchased. Dave checking if blowers are front opening. *may not make a significant difference because of orientation of blowers. *may not be worth it to move blowers closer toegther to reduce size of building in E-W direction (want flush with odour control room) *Atlas Copco blowers require 1 m on either side for maintenance	No. blowers already purchased.	-	-	0	0	-
consider outdoor installation of blowers. This would eliminate significant amount of building area for phase 1 and future phases. In this case would need a cover.	Structural/building	*operations team wants no outdoor equipment	No	-	-	0	0	-
reduce size blower room (area for phase 2 blowers)	Structural/building	-	yes	03/02/2023	DM1	$$	$	2
Vibration isolation for centrifuges	Structural/building	Added value discussion.	yes	03/02/2023	DL	0	0	-
fewer blowers - 5 blowers vs 4 blowers	Process/electrical	4 duty fans and 1 stand by base design.	No. blowers already purchased	03/02/2023	-	$	$	3
move blowers to shorten buildings and pipe runs	Process/electrical	Pipe fittings optimization for efficiencies	Yes	03/02/2023	DM1	$$	$	2
move blower room and tie into the UV disinfection room/ filter bldg	Process/electrical	Reduce the pipe runs	No	2023-03-07	DM1	$$	$$	3
move blower room to filter building	-	*would need to be built to be expandable for phase 2 *reduce pipe runs	-	-	-	$$	$$	3
	-	-	-	-	-	-	-	4
SBR	-	-	-	-	-	-	-	**4**
consider having only 1 common WAS pipe to digester, fed from two WAS pumps. This assumes WAS would be removed from one SBR at a time since WAS pumps have already been purchased. Or were 2 lines included for redundancy and this cannot be changed?	Process/electrical	-	No	03/02/2023	-	$	$	3
can cover and odour control for pre-react zone be removed?	Structural/building	*this will lead to increased odour control issues *CBA required for this.	No	03/02/2023	-	$$	$	2
manifold from splitter box outside to eliminate pipe penetrations?	Structural/building	*taken care of by process.	-	-	-	0	0	-
Combined PA line to digesters, split at tank. Currently separate lines right from blowers	Process/electrical	Not a priority	No	03/02/2023	-	$$	$	2
OF piping off SBR could be optimized.	Process/Electrical	*could save a lot of piping from the southernmost reactor. May need to upsize overflow in northernmost reactor to account for overflow from both reactors (worst case scenario) *decanter discharges to equilization tank, whereas overflow bypasses rest of treatment system and discharges directly to the RIBs by entering SBR effluent line downstream of connection to equilization tank.	Yes	03/02/2023	DM3	$$	$	2
100 PA SS SCH10 in SBR. Could change the legs to PVC?	Process/Electrical	Switch at water line *PVC is likely not a good idea due to PVC not being entirely chemically resistant to sodium hydroxide, which will be dose at the splitter box	Yes	03/02/2023	DM3	$	$	3
Review SBR walkways and MSC Metals	Structural/building	-	yes	03/02/2023	DL	$$	$	2
SBR piping in the middle of the top of wall/slab joint	Structural/building	refer to Process PIT - SBR Review	Yes	03/02/2023	DM3	$$	$	2
sch 10 SBR piping	Process/electrical	-	Yes	03/02/2023	DM3	$	$	3
	-	-	-	-	-	-	-	4
AEROBIC DIGESTER (and site)	-	-	-	-	-	-	-	**4**
consider packaged lift station for waste return wet well	Structural/building	*may not result in much cost reduction due to shared wall with aerobic digester	No	03/02/2023	-	$	$	3
Delete flow meter chamber by incoporating into upstream valve chamber or in headworks building	Structural/building	-	Yes	-	DM3	$	0	3
filter reject goes straight to digester?	Process/electrical	-	Yes	03/02/2023	DM3	$	$	3
Simplify Digester/West Piping as a system	Process/Electrical	Supernatant valve manholes. Delete and pipe directly into the RIB sump. I'm assuming these are only there for the manholes. Delete valve boxes and put valves up on slab? Do things freeze in cultus lake? Or atleast optimize depth so it's not a confined space.	Yes	03/02/2023	DM7	$$	$	2
Move Tank next to	-	-	-	-	-	-	-	4

-	-	-	-	-	-	-	-	4
PAVING	-	-	-	-	-	-	-	**4**
delete all asphalt and just include 3m wide concrete pads at front of building and doors. concrete sidewalk deleted.	Structural/building	*270K for all pavement currently	Yes	03/02/2023	DL	$$$	$	1
-	-	-	-	-	-	-	-	4
FILTER BUILDING	-	-	-	-	-	-	-	**4**
Storage of re-use water tank in above ground poly tank (instead of belowground concrete)	Process/Electrical	-	No (its impractical)	03/02/2023	-	$	$	3
redesign depth of footings	Structural/building	*leave for now	No	-	-	0	0	-
finished concrete instead of epoxy coating flooring	Structural/building	-	-	-	-	0	0	-
building structure type	Structural/building	*see above general building	-	-	-	0	0	-
eliminate some overhead doors	Structural/building	*see above general building	-	-	-	0	0	-
revisit roofing material (currently shingles). change to metal roofing.	Structural/building	*see above general building	-	-	-	0	0	-
Eliminate all process piping and houskeeping pads for future filter polymer dosing system from scope of work	Structural/building	*design drawings note that polymer system may be required if effluent quality cannot be achieved without polymer	-	-	-	$	0	3
filter efficiencies and function? Maybe we can delete some	Process/electrical	less filter	No(operations requirement)	03/02/2023	-	$	$	3
delete polymer chemical system P&ID - reflected on the drawings already	Process/electrical	only required in this phase	No	03/02/2023	-	$	$	3
remove filtrate backwash pumps	Process/electrical	-	No	03/02/2023	-	$	$	3
3 vs 2 submersible pumps (for equilization tank)	Process/electrical	all 3 required; we need all the turndowns	No	03/02/2023	-	$	$	3
use municipal potable water instead of re-use system	Process/Electrical	High priority review Process piping; remove 2 pumps; remove chamber; remove hypo system; remove filter; remove valves - Structure to add Permitting will be better get rid of pressure tanks as well	Yes	03/02/2023	DL	$$$	$	1
Is there other uses for reuse water? Can it be sold to golf course for irrigation	Process/Electrical	Impact on operating plan and permit. Nice to have if possible	No	03/02/2023	-	$$	$$	3
Any reason why the buildings are separate? Could remove a lot of the yard piping between SBRs and EQ tank if they were connected.	Structural/building	Future phase considerations. Access for vehicles for loading. Seismic considerations important. *would need to talk to structural (may be a seismic consideration)	No	-	-	$$$	$$$	4
Flatten bottom slab and bench in EQ tank. Reduce elevation and increase size for unused portion. Reduce building size likely possible	Structural/building	*more of a constructuability issue	Yes	03/02/2023	DM1	$	$	3
Filter inlet piping is 150 PVC SCH80 but the OF piping is stainless? Can the OF piping be PVC as well	Process/Electrical	-	no	03/02/2023	-	$	$	3
EQ Tank OF noted SCH 40. Can this be SCH 10 or PVC?	Process/Electrical	-	yes	03/02/2023	DM3	$	$	3
With removing the EQ tank under the Filtration Bldg, can bldg be woodframe?	Structural/building	**Woodframe/Pre-Eng**	-	-	-	-	-	**4**
-	-	-	-	-	-	-	-	**4**
-	-	-	-	-	-	-	-	**4**
ELECTRICAL ROOM	-	-	-	-	-	-	-	**4**
close in electrical room to eliminate fire rating of staircase.	Structural/building	*ignore if delete second floor of headworks building.	yes	03/02/2023	DM1	$	$	3
consider combining electrical and mechnical rooms, and combine with admin room	Structural/building	-	yes	03/02/2023	DM1	$$	$	2
consider moving electrical room closer to blowers	Structural/building	*not ideal because farther from electrical service	No	-	-	0	0	-
Confirm electrical loads for generator sizing - what actually requires backup power during an emergency?	Process/electrical	Currently Plant is sized for Phase 1 and 2;	Yes	03/02/2023	DL	$$	$	2
Combine electrical rooms (headworks and filter building) - move headworks electrical to filter building?	Structural/building	*more loads near headworks so must be here.	No	-	-	0	0	-
More widows vs light?	Structural/building	windows will add expense compared to operating LEDs over long term.	No	-	-	0	0	-
Electrical Optimization Overall	Process/electrical	Cable Tray optimization	Yes	03/02/2023	DL	$$	$	2
-	-	-	-	-	-	-	-	4
-	-	-	-	-	-	-	-	4
MECHANICAL/PLUMBING	-	-	-	-	-	-	-	**4**
Consider ducting blower room air to odour and headworks building. otherwise just heating the outside air.	Structural/building	*for heat recovery off of blowers.	No	-	-	0	0	-

gas heating for all non-classified areas.	Structural/building	*mainly for operating costs. would likely also be cheaper to purchase. *should look at efficiency	Yes	03/02/2023	DM8	$	$	3
Consider using gas unit heaters instead of electric baseboard heaters	Structural/building	*also operating costs to consider	Yes	03/02/2023	DM8	$	$	3
Consider using heat trace on pipes instead of forced air electric heaters	Structural/building	*concerns with rooms that are changing air 12x/hr *question for mechanical engineer	Yes	03/02/2023	DM8	$$	$	2
Duct sizing control - reduce the exchange - minimize the volume of foul air by enclosing areas	Process/electrical	-	-	-	-	0	0	-
Can we remove equipment requires natural gas	Process/electrical	-	No	03/02/2023	-	$	$	3
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
GENERAL PROCESS PIPING AND VALVES	-	-	-	-	-	-	-	**4**
Vendor suggested valves procurement rather than pricing what is specified	Process/electrical	-	yes	03/02/2023	DL	$$	**$**	**2**
Pipe thickness	Process/electrical	-	yes	03/02/2023	DM3	$$	**$**	**2**
Expansion joints efficiencies	Process/electrical	-	yes	03/02/2023	DM3	$$	**$**	**2**
Are we insulating PA lines? Optimization of heat trace requirements.	Process/Electrical	-	yes	03/02/2023	DM3	$	$	3
potable water run efficiencies	-	-	**yes**	-	DM3	-	-	**4**
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
YARD PIPING	-	-	-	-	-	-	-	**4**
Piping size optimization to common pipe sizes	Process/Electrical	avoid non standard sizes that have lead time or pricing increases	Yes	03/02/203	DM3	$	$	3
recommend a session to reduce the qty of yard piping	Process/Electrical	-	yes	03/02/2023	DM3	$$	$	2
	-	-	-	-	-	-	-	4
	-	-	-	-	-	-	-	4
INSTRUMENTATION	-	-	-	-	-	-	-	**4**
optimize instrumentation headworks	Process/Electrical	-	no	03/02/2023	-	$	**$**	**3**
								-
Remove NaOH Room	Structural/building	*electrical room likely needs to be increased anyways.	No	03/02/2023	DM1	$	$	3

Appendix C

Assumptions Log

Cultus Lake IPD Project - Assumption Log

Assumption Log Version: 2023/04/24

Number	Topic	Assumption	Notes
1	P/E PIT	Electrical Assumption - For BC Hydro works, Omni is to complete ducting, direct placing of pad and vault. FVRD to complete earthworks	
2	PMT	Warranty. General 1 year warranty described in Validation report. Clarifications provided that warranty on FVRD purchased equipment will be likely expired prior to project completion	
3	Owners PIT	Assume FVRD to self-perform earthworks, yard piping install (PVC, HDPE, and manholes), also remove asphalt placing shown on drawings. Assumed savings approximately $250,000.00	
4	Owners PIT	Supply of Superintendent truck costs including mileage, gas to be supplied by FVRD. Abstract to provide to FVRD.	
5	Owners PIT	Silt Fencing and Temporary Dewatering in the hole removed from the Estimate. FVRD to supply dewatering pumps	
6	Owners PIT	Fencing chainlink can be just galvanized instead of black powder coated fencing	
7	~~Owners PIT~~	~~Remove overhead and ICL on the procurement of the equipment. No contract or procurement going through Chandos. Therefore, no overhead procurement.~~	Cost savings were found to allow this to remain.
8	Procurement PIT	FVRD to cover costs for any Development and Building permits requirements. Costs outside of the IPD contract.	
9	Procurement PIT	Laydown area available within the project site	
10	Procurement PIT	Materials for backfill around structures available on site. Only surveyed quantity carried in the estimate. ~4640.25 m3. No import expected for backfill backfill of the filter building, as soil on site suitable for backfilling under tehe filter building.	
11	Procurement PIT	Any Div 12 00 00 Office furnishing to be under FVRD Scope - outside of the IPD contract.	Furnishings.
12	P/E PIT	BC Hydro costs carried in the Validation project $98k and the $34K could be identified in the risk register and take the risk on 25% increase in cost. Based from recent BC Hydro service call out (site location in Chilliwack; with significant scopes of work) that mentioned project came under budget by $25k.	Added to risk register and incorporated in estimate.
13	P/E PIT	Streetlights on site reduced to 2 poles. Site light level or quality will not be impacted. Flood lights will be placed on the main building. FVRD can provide safe access to the site and for traffic on Columbia Road.	
14	P/E PIT	Building chemical or air quality analyzers allowed in the Electrical budget: Supply and install air pressure, CH4, H2S air quality analyzers 2 per only in the headworks area.	
15	P/E PIT	Local LCPs and devices such as floats, level detection/ flow volume meters, solid analyzers and injection systems per P&ID drawings are supplied by vendors. OMNI only carried supply and install of main dewatering and filter building PLCs.	
16	P/E PIT	For cost effectiveness and flexibility of supplier leadtime, alternate use of PLCs/VFDs and other electrical devices to be given consideration.	
17	P/E PIT	Equipment received per the materials equipment list provided by FVRD during Validation assumed to be in good condition and ready for install (ie do not require major refurbish or replacement). Refer to the equipment list In general, equipment received are the following: - SBR - UV Disinfection - Digester Aeration Equipment - Sludge Tank Mixing - Odour Control	Minor refurbishment/repair costs have been considered in the Risk Register. Costs for major repairs or replacements exceeding the associated risk register line items are outside of the IPD contract.
18	P/E PIT	Source of seeded effluent can be obtained from existing and nearby communities.	
19	P/E and Procurement PIT	Construction duration 65 weeks based from equipment leadtimes; General Conditions costs based from 65 weeks construction. Commissioning period will be supported by FVRD staff and is estimated at 7 weeks. Allowed Part-time GC to support commissioning Support from Chandos for only 6 weeks.	
20	P/E and Procurement PIT	Assumed production of pre-cast panels based from shop time/availability - from reviewed submittals to delivery to site (coming from Agassiz, BC) aproximately 20 weeks.	
21	Procurement PIT	FVRD district not PST exempt.	
22	Procurement PIT	Utilities (construction water, temp construction water, FVRD can supply or avail to the project team. No costs carried for any works related to temp utilities during construction)	
23	Procurement PIT	Assumed permanent fencing to be installed early in lieu of renting temporary fencing to delineate site.	
24	P/E PIT	Assumed no futher works required in relation to tie into the existing septic field or decommissioning septic field.	Field to remain in service.
25	All PIT	Previous equipment package cancellation allowed at $25,000 costs to deal with administrative work, mainly shop drawings production. Headworks and Filter Euquipment will be re-tendered.	Costs beyond the $25,000 related to the cancellation of the previous vendor purchase agreement are outside the provisions of this IPD agreement.
26	All PIT	Inflation capped at 5% for labour.	
27	All PIT	Allowed Part-time GC to support commissioning Support from Chandos for only 6 weeks.	
28	All PIT	Allowed 6 weeks for detailed design after council approval	
29	All PIT	No Remediation required for initial bearing inspections at SBR raft slab	Soil is well drained and should not cause significant weather delays during construction
30	Buildings PIT	SBR construction and hydrotesting to be prioritized before winter months to reduce heating and hoarding costs.	
31	Buildings PIT	2 weeks shutdown during Christmas built in the schedule	
32	Buildings PIT	Plywood layer beneath steel truss system in the Headworks building can be reduced.	Required in some areas to prevent corrosion - less costly than steel coatings.
33	P/E PIT	Electrical Service to WWTP sized to Phase III	Difference of upsizing the kVA negligable on cost. Sizing for futrue now is more cost effective as we avoid Hydro rewiring and switching existing kVA.
34	P/E PIT	Equipment selection was based from FRVD's preference, balance beween cost effective and lifecycle costs for overall buildout	
35	P/E PIT	PLC brand IPD team is carrying has 36 weeks leadtime	Further discussion with Electrical EOR to consider alterantives for better leadtime
36	P/E PIT	Location and size requirements per the issued drawings are acceptable to BC Hydro	
37	All PIT	$100k in project cost savings can be realized through FVRD negotiations or modification to equipment supply agreements.	
38	All PIT	Vendors enganged during validation are willing to enter contracts post contract signing.	
39	All PIT	Inflation risk from date of signing to the execution of subcontractor agreements to 5%. Any inflation costs beyond will be outside of the IPD contract.	
40	All PIT	Chandos Construction will not require any Performance and Labour Bonding as part of the poly party/IPD team. Subtrades to provide bonding.	
41	All PIT	All approvals and permitting from FVRD (building permit), MOE (MWR) will be otained so as not to delay the project.	
42	Procurement PIT	Waste bins for centrifuge solids disposal are not included in the estimate.	

Appendix D

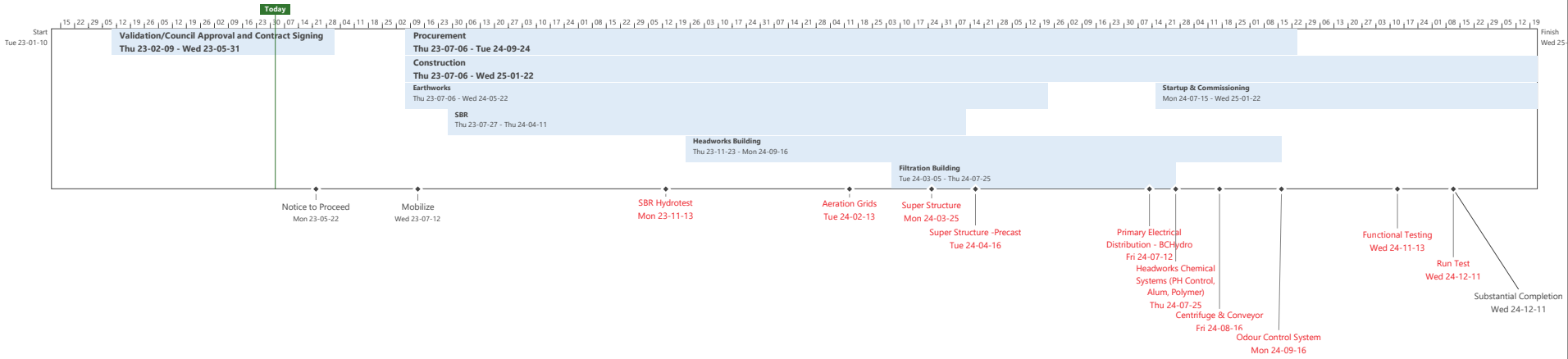
Base Target Cost Supporting Estimate

Project: Cultus Lake WWTP IPD
Owner: Fraser Valley Regional District
Prime Consultant: Urban Systems
Estimate: Validation: Base Target Cost

Description	QUAN.	UOM	Cost
Procurement and Contracting Requirements	1	LS	$ 596,939
General Requirements	1	LS	$ 1,547,469
Concrete	1	LS	$ 2,588,538
Metals	1	LS	$ 514,172
Wood, Plastics and Composites	1	LS	$ 104,800
Thermal and Moisture Protection	1	LS	$ 147,228
Openings	1	LS	$ 141,374
Finishes	1	LS	$ 188,730
Equipment	1	LS	$ 2,466,152
Plumbing	1	LS	$ 1,433,063
Electrical	1	LS	$ 1,455,974
Earthwork	1	LS	$ 106,030
Exterior Improvements	1	LS	$ 170,493
Utilities	1	LS	$ 384,656
Material Processing and Handling Equipment	1	LS	$ 9,473
Subtotal	**1**	**LS**	**$ 11,855,091**
Urban Systems: Overhead, Lab, Sub-consultant & disbursements	1	LS	$ 846,413
Chandos Overhead	1	LS	$ 678,802
PST (7%)	1	LS	$ 262,970
Urban System Profit at Risk	1	LS	$ 32,677
Chandos ICL	1	LS	$ 323,619
Risk Register	1	LS	$ 398,988
Subtotal	**1**	**LS**	**$ 2,543,469**
Total Estimate	**1**	**LS**	**$ 14,398,560**

Appendix E

Validation Construction Schedule

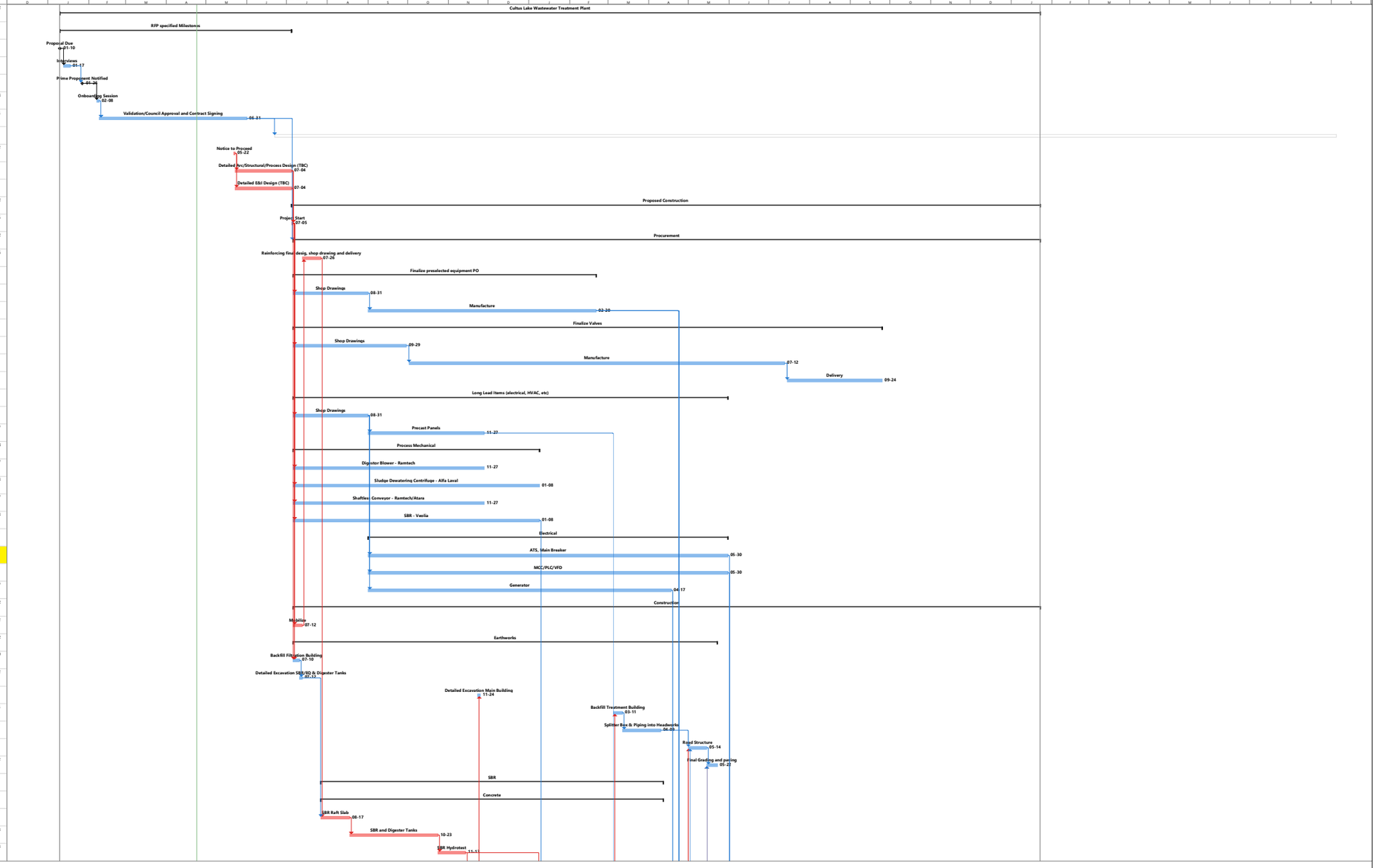


CHANDOS

Cultus Lake Wastewater Treatment Plant

Mon 23-04-24

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Cultus Lake Wastewater Treatment Plant**	**500 days?**	**Tue 23-01-10**	**Wed 25-01-22**
2		**RFP specified Milestones**	**125 days?**	**Tue 23-01-10**	**Tue 23-07-04**
3		Proposal Due	0 days	Tue 23-01-10	Tue 23-01-10
4		Interviews	3 days	Fri 23-01-13	Tue 23-01-17
5		Prime Proponent Notified	0 days	Thu 23-01-26	Thu 23-01-26
6		Onboarding Session	2 days	Tue 23-02-07	Wed 23-02-08
7		Validation/Council Approval and Contract Signing	16 wks	Thu 23-02-09	Wed 23-05-31
8		~~Construction~~	~~13.75 mons~~	~~Thu 23-05-25~~	~~Thu 25-09-04~~
9		Notice to Proceed	1 day?	Mon 23-05-22	Mon 23-05-22
10		*Detailed Arc/Structural/Process Design (TBC)*	*6 wks*	*Tue 23-05-23*	*Tue 23-07-04*
11		*Detailed E&I Design (TBC)*	*6 wks*	*Tue 23-05-23*	*Tue 23-07-04*
12		**Proposed Construction**	**375 days**	**Wed 23-07-05**	**Wed 25-01-22**
13		Project Start	1 day	Wed 23-07-05	Wed 23-07-05
14		**Procurement**	**374 days**	**Thu 23-07-06**	**Wed 25-01-22**
15		Reinforcing final desig, shop drawing and delivery	2 wks	Thu 23-07-13	Wed 23-07-26
16		**Finalize preselected equipment PO**	**150 days**	**Thu 23-07-06**	**Tue 24-02-20**
17		Shop Drawings	8 wks	Thu 23-07-06	Thu 23-08-31
18		Manufacture	22 wks	Fri 23-09-01	Tue 24-02-20
19		**Finalize Valves**	**300 days**	**Thu 23-07-06**	**Tue 24-09-24**
20		Shop Drawings	12 wks	Thu 23-07-06	Fri 23-09-29
21		Manufacture	38 wks	Mon 23-10-02	Fri 24-07-12
22		Delivery	10 wks	Mon 24-07-15	Tue 24-09-24
23		**Long Lead Items (electrical, HVAC, etc)**	**220 days**	**Thu 23-07-06**	**Thu 24-05-30**
24		Shop Drawings	8 wks	Thu 23-07-06	Thu 23-08-31
25		Precast Panels	12 wks	Fri 23-09-01	Mon 23-11-27
26		**Process Mechanical**	**320 days**	**Thu 23-07-06**	**Mon 24-01-08**
27		Digestor Blower - Ramtech	20 wks	Thu 23-07-06	Mon 23-11-27
28		Sludge Dewatering Centrifuge - Alfa Laval	24 wks	Thu 23-07-06	Mon 24-01-08
29		Shaftless Conveyor - Ramtech/Atara	20 wks	Thu 23-07-06	Mon 23-11-27
30		SBR - Veolia	24 wks	Thu 23-07-06	Mon 24-01-08
31		**Electrical**	**180 days**	**Fri 23-09-01**	**Thu 24-05-30**
32		ATS, Main Breaker	36 wks	Fri 23-09-01	Thu 24-05-30
33		MCC/PLC/VFD	36 wks	Fri 23-09-01	Thu 24-05-30
34		Generator	30 wks	Fri 23-09-01	Wed 24-04-17
35		**Construction**	**374 days**	**Thu 23-07-06**	**Wed 25-01-22**
36		Mobilize	5 days	Thu 23-07-06	Wed 23-07-12
37		**Earthworks**	**214 days**	**Thu 23-07-06**	**Wed 24-05-22**
38		Backfill Filtration Building	3 days	Thu 23-07-06	Mon 23-07-10
39		Detailed Excavation SBR/EQ & Digester Tanks	2 days	Tue 23-07-11	Wed 23-07-12
40		Detailed Excavation Main Building	2 days	Thu 23-11-23	Fri 23-11-24
41		Backfill Treatment Building	5 days	Tue 24-03-05	Mon 24-03-11
42		Splitter Box & Piping into Headworks	4 wks	Tue 24-03-12	Tue 24-04-09
43		Road Structure	10 days	Wed 24-05-01	Tue 24-05-14
44		Final Grading and paving	5 days	Wed 24-05-15	Wed 24-05-22
45		**SBR**	**171 days**	**Thu 23-07-27**	**Thu 24-04-11**
46		**Concrete**	**171 days**	**Thu 23-07-27**	**Thu 24-04-11**
47		SBR Raft Slab	3 wks	Thu 23-07-27	Thu 23-08-17
48		SBR and Digester Tanks	9 wks	Fri 23-08-18	Mon 23-10-23
49		SBR Hydrotest	3 wks	Tue 23-10-24	Mon 23-11-13

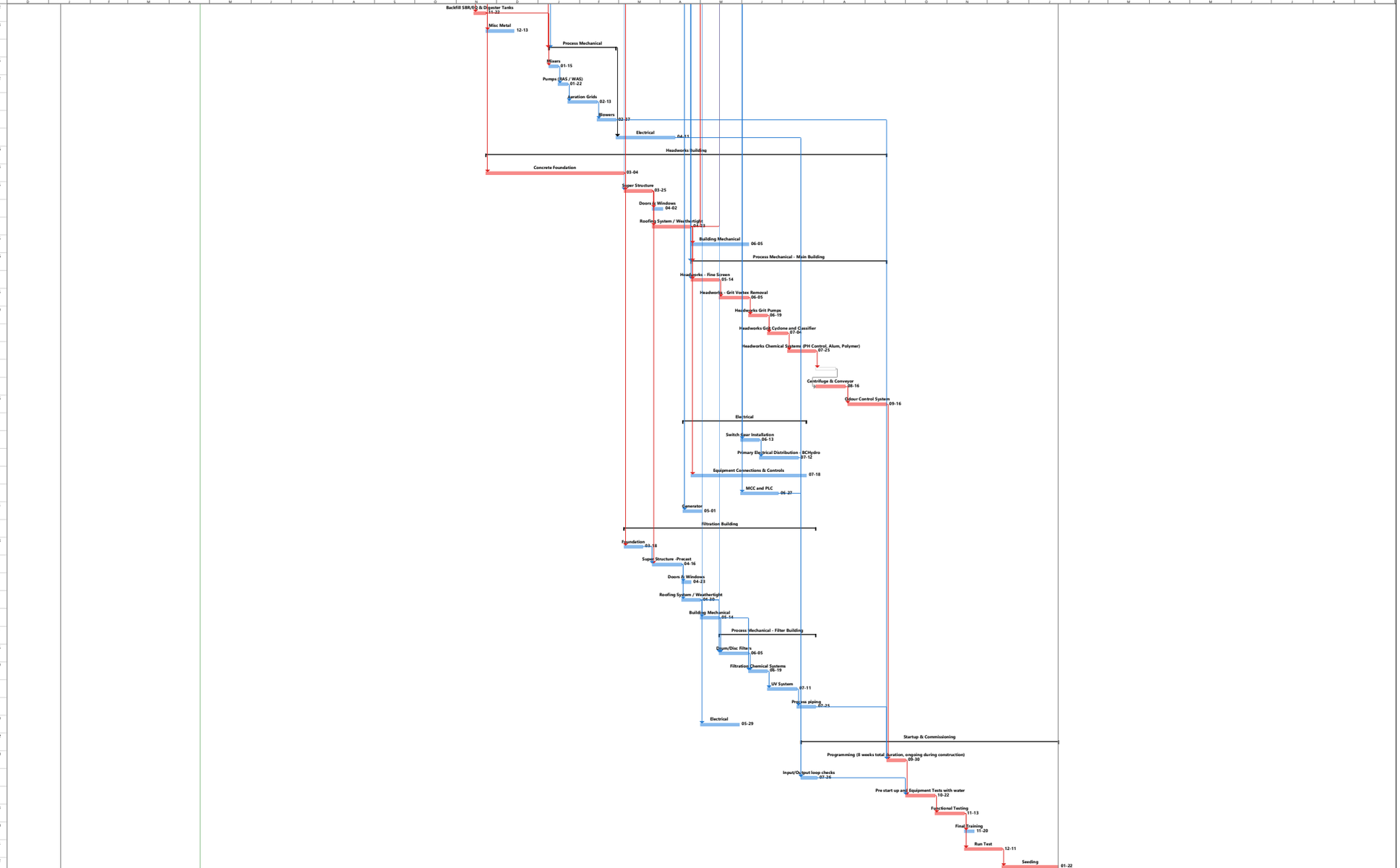


CHANDOS

Cultus Lake Wastewater Treatment Plant

Mon 23-04-24

ID	Task Mode	Task Name	Duration	Start	Finish
50		Backfill SBR/EQ & Digester Tanks	7 days	Tue 23-11-14	Wed 23-11-22
51		Misc Metal	3 wks	Thu 23-11-23	Wed 23-12-13
52		**Process Mechanical**	**35 days**	**Tue 24-01-09**	**Tue 24-02-27**
53		Mixers	1 wk	Tue 24-01-09	Mon 24-01-15
54		Pumps (RAS / WAS)	1 wk	Tue 24-01-16	Mon 24-01-22
55		Aeration Grids	3 wks	Tue 24-01-23	Tue 24-02-13
56		Blowers	2 wks	Wed 24-02-14	Tue 24-02-27
57		Electrical	1 mon	Wed 24-02-28	Thu 24-04-11
58		**Headworks Building**	**197 days**	**Thu 23-11-23**	**Mon 24-09-16**
59		Concrete Foundation	2 mons	Thu 23-11-23	Mon 24-03-04
60		Super Structure	15 days	Tue 24-03-05	Mon 24-03-25
61		Doors & Windows	5 days	Tue 24-03-26	Tue 24-04-02
62		Roofing System / Weathertight	4 wks	Tue 24-03-26	Tue 24-04-23
63		Building Mechanical	6 wks	Wed 24-04-24	Wed 24-06-05
64		**Process Mechanical - Main Building**	**100 days**	**Wed 24-04-24**	**Mon 24-09-16**
65		Headworks - Fine Screen	3 wks	Wed 24-04-24	Tue 24-05-14
66		Headworks - Grit Vortex Removal	3 wks	Wed 24-05-15	Wed 24-06-05
67		Headworks Grit Pumps	2 wks	Thu 24-06-06	Wed 24-06-19
68		Headworks Grit Cyclone and Classifier	2 wks	Thu 24-06-20	Thu 24-07-04
69		Headworks Chemical Systems (PH Control, Alum, Polymer)	3 wks	Fri 24-07-05	Thu 24-07-25
70		~~Sludge Mixing & Pumping~~	~~3 wks~~	~~Fri 24-07-26~~	~~Thu 24-08-08~~
71		Centrifuge & Conveyor	3 wks	Fri 24-07-26	Fri 24-08-16
72		Odour Control System	4 wks	Mon 24-08-19	Mon 24-09-16
73		**Electrical**	**64 days**	**Thu 24-04-18**	**Thu 24-07-18**
74		Switch Gear Installation	2 wks	Fri 24-05-31	Thu 24-06-13
75		Primary Electrical Distribution - BCHydro	4 wks	Fri 24-06-14	Fri 24-07-12
76		Equipment Connections & Controls	12 wks	Wed 24-04-24	Thu 24-07-18
77		MCC and PLC	4 wks	Fri 24-05-31	Thu 24-06-27
78		Generator	2 wks	Thu 24-04-18	Wed 24-05-01
79		**Filtration Building**	**100 days**	**Tue 24-03-05**	**Thu 24-07-25**
80		Foundation	2 wks	Tue 24-03-05	Mon 24-03-18
81		Super Structure -Precast	3 wks	Tue 24-03-26	Tue 24-04-16
82		Doors & Windows	1 wk	Wed 24-04-17	Tue 24-04-23
83		Roofing System / Weathertight	2 wks	Wed 24-04-17	Tue 24-04-30
84		Building Mechanical	2 wks	Wed 24-05-01	Tue 24-05-14
85		**Process Mechanical - Filter Building**	**50 days**	**Wed 24-05-15**	**Thu 24-07-25**
86		Drum/Disc Filters	3 wks	Wed 24-05-15	Wed 24-06-05
87		Filtration Chemical Systems	2 wks	Thu 24-06-06	Wed 24-06-19
88		UV System	3 wks	Thu 24-06-20	Thu 24-07-11
89		Process piping	10 days	Fri 24-07-12	Thu 24-07-25
90		Electrical	4 wks	Wed 24-05-01	Wed 24-05-29
91		***Startup & Commissioning***	***124 days***	***Mon 24-07-15***	***Wed 25-01-22***
92		Programming (8 weeks total duration, ongoing during construction)	2 wks	Tue 24-09-17	Mon 24-09-30
93		Input/Output loop checks	2 wks	Mon 24-07-15	Fri 24-07-26
94		Pre start up and Equipment Tests with water	3 wks	Tue 24-10-01	Tue 24-10-22
95		Functional Testing	3 wks	Wed 24-10-23	Wed 24-11-13
96		Final Training	5 days	Thu 24-11-14	Wed 24-11-20
97		Run Test	4 wks	Thu 24-11-14	Wed 24-12-11
98		Seeding	4 wks	Thu 24-12-12	Wed 25-01-22



Appendix F

Supporting Drawings (Target Value Design)

Fraser Valley Regional District

North Cultus WWTP Target Value Design Changes

Municipal Address: 3720 Columbia Valley Road
Legal Description: Subdivision 9, Section 25, Township 22, New Westminster District

SITE LOCATION
SCALE 1:5000

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DRAWING LIST

PROCESS MECHANICAL

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---- / NORTH CULTUS WWTP TARGET VALUE DESIGN CHANGES / 0999.0069.06 / 2023-04-21

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ACCESSORY

SYMBOL	TAG	DESCRIPTION
	BS-XXXX	BASKET STRAINER (SIDE VIEW)
	BS-XXXX	BASKET STRAINER (TOP VIEW)
	ES-XXXX	EMERGENCY SHOWER AND EYEWASH STATION (SIDE VIEW)
	ES-XXXX	EMERGENCY SHOWER AND EYEWASH STATION (TOP VIEW)
	EJ	EXPANSION JOINT - RUBBER, SINGLE ARCH
		FLANGE - PVC SOCKET
		FLANGE - STEEL SLIP / LAP JOINT
		FLANGE - STEEL WELD NECK
	FD	FLOOR DRAIN - FLUSH MOUNT (SIDE VIEW)
	FD	FLOOR DRAIN - FLUSH MOUNT (TOP VIEW)
	FFD	FLOOR DRAIN - FUNNEL (SIDE VIEW)
	FFD	FLOOR DRAIN - FUNNEL (TOP VIEW)
	GC	GROOVED COUPLING - FLEXIBLE / RIGID
	IQ-XXXX	INJECTION QUILL (SIDE VIEW)
	IQ-XXXX	INJECTION QUILL (TOP VIEW)
		PIPE - END
		PIPE - BREAK / CONTINUATION
		PIPE - PLAIN END TERMINATION
	QC	QUICK CONNECT CONNECTION - MALE
	QC	QUICK CONNECT CONNECTION - FEMALE
	SS	SERVICE SADDLE (SIDE VIEW)
		SERVICE SADDLE (TOP VIEW)
		SOCKOLET (SIDE VIEW)
		SOCKOLET (TOP VIEW)
	SM-XXXX	STATIC MIXER - TUBULAR (SIDE VIEW)
	SM-XXXX	STATIC MIXER - TUBULAR (TOP VIEW)
		THREADOLET (SIDE VIEW)
		THREADOLET (TOP VIEW)
	RC	TRANSITION COUPLING - RESTRAINED
	TC	TRANSITION COUPLING - UNRESTRAINED
	UJ	UNION JOINT
		WELDOLET (SIDE VIEW)
		WELDOLET (TOP VIEW)
	WY-XXXX	WYE STRAINER (SIDE VIEW)
	WY-XXXX	WYE STRAINER (TOP VIEW)
		SAMPLE POINT / DRAIN

VALVE

SYMBOL	TAG	DESCRIPTION
	AR-XXXX	AIR RELEASE VALVE - SMALL PORT (SIDE VIEW)
	AR-XXXX	AIR RELEASE VALVE - SMALL PORT (TOP VIEW)
	ARC-XXXX	AIR RELEASE VALVE - COMBINATION (SIDE VIEW)
	ARC-XXXX	AIR RELEASE VALVE - COMBINATION (TOP VIEW)
	AVC-XXXX	AIR VALVE - CHEM STYLE (SIDE VIEW)
	AVC-XXXX	AIR VALVE - CHEM STYLE (TOP VIEW)
	DC-XXXX	BACK-FLOW PREVENTER - DOUBLE CHECK VALVE ASSEMBLY (SIDE VIEW)
	DC-XXXX	BACK-FLOW PREVENTER - DOUBLE CHECK VALVE ASSEMBLY (TOP VIEW)
	DC-XXXX	BACK-FLOW PREVENTER - REDUCED PRESSURE PRINCIPLE STYLE (SIDE VIEW)
	DC-XXXX	BACK-FLOW PREVENTER - REDUCED PRESSURE PRINCIPLE STYLE (TOP VIEW)
	BL	BALL VALVE - SOCKET, THREADED (SIDE VIEW)
	BL	BALL VALVE - SOCKET, THREADED (TOP VIEW)
	BL	BALL VALVE - FLANGED (SIDE VIEW)
	BL	BALL VALVE - FLANGED (TOP VIEW)
	BV-XXXX	BUTTERFLY VALVE - WAFER / LUGGED (SIDE VIEW)
	BV-XXXX	BUTTERFLY VALVE - WAFER / LUGGED (TOP VIEW)
	CV-XXXX	CHECK VALVE - BALL
	CV-XXXX	CHECK VALVE - DUCK BILL (SIDE VIEW)
	CV-XXXX	CHECK VALVE - DUCK BILL (TOP VIEW)
	CV-XXXX	CHECK VALVE - SWING (SIDE VIEW)
	CV-XXXX	CHECK VALVE - SWING (TOP VIEW)
	CV-XXXX	CHECK VALVE - WAFER
	GV-XXXX	GATE VALVE (SIDE VIEW)
	GV-XXXX	GATE VALVE (TOP VIEW)
	GL-XXXX	GLOBE VALVE (SIDE VIEW)
	GL-XXXX	GLOBE VALVE (TOP VIEW)

VALVE

SYMBOL	TAG	DESCRIPTION
	KV-XXXX	KNIFE GATE VALVE (SIDE VIEW)
	KV-XXXX	KNIFE GATE VALVE (TOP VIEW)
	NV	NEEDLE VALVE (SIDE VIEW)
	NV	NEEDLE VALVE (TOP VIEW)
	PNV-XXXX	PINCH VALVE (SIDE VIEW)
	PNV-XXXX	PINCH VALVE (TOP VIEW)
	PV-XXXX	PLUG VALVE (SIDE VIEW)
	PV-XXXX	PLUG VALVE (TOP VIEW)
	PCV-XXXX	PRESSURE VALVE - GLOBE STYLE SUSTAINING, RELIEF, SURGE, REDUCING (SIDE VIEW)
	PCV-XXXX	PRESSURE VALVE - GLOBE STYLE SUSTAINING, RELIEF, SURGE, REDUCING (TOP VIEW)
	SV-XXXX	SOLENOID VALVE (SIDE VIEW)
	SV-XXXX	SOLENOID VALVE (TOP VIEW)
	VB-XXXX	VACUUM BREAKER VALVE (SIDE VIEW)
	VB-XXXX	VACUUM BREAKER VALVE (TOP VIEW)

VALVE ACTUATOR AND OPERATOR

SYMBOL	DESCRIPTION
	MANUAL GEAR OPERATOR C/W HAND WHEEL (SIDE VIEW)
	MANUAL GEAR OPERATOR C/W HAND WHEEL (TOP VIEW)
	MANUAL OPERATOR C/W LEVER STYLE HANDLE (SIDE VIEW)
	MANUAL OPERATOR C/W LEVER STYLE HANDLE (TOP VIEW)

INSTRUMENTATION

SYMBOL	TAG	DESCRIPTION
	AE-XXXX	ANALYSIS ELEMENT - CHLORINE FREE
	AE-XXXX	ANALYSIS ELEMENT - CHLORINE TOTAL RESIDUAL
	AE-XXXX	ANALYSIS ELEMENT - CONDUCTIVITY
	AE-XXXX	ANALYSIS ELEMENT - PARTICLE
	AE-XXXX	ANALYSIS ELEMENT - PH
	AE-XXXX	ANALYSIS ELEMENT - REDOX
	AE-XXXX	ANALYSIS ELEMENT - TURBIDITY
	AE-XXXX	ANALYSIS ELEMENT - UVT
	FE-XXXX	FLOW ELEMENT - MASS FLOW PROBE
	LE-XXXX	LEVEL ELEMENT
	PE-XXXX	PRESSURE ELEMENT
	TE-XXXX	TEMPERATURE ELEMENT
	FE-XXXX	FLOW METER
	PG-XXXX	PRESSURE GAUGE C/W FEED PIPING AND ISOLATION BALL VALVE (SIDE VIEW)
	PG-XXXX	PRESSURE GAUGE (TOP VIEW)
	RM	ROTAMETER (SIDE VIEW)
	RM	ROTAMETER (TOP VIEW)
FS	FS-XXXX	SWITCH - FLOAT
LS	LS-XXXX	SWITCH - LEVEL
PS	PS-XXXX	SWITCH - PRESSURE
TS	TS-XXXX	SWITCH - TEMPERATURE

LINE TYPE

DESCRIPTION	PROPOSED	EXISTING	FUTURE
COMPONENT OR EQUIPMENT			
CONCRETE STRUCTURES			
LIQUID (OR HGL) LEVEL			
LIQUID LEVEL LOW			
PIPING - AIR (HIGH PRESSURE)			
PIPING - AIR (LOW PRESSURE)			
PIPING - CHEMICAL			
PIPING - DRAIN			
PIPING - WATER (PRIMARY)			
PIPING - WATER (SECONDARY)			
PIPING - WASTEWATER (PRIMARY)			
PIPING - WASTEWATER (SECONDARY)			
PIPING - WASTEWATER (TERTIARY)			
PIPING OR EQUIPMENT CENTERLINE			

REFERENCE SYMBOL

ANNOTATION AND SYMBOLS	DESCRIPTION
X / PXX — PLAN — TITLE — NOT TO SCALE	PLAN TITLE
X / PXX — SECTION — TITLE — NOT TO SCALE	SECTION TITLE, REFERENCE INFORMATION
X / PXX	SECTION INDICATION AND REFERENCE INFORMATION
PLAN — TITLE — NOT TO SCALE	DETAIL TITLE AND REFERENCE INFORMATION
X / PXX	DETAIL INDICATOR AND REFERENCE INFORMATION

ANNOTATION SYMBOL

SYMBOL	DESCRIPTION
ELEV: XXX.XXXm	LIQUID LEVEL OR HGL AT ATMOSPHERIC PRESSURE
	PIPE FLOW DIRECTION ARROW
PIPE INVERT: XXX.XXXm	ELEVATION SECTION MARKER (GEODETIC)

FITTING ID

ABB	DESCRIPTION
BM	BELL MOUTH
CR	CROSS
RE	REDUCER - ECCENTRIC
SR	ELBOW - 90° SHORT RADIUS
TR	TEE - REDUCING
Y	LATERAL

COMMODITY

ABB	DESCRIPTION
CENT	CENTRATE
CIP	CLEAN IN PLACE
COG	COAGULANT (ALUM)
DE	DISINFECTED EFFLUENT
DGS	DIGESTED SLUDGE
DRW	DRAIN (BUILDING FLOOR DRAINS)
FA	FOUL AIR (ODOUR CONTROL)
FSE	FILTERED SECONDARY EFFLUENT
GR	GRIT (DEWATERED)
GS	GRIT SLURRY
HYD	SODIUM HYDROXIDE (NaOH)
HYP	SODIUM HYPOCHLORITE (NaOCL)
IA	INSTRUMENT AIR
ML	MIXED LIQUOR
PA	PROCESS AIR
PE	PRIMARY EFFLUENT
PLY	POLYMER
POT	POTABLE WATER
PY	PRIMARY SCUM
PS	PRIMARY SLUDGE
RAS	RETURN ACTIVATED SLUDGE
REJ	FILTER REJECT (OR CONCENTRATE)
RS	RAW SEWAGE/RAW INFLUENT
RW	RECLAIMED WATER
SAN	SANITARY (BUILDING SEWER)
SE	SECONDARY EFFLUENT
SA	SERVICE AIR
SEP	SEPTAGE RECEIVING
SLD	SLUDGE DEWATERED
SP	PRIMARY SCUM
SRS	SCREENED RAW SEWAGE
SS	SECONDARY SLUDGE
SUP	SUPERNATANT
SW	SERVICE WATER (POTABLE QUALITY)
SY	SECONDARY SCUM
TA	TREATED AIR
TWAS	THICKENED WASTE ACTIVATED SLUDGE
VAC	VACUUM
WAS	WASTE ACTIVATED SLUDGE

PIPE TAG IDENTIFICATION SYSTEM

PIPE MATERIAL

ABB	DESCRIPTION
ABS	ACRYLONITRILE BUTADIENE STYRENE
CPVC	CHLORINATE POLYVINYL CHLORIDE
CS	CARBON STEEL
CU	COPPER
DI	DUCTILE IRON
GLDI	GLASS LINED DUCTILE IRON
HDPE	HIGH DENSITY POLYETHYLENE
PEX	CROSS LINKED POLYETHYLENE
PVC	POLYVINYL CHLORIDE
SS	STAINLESS STEEL
TBG	TUBING
UPVC	UN-PLASTICIZED PVC (DRAIN PIPING)

ABBREVIATION

ABB	DESCRIPTION
AI	ARROW IDENTIFICATION (FLOW ARROW)
CIRC	CIRCULATION
CONT	CONTROL
COND	CONDUCTIVITY
DIA	DIAMETER
DP	DIFFERENTIAL PRESSURE
DEC	DECANT
DF	DRAIN (FLOOR)
DR	DRAIN (PROCESS)
DWG	DRAWING
ELEV	ELEVATION
EQ	EQUALIZATION
HWL	HIGH WATER LEVEL
HHWL	HIGH-HIGH WATER LEVEL
HOA	HAND/OFF/AUTO
HP	HORSE POWER
IND	INDICATE
LWL	LOW WATER LEVEL
LLWL	LOW-LOW WATER LEVEL
MAG	MAGNETIC
MAX	MAXIMUM
MIN	MINIMUM
MS	MOTOR STARTER
O/C	OPEN/CLOSED
OF	OVERFLOW
PLC	PROGRAMMABLE LOGIC CIRCUIT
POS	POSITION
Q	FLOW
REC	RECIRCULATION
SCH	SCHEDULE
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
TURB	TURBIDITY
TYP	TYPICAL
UV	ULTRAVIOLET
UVT	ULTRAVIOLET TRANSMITTANCE
VA	VACUUM
VAC	VOLTS AC
VDC	VOLTS DC
VE	VENTILATION
VFD	VARIABLE FREQUENCY DRIVE
VT	VERTICAL TURBINE PUMP
WTP	WATER TREATMENT PLANT
WWTP	WASTE WATER TREATMENT PLANT

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Professional Seals

#	Date	Issue / Revision	App
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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: S.DODD
Drawn by: MURDO SMITH

North Cultus WWTP Target Value Design Changes

PROCESS LEGEND

Sheet Number: 1 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-001	0

ISSUED FOR INFORMATION

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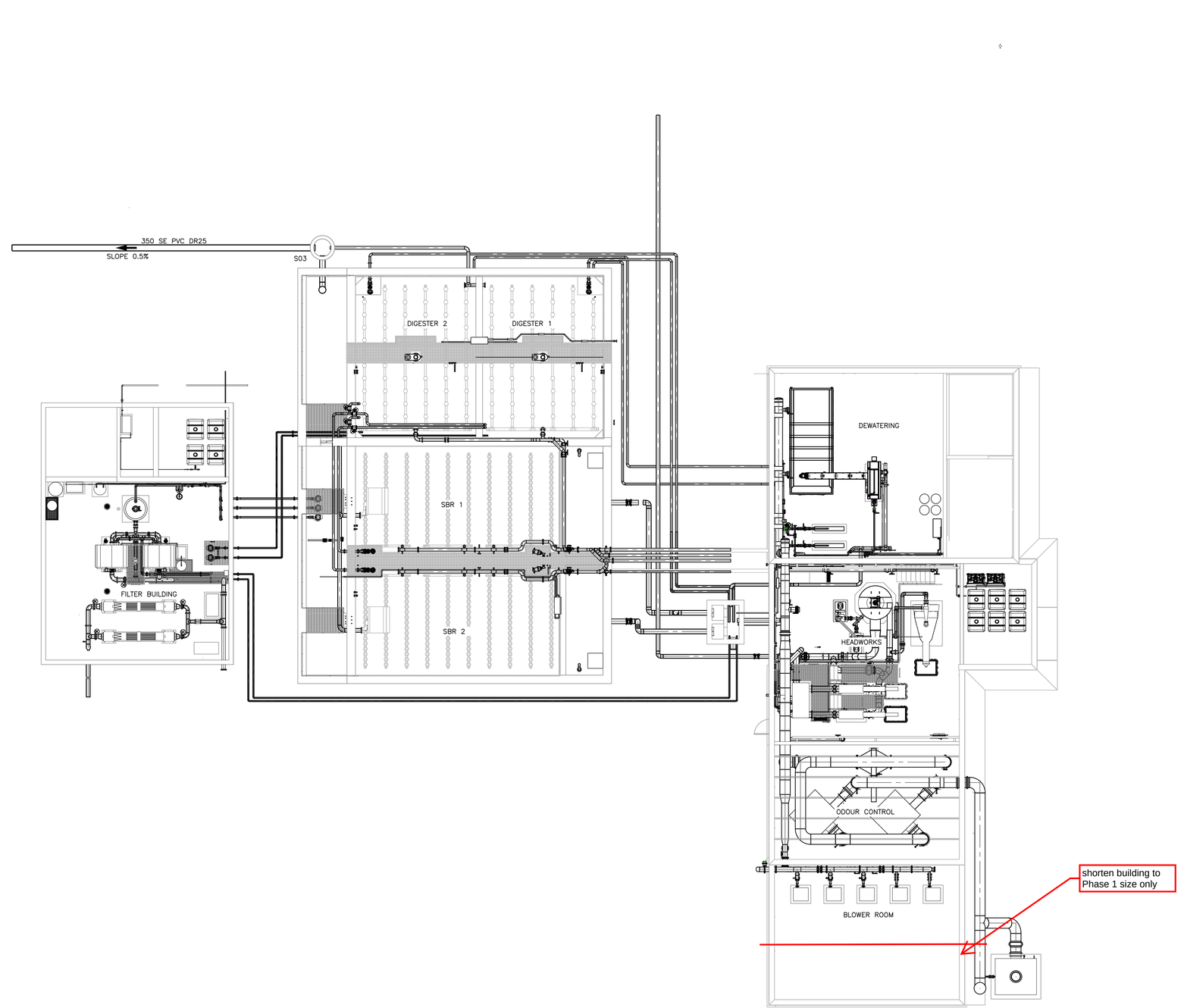

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Fraser Valley Regional District

URBAN systems

Scale NOT TO SCALE

Quality Control by M.BOULANGER
Designed by M. SMITH
Drawn by MURDO SMITH

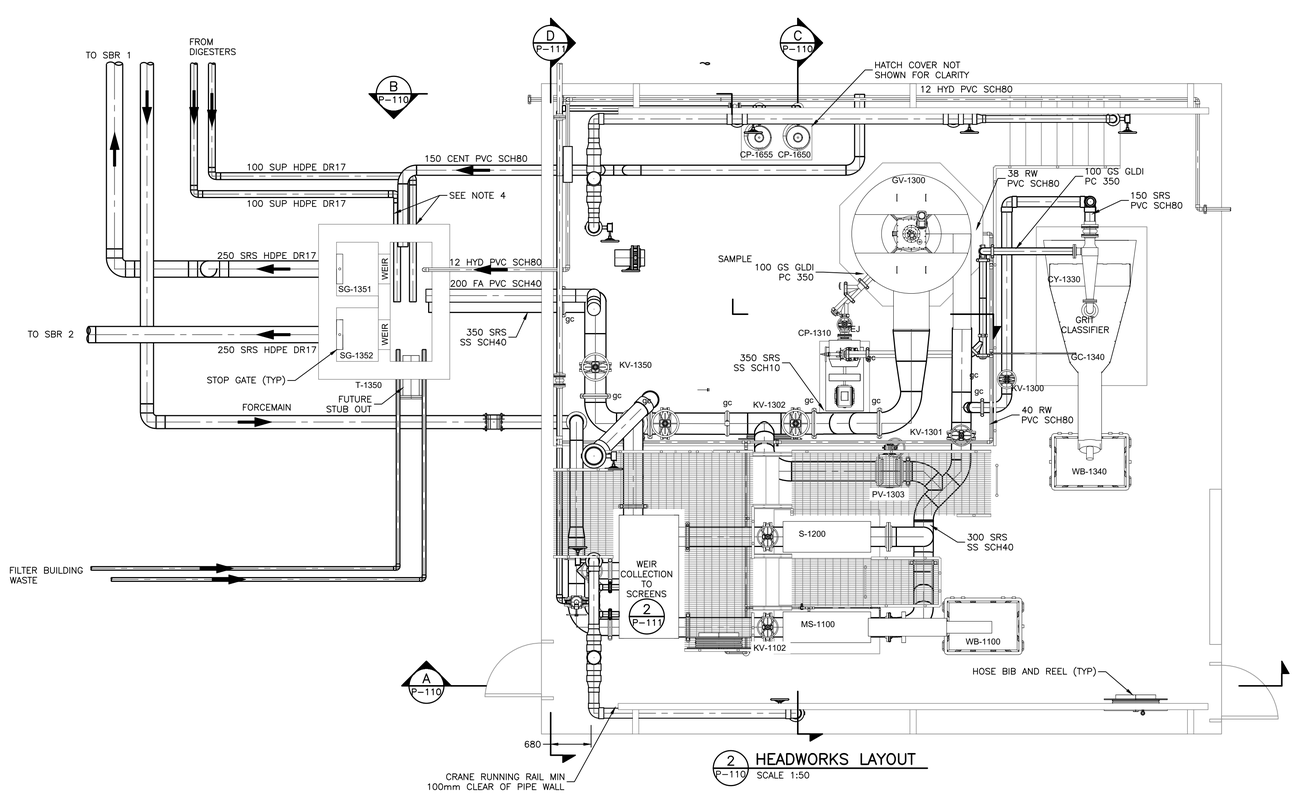
North Cultus WWTP Target Value Design Changes

OVERVIEW

Sheet Number 2 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-100	0

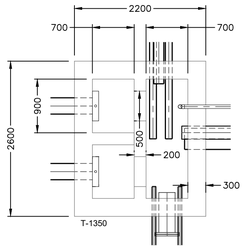
ISSUED FOR INFORMATION



2 HEADWORKS LAYOUT
2 P-110 SCALE 1:50

NOTES:

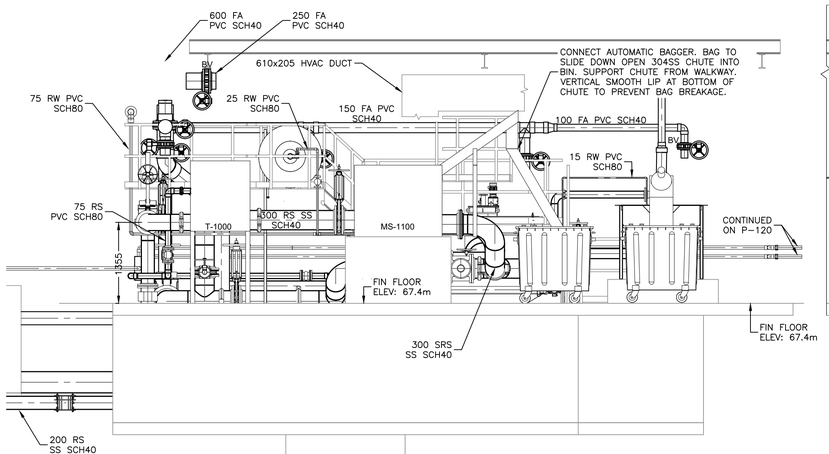
1. HOSEREEL SYMBOL SHOWN IS FOR LOCATION ONLY. HOSEREEL CONSTRUCTION AS PREFERRED BY OWNER.
2. FOUL AIR CONNECTIONS TO EQUIPMENT NOT SHOWN. LOCATE FOUL AIR CONNECTIONS TO EQUIPMENT SO AS TO MINIMISE INTERFERENCE WITH CRANE EQUIPMENT PICKUP. REFER TO DETAIL. SUBMIT ROUTING CONCEPT TO ENGINEER FOR REVIEW PRIOR TO FABRICATION AND INSTALLATION.
3. REFER TO STANDARD DETAILS DRAWING FOR ALL PIPE PENETRATION DETAILS.
4. DIGESTER PIPING TO ENTER SPLITTER BOX ABOVE HWL.
5. ODOUR CONTROL HEADER NOT SHOWN FOR CLARITY.



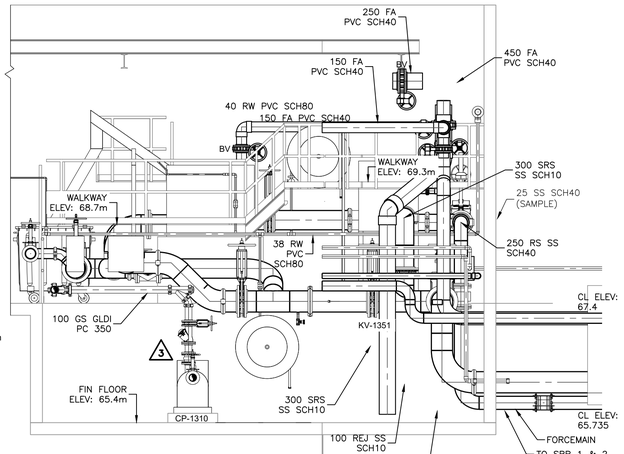
NOTE:

1. 200mm THICK BASE
2. SPLITTER BOX TO BE COVERED WITH GRATING AND RUBBER MAT FOR ODOUR CONTAINMENT

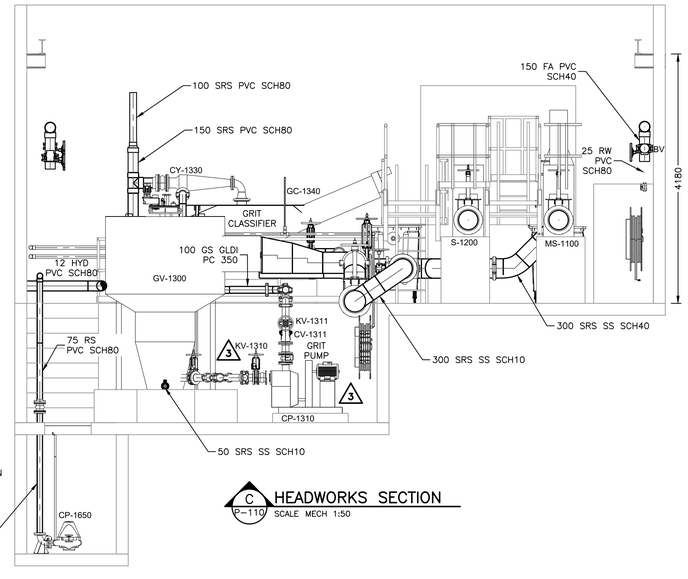
SPLITTER BOX
SCALE 1:50



A HEADWORKS SECTION
A P-110 SCALE MECH 1:50



B HEADWORKS SECTION
B P-110 SCALE MECH 1:50



C HEADWORKS SECTION
C P-110 SCALE MECH 1:50

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: M. SMITH
Drawn by: MURDO SMITH

North Cultus WWTP Target Value Design Changes

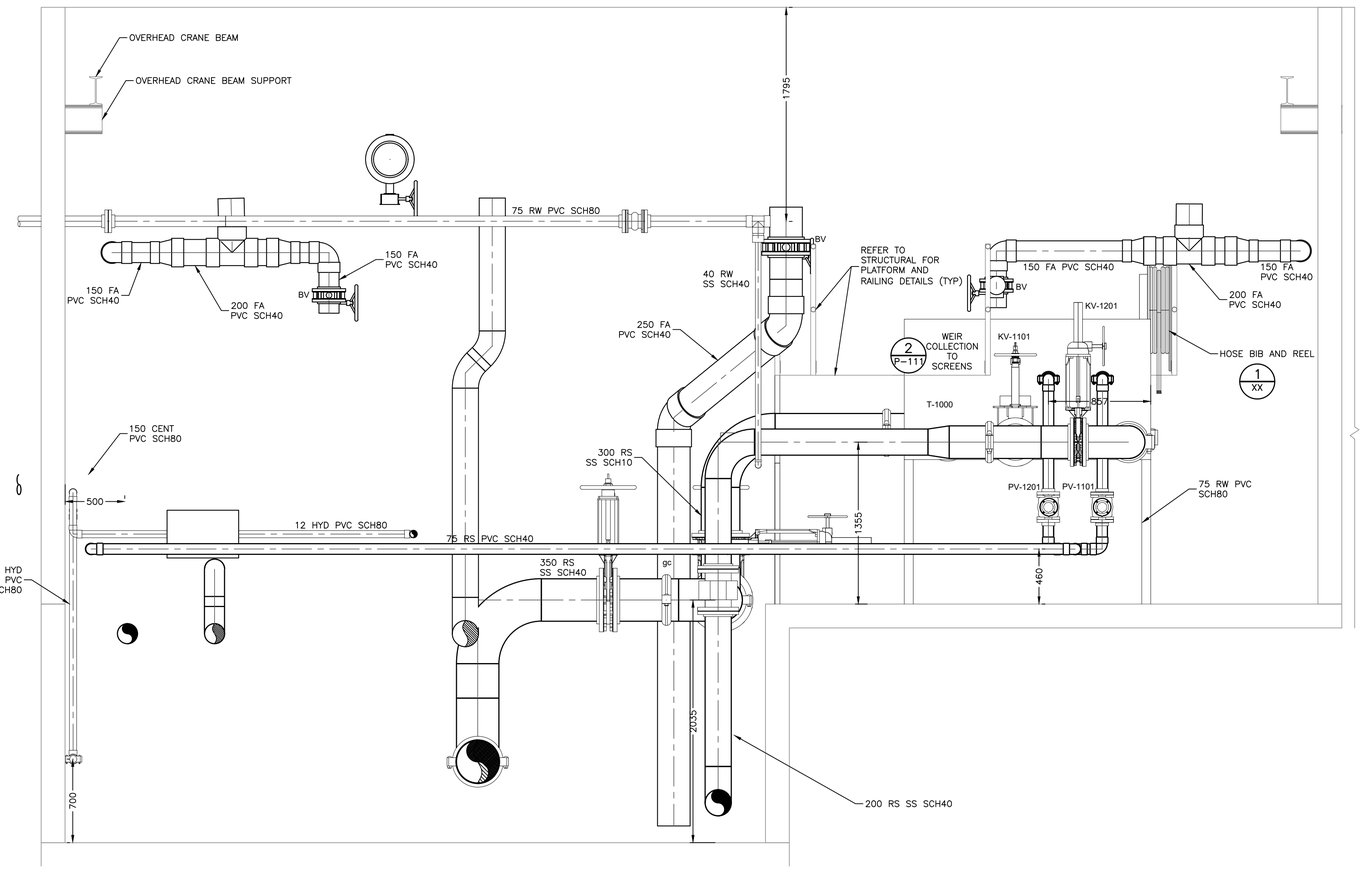
HEADWORKS

Sheet Number: 3 of 10

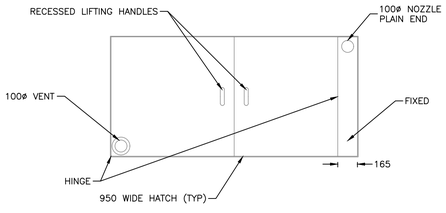
Project Number	Drawing Number	Revision
0999.0069.06	P-110	0

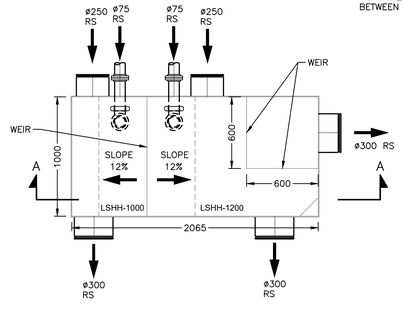
ISSUED FOR INFORMATION

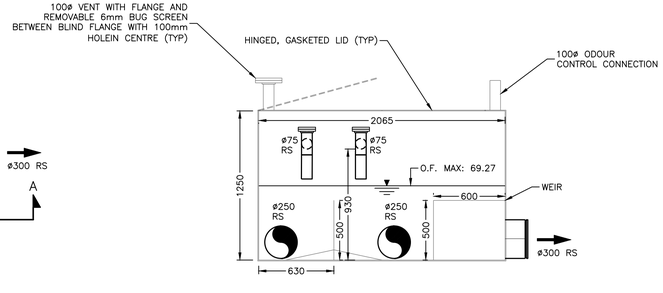
U:\Projects_KAM\0999\0069\06\D-Design\CAD\P3D\0999.0069.06 WWTP\Ortho\DWGs\P-110-Headworks_Plan.dwg, P-110, 2023-04-21 03:12 pm musmith



D P-110 HEADWORKS SECTION
SCALE MECH 1:25







SECTION A–A

2 P-111 T–1000 DETAIL
SCALE 1:50

NOTES:

1. ALL 304L SS CONSTRUCTION
2. INSIDE DIMENSIONS SHOWN
3. MINIMUM PLATE THICKNESS 3mm OR GREATER AS REQUIRED FOR STRUCTURAL STABILITY
4. REFER TO SECTION 46 05 00 FOR STAINLESS STEEL WELDING AND PASSIVATION REQUIREMENTS
5. ALL NOZZLES MINIMUM 150mm LENGTH. PROVIDE NOZZLE ENDS AS SHOWN
6. STRUCTURAL DESIGN BY FABRICATOR'S ENGINEER
7. COVERS OF CHECKERPLATE RATED FOR PERSONNEL LOADING
8. SUBMIT SHOP DRAWING OF SPLITTER BOXES FOR REVIEW PRIOR TO FABRICATION.
9. MANUAL SCREEN DETAILS TO COME.
10. VENTS, DRAINS, SAMPLE POINTS AND PIPE SUPPORTS/SEISMIC BRACING ARE GENERALLY NOT SHOWN BUT ARE REQUIRED. REFER TO SPECIFICATIONS. SAMPLE POINTS ARE SHOWN ON P&ID's.

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Professional Seals

#	Date	Issue / Revision	App

Fraser Valley Regional District

URBAN systems

Scale #m 0 # ## ##

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Designed by	M. SMITH
Drawn by	MURDO SMITH

North Cultus WWTP Target Value Design Changes

HEADWORKS
SECTION & DETAILS

Sheet Number		4 of 10
Project Number	Drawing Number	Revision
0999.0069.06	P-111	0

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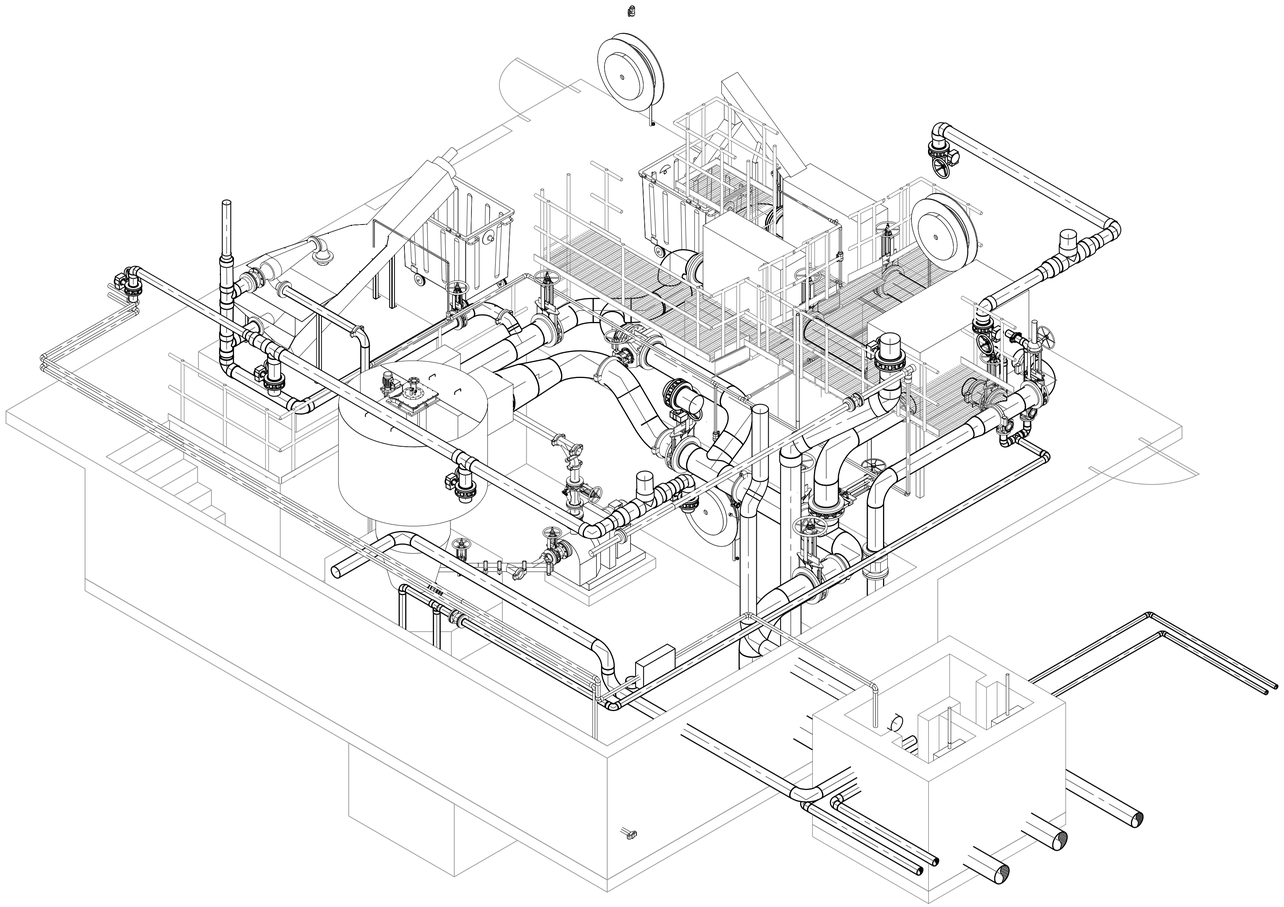

1 HEADWORKS NW ISOMETRIC VIEW
NOT TO SCALE

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North Cultus WWTP Target Value Design Changes

HEADWORKS
NW ISOMETRIC VIEW

Sheet Number 5 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-112	0

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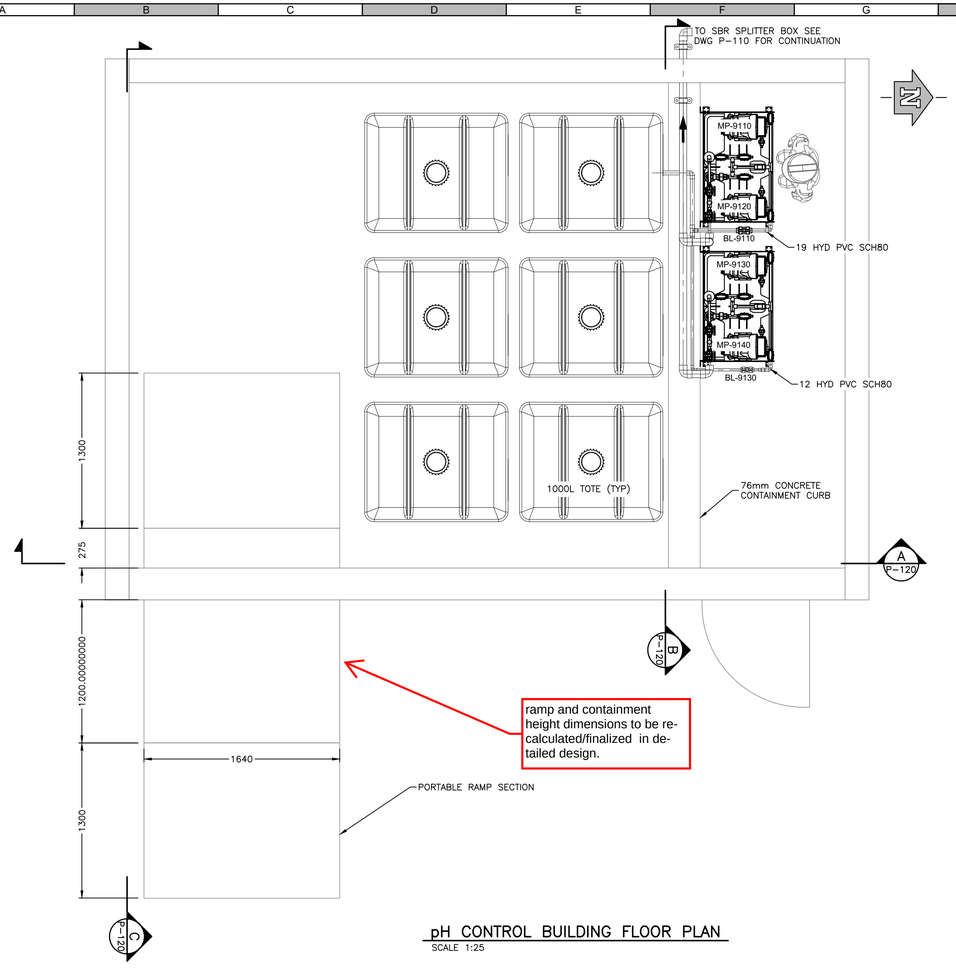
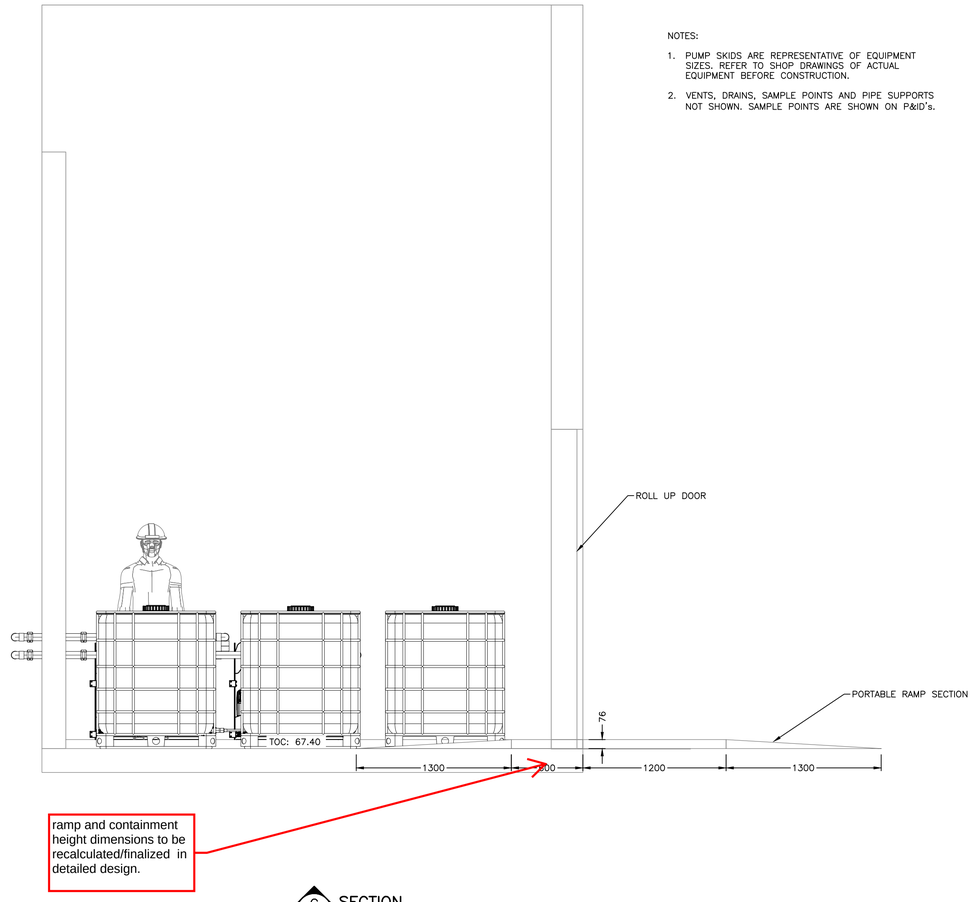
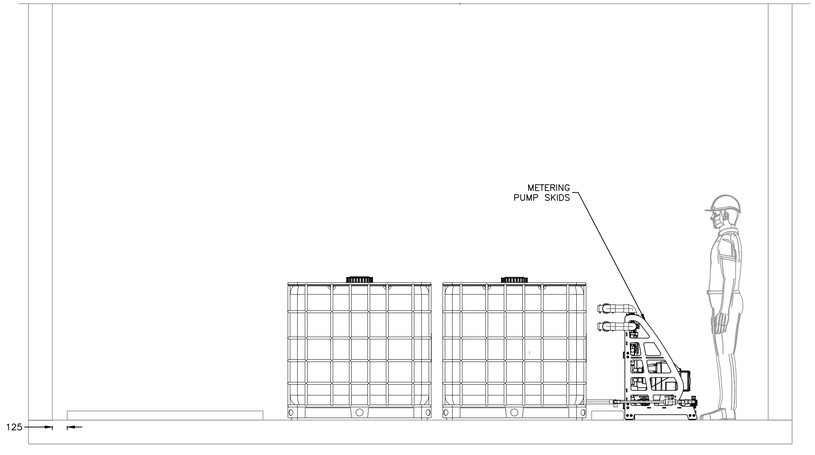


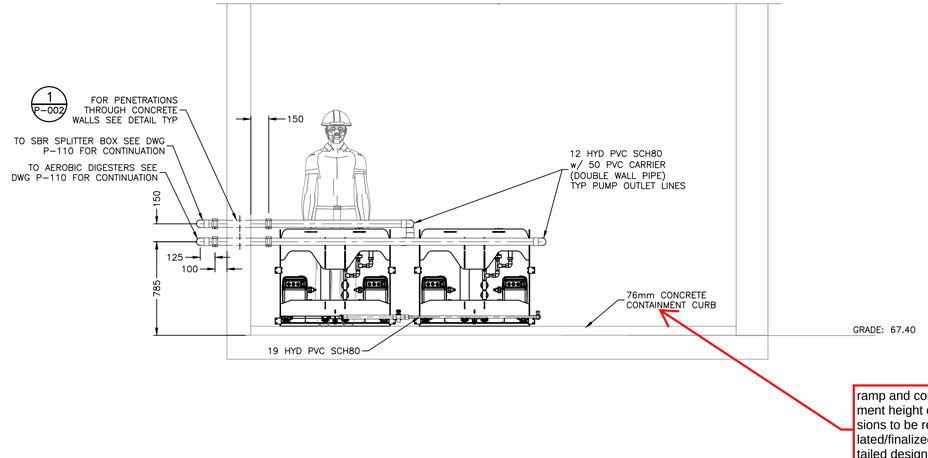
pH CONTROL BUILDING FLOOR PLAN
SCALE 1:25



C P-120 SECTION
SCALE 1:25



A P-120 SECTION
SCALE 1:25



B P-120 SECTION
SCALE 1:25

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Drawn by	MURDO SMITH

North Cultus WWTP Target Value Design Changes

pH CONTROL ROOM LAYOUT

Sheet Number: 6 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-120	0

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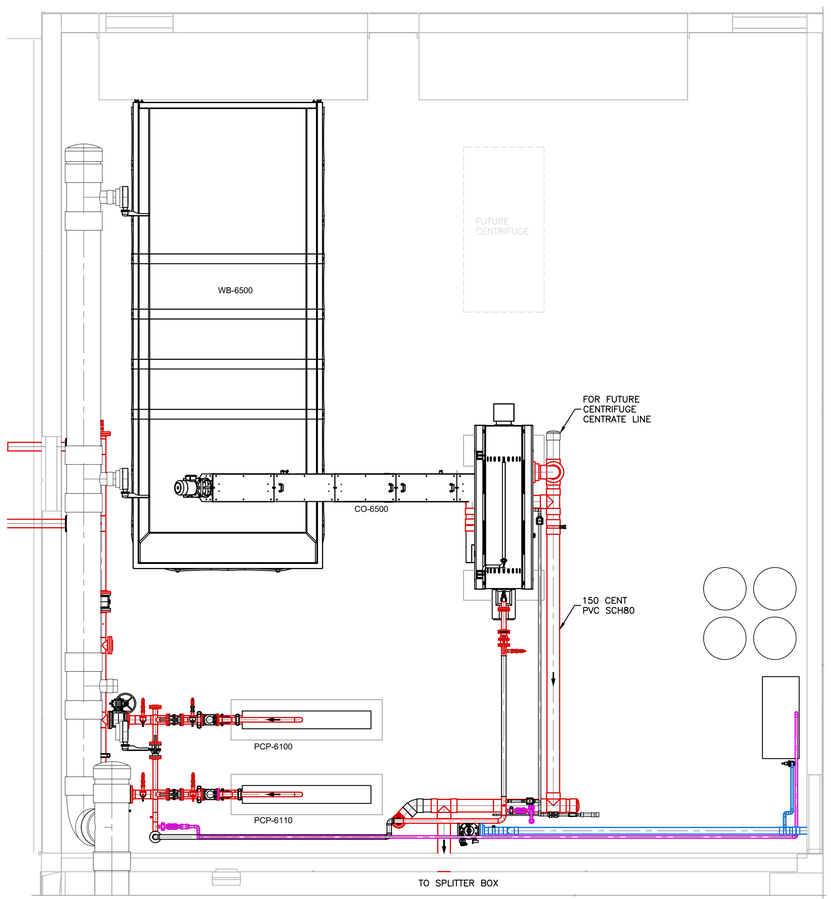

PLAN VIEW
SCALE 1:40

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DEWATERING

Sheet Number 7 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-150	0

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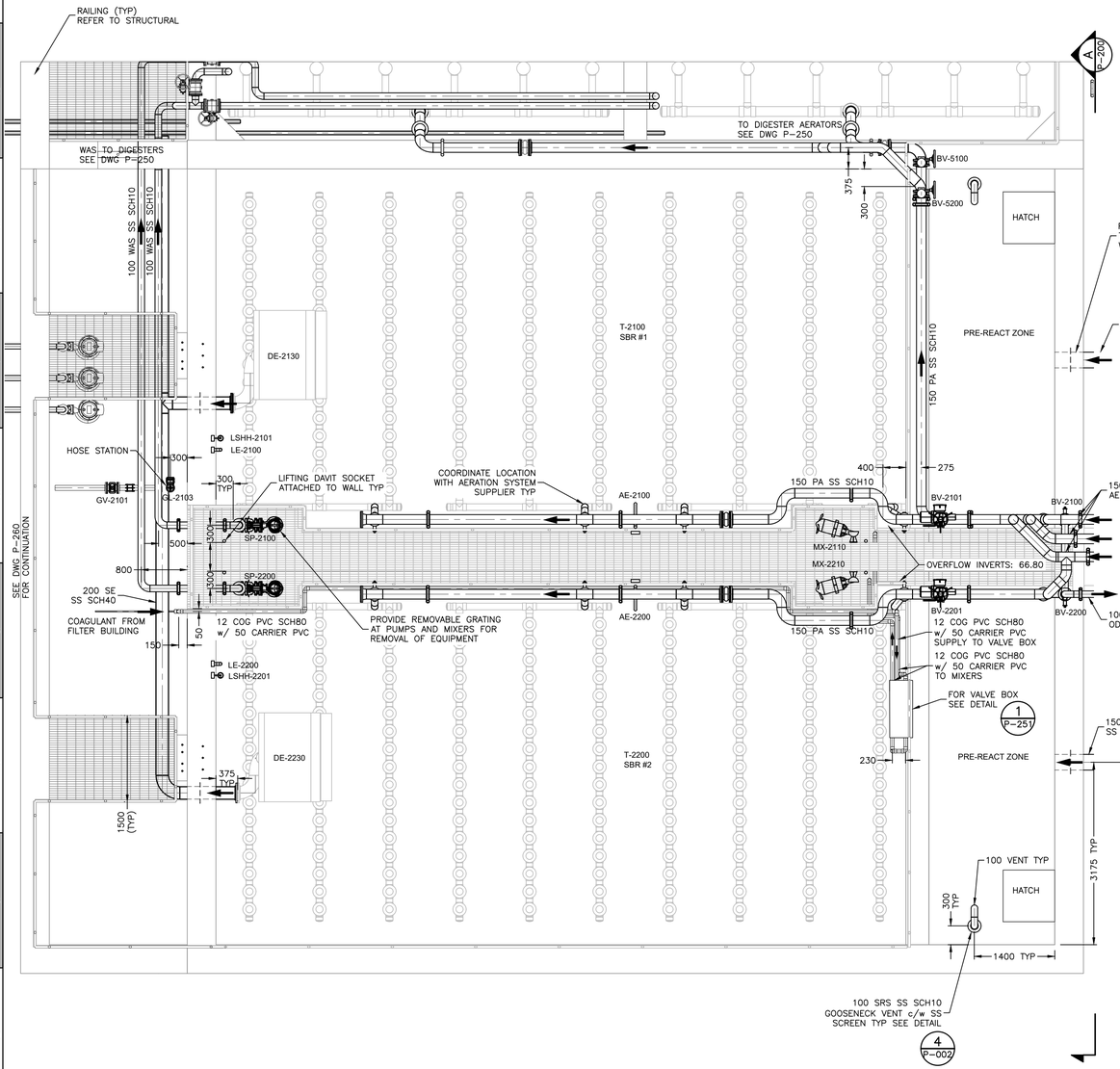
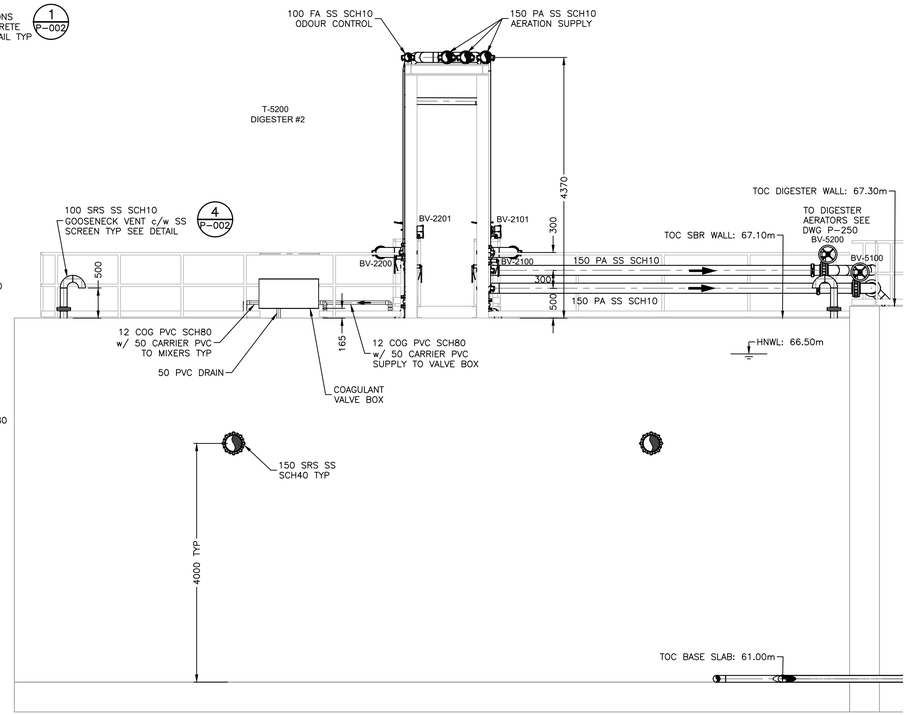


SBR PLAN
SCALE: 1:50



A SECTION
P-200 SCALE 1:50

NOTES:

1. VENTS, DRAINS, SAMPLE POINTS AND PIPE SUPPORTS/SEISMIC BRACING ARE GENERALLY NOT SHOWN BUT ARE REQUIRED. REFER TO SPECIFICATIONS. SAMPLE POINTS ARE SHOWN ON P&ID's.

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North Cultus WWTP Target Value Design Changes

SEQUENCING BATCH REACTOR PLAN & SECTION

Sheet Number		8 of 10
Project Number	Drawing Number	Revision
0999.0069.06	P-200	0

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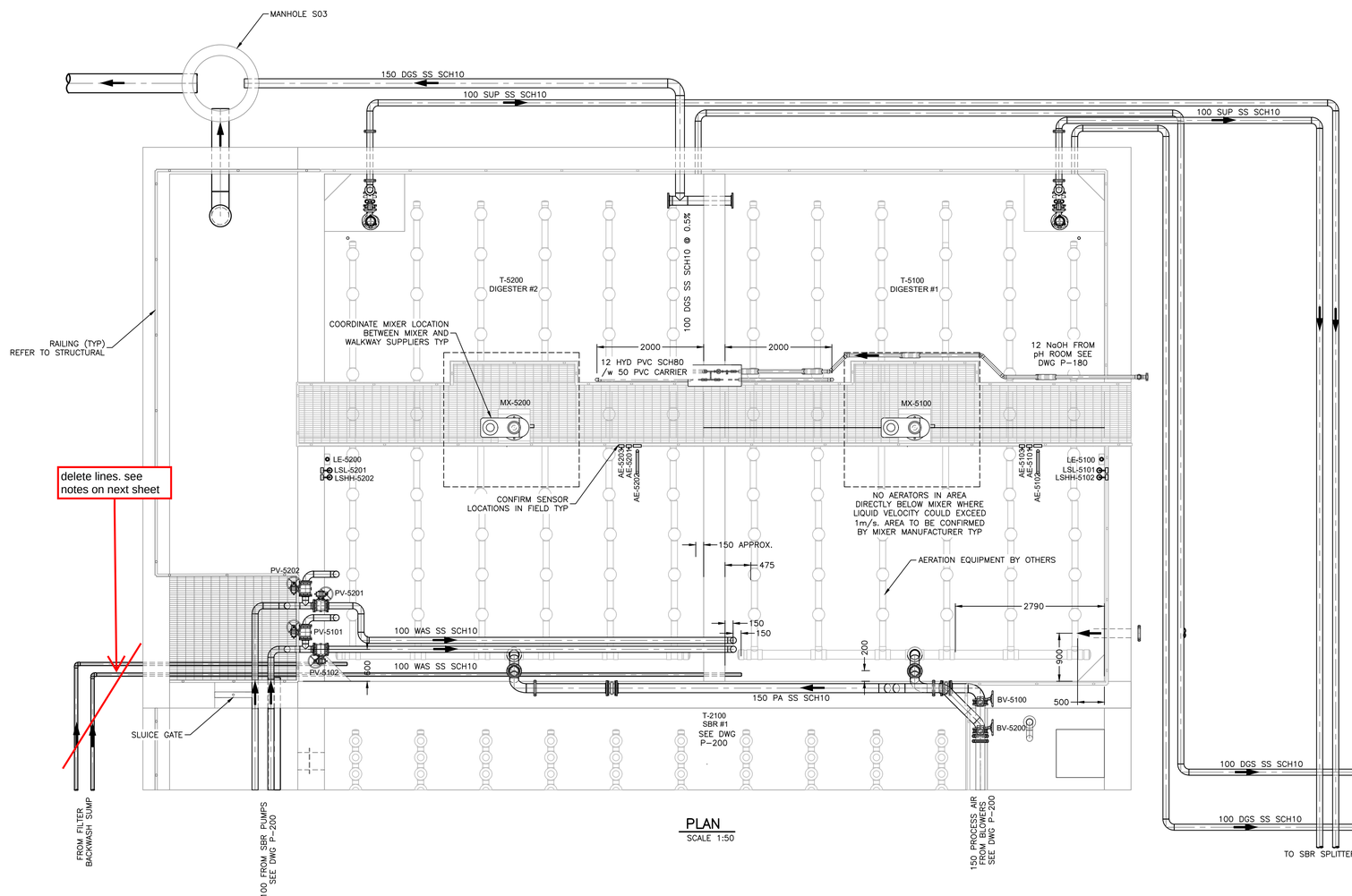

PLAN
SCALE 1:50

N

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North Cultus WWTP Target Value Design Changes

AEROBIC DIGESTER LAYOUT

Sheet Number 9 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-250	0

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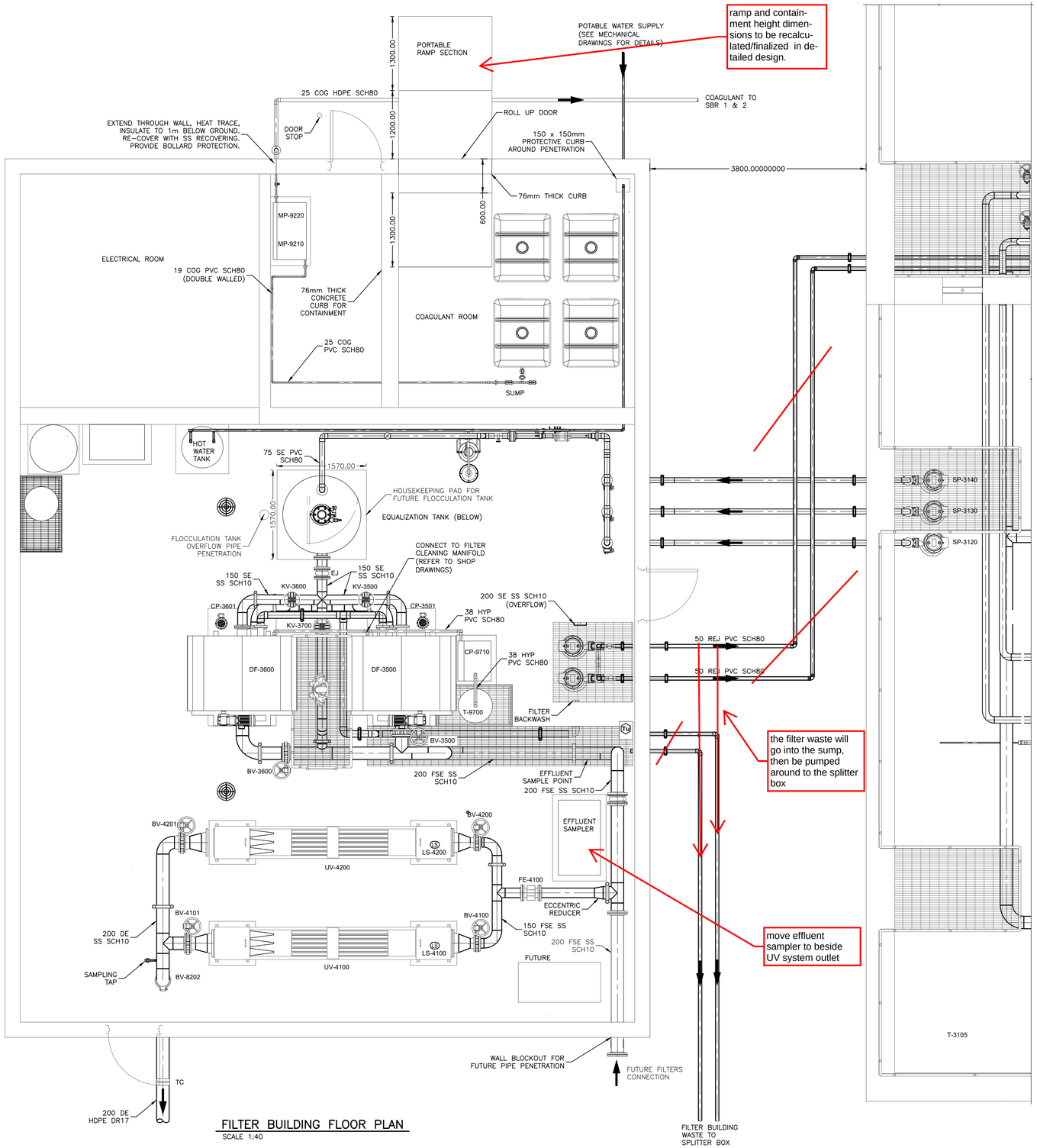

FILTER BUILDING FLOOR PLAN

SCALE 1:40

NOTES:

1. GROOVED JOINT COUPLINGS ON PVC PIPE TO BE FLEXIBLE TYPE.
2. REFER TO STANDARD DETAILS DRAWING P-002 FOR ALL WALL PENETRATIONS.
3. DOUBLE WALLED PIPING TO BE USED BETWEEN CHEMICAL CONTAINMENT UNITS.
4. PLUMBING DRAIN LINES TO BE DIRECTED TO SUMP. REFER TO MECHANICAL DRAWINGS.
5. PIPE SPOOLS THROUGH WALLS TO BE STAINLESS STEEL.

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North Cultus WWTP Target Value Design Changes

FILTER BUILDING LAYOUT

Sheet Number 10 of 10

Project Number	Drawing Number	Revision
0999.0069.06	P-330	0

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ANSI/ISA 5.1-2009 INSTRUMENTATION IDENTIFICATION

	FIRST LETTERS		SUCCEEDING LETTERS		
	COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
A	ANALYSIS		ALARM		
B	BURNER				
C	AUTO			CONTROL	CLOSE
D	USER'S CHOICE	DIFFERENTIAL	DISABLE		DEVIATION
E	VOLTAGE		PRIM ELEMENT		
F	FLOW	RATIO			
G	USER'S CHOICE	RATIO	GLASS, GAUGE		
H	HAND				HIGH
I	CURRENT		INDICATE		
J	POWER		SCAN		
K	TIME, SCHEDULE	RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	REQUEST		TREND		MIDDLE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE		OPEN
P	PRESSURE		POINT		
Q	QUANTITY	INTEGRATE	TOTALIZE		
R	RADIATION	REMOTE	RECORD		RUN
S	SPEED, FREQ	SAFETY		SWITCH	STOP
T	TEMPERATURE	SAFETY		TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTIONAL	MULTIFUNCTIONAL	
V	VIBRATION			VALVE	
W	WEIGHT, FORCE		WELL, PROBE		
X	LAMP/LIGHT	X-AXIS	ACC. DEVICES	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE	Y-AXIS		AUXILIARY DEV	
Z	POSITION	Z-AXIS		DRIVE, ACTUATOR	

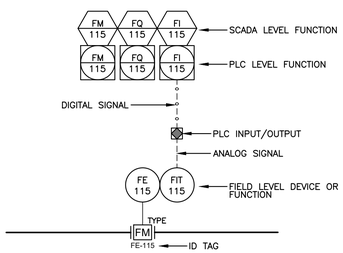
INSTRUMENTATION DEVICE AND FUNCTION TAG

SYMBOL	DESCRIPTION
XXX 000	FIELD MOUNTED DEVICE
XXX 000	LOCAL PANEL MOUNTED DEVICE
XXX 000	INACCESSIBLE LOCAL PANEL DEVICE
XXX 000	FUNCTION LOCATED IN PRIMARY PLC, NOT ACCESSIBLE TO OPERATOR
XXX 000	FUNCTION LOCATED IN PRIMARY PLC, ACCESSIBLE TO OPERATOR
XXX 000	FUNCTION LOCATED IN PRIMARY PLC, NOT NORMALLY ACCESSIBLE TO OPERATOR
XXX 000	SCADA LEVEL FUNCTION, NOT ACCESSIBLE TO OPERATOR
XXX 000	SCADA LEVEL FUNCTION, ACCESSIBLE TO OPERATOR

PLC AND HARDWARE COMMUNICATION

SYMBOL	DESCRIPTION
	HARDWARE INTERLOCK
	PLC INPUT/OUTPUT (I/O)
	PLC LOGIC FUNCTION

LOCAL, PLC AND SCADA INSTRUMENTATION



INSTRUMENTATION COMPONENT

SYMBOL	TAG	DESCRIPTION
	FS	FLOAT SWITCH
FM	FE-XXXX	FLOW METER - MAG TYPE
US	LE-XXXX	LEVEL TRANSMITTER - ULTRASONIC
TD	LE-XXXX	LEVEL TRANSMITTER - TRANSDUCER
RAD	LE-XXXX	LEVEL TRANSMITTER - RADAR

MAJOR EQUIPMENT (ENERGIZED)

SYMBOL	TAG	DESCRIPTION
	AC-XXXX	AIR COMPRESSOR
	BR-XXXX	BLOWER - ROTARY
	BL-XXXX	CENTRIFUGAL BLOWER/FAN
	CE-XXXX	CENTRIFUGE
	CO-XXXX	CONVEYOR
	DF-XXXX	DRUM OR DISC FILTER/SCREEN
	GC-XXXX	GRIT CLASSIFIER
	CY-1330	GRIT CYCLONE
	FL-XXXX	MEMBRANE FILTER
	MG-XXXX	MACERATOR OR INFLUENT GRINDER
	MX-XXXX	MIXER
	CP-XXXX	PUMP CENTRIFUGAL
	MP-XXXX	PUMP - METERING
	PPC-XXXX	PUMP - PROGRESSIVE CAVITY
	SP-XXXX	PUMP - SUBMERSIBLE
	VP-XXXX	PUMP - VERTICAL TURBINE
	MS-XXXX	SCREEN - MECHANICAL
	SR-XXXX	SOLIDS COMPACTOR
M	SWP-XXXX	SUBMERSIBLE WELL PUMP WITH INTEGRATED CHECK VALVE AND MOTOR
	UV-XXXX	UV REACTOR - LOW PRESSURE
	UV-XXXX	UV - OPEN CHANNEL

STORAGE TANKS AND PRESSURE VESSEL

SYMBOL	TAG	DESCRIPTION
	AC-XXXX	ACTIVATED CARBON MEDIA STORAGE TANK
	DT-XXXX	CHEMICAL STORAGE DAY TANK C/W SECONDARY CONTAINMENT
	CT-XXXX	CHEMICAL STORAGE TOTE C/W SECONDARY CONTAINMENT
	BS-XXXX	CHEMICAL BULK STORAGE VESSEL
	HT-XXXX	HYDROPNEUMATIC BLADDER TANK
	LCT-XXXX	LIQUID STORAGE TANK - CLOSED TOP
	T-XXXX	LIQUID CONTAINING TANK - OPEN TOP OR OPEN TO ATMOSPHERE

VALVE

SYMBOL	TAG	DESCRIPTION
	AR-XXXX	AIR RELEASE VALVE
	AV-XXXX	AIR/VACUUM VALVE
	DC-XXXX	BACK-FLOW PREVENTER - DOUBLE CHECK OR REDUCED PRESSURE PRINCIPLE STYLE
	BL	BALL VALVE - NORMALLY CLOSED
	BL	BALL VALVE - NORMALLY OPEN
	BV-XXXX	BUTTERFLY VALVE - NORMALLY CLOSED
	BV-XXXX	BUTTERFLY VALVE - NORMALLY OPEN
	CV-XXXX	CHECK VALVES - BALL, FLAP, SILENT, SWING DISC AND SPLIT DISC TYPES
	CVD-XXXX	CHECK VALVE - DUCK BILL STYLE
	CA-XXXX	COMBINATION AIR VALVE
	DV-XXXX	DIAPHRAGM VALVE - NORMALLY CLOSED
	DV-XXXX	DIAPHRAGM VALVE - NORMALLY OPEN
	AF-XXXX	FLOAT OR ALTITUDE CONTROL VALVE
	GV-XXXX	GATE VALVE - NORMALLY CLOSED
	GV-XXXX	GATE VALVE - NORMALLY OPEN
	GL-XXXX	GLOBE VALVE - NORMALLY CLOSED
	GL-XXXX	GLOBE VALVE - NORMALLY OPEN
	KV-XXXX	KNIFE GATE VALVE - NORMALLY CLOSED
	KV-XXXX	KNIFE GATE VALVE - NORMALLY OPEN
	MV-XXXX	MUD VALVE
	NV	NEEDLE VALVE
	PC	PETCOCK VALVE
	PNV-XXXX	PINCH VALVE - NORMALLY CLOSED
	PNV-XXXX	PINCH VALVE - NORMALLY OPEN
	PV-XXXX	PLUG VALVE - NORMALLY CLOSED
	PV-XXXX	PLUG VALVE - NORMALLY OPEN
	PCV-XXXX	PRESSURE CONTROL VALVES - INLINE AND ANGLE TYPE - REDUCING OR SUSTAINING FUNCTIONS (PILOTING PLACED ON CONTROL SIDE)
	PR-XXXX	PRESSURE RELIEF OR SURGE ANTICIPATING VALVES - INLINE AND OFFLINE ANGLE TYPES
	PR-XXXX	AIR PRESSURE RELIEF VALVE - OFFLINE DUMP TYPE
	SV-XXXX	SOLENOID VALVE - DUAL PORT - NORMALLY CLOSED
	SV-XXXX	SOLENOID VALVE - DUAL PORT - NORMALLY OPEN
	VB-XXXX	VACUUM BREAKER VALVE
	TW-XXXX	3-WAY VALVE - GENERIC SYMBOL
	FW-XXXX	4-WAY VALVE - GENERIC SYMBOL

ACTUATOR AND OPERATOR

SYMBOL	DESCRIPTION
M XXX VXX	ELECTRIC ACTUATOR
Q-MOD M XXX VXX	ELECTRIC ACTUATOR - FLOW CONTROL
M XXX VXX	ELECTRIC ACTUATOR C/W MANUAL OVERRIDE
Q-MOD M XXX VXX	ELECTRIC ACTUATOR - FLOW CONTROL C/W MANUAL OVERRIDE
	MANUAL CHAIN-WHEEL OPERATOR
	MANUAL GEAR OPERATOR
	MANUAL LEVER OPERATOR
	PNEUMATIC ACTUATOR
	PNEUMATIC ACTUATOR C/W MANUAL OVERRIDE
E XXX VDC	PNEUMATIC FLOW CONTROL ACTUATOR
S XXX VDC	SOLENOID ACTUATOR

ELECTRICAL AND CONTROL

SYMBOL	DESCRIPTION
MS XVAC XA M	MOTOR (FIXED DRIVE), STARTER AND SUPPLY VOLTAGE
SS XVAC XA M	MOTOR WITH SOFT START
VFD XVAC XA M	MOTOR WITH VARIABLE SPEED DRIVE AND SUPPLY VOLTAGE
S XXX VDC	SOLENOID AND SUPPLY VOLTAGE
VS XXX VDC	SOLENOID WITH VARIABLE SPEED CONTROL

LINE TYPE

DESCRIPTION	PROPOSED	EXISTING	FUTURE
AIR			
CHEMICAL DOUBLE WALL			
CHEMICAL			
DRAIN			
ELECTRICAL SIGNAL ANALOG			
ELECTRICAL SIGNAL DIGITAL			
ELECTRICAL SUPPLY			
FLOW DIRECTION			
FOUL AIR			
PROCESS - PRIMARY			
PROCESS - SECONDARY			

ANNOTATION

SYMBOL	DESCRIPTION
ELEV: XXX.XXXm	LIQUID OR WATER LEVEL OR HGL AT ATMOSPHERIC PRESSURE
AI DWG No. SOURCE OR DESTINATION DESC.	PRIMARY OR SECONDARY PROCESS SYSTEM FLOW INFORMATION
AI DWG No. SOURCE OR DESTINATION DESC.	AIR OR PNEUMATIC OR SYSTEM PROCESS FLOW INFORMATION
AI DWG No. SOURCE OR DESTINATION DESC.	ELECTRICAL OR DATA SYSTEM PROCESS FLOW INFORMATION

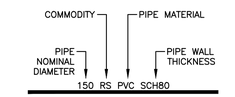
SYSTEM COMPONENTS AND ACCESSORIES

SYMBOL	TAG	DESCRIPTION
	AD	AERATION DIFFUSER HEADER
	AF-XXXX	AIR FILTER
	CC	CALIBRATION COLUMN
	IQ-XXXX	CHEMICAL INJECTION QUILL
	C/O	CLEANOUT
	DE-XXXX	DECANTER
	DM-XXXX	DE-MISTER
	FD	DISCHARGE TO FUNNEL STYLE FLOOR DRAIN C/W ATMOSPHERIC BREAK
		EXPANSION JOINT
		FLANGE
		GAUGE ISOLATOR
		OVERFLOW BELL-MOUTH
	PF-XXXX	PARSHALL FLUME
	PA	PITLESS ADAPTER
	PD	PULSATION DAMPENER
	QC	QUICK CONNECT COUPLING - MALE AND FEMALE ENDS
		REDUCER - CONCENTRIC
		REDUCER - ECCENTRIC
	RM-XXXX	ROTAMETER
	RT-XXXX	ROCK TRAP
S	SL-XXXX	SILENCER
	SG-XXXX	SLIDE OR SLUICE GATE NORMALLY OPEN
	SG-XXXX	SLIDE OR SLUICE GATE NORMALLY CLOSED
	WY-XXXX	STRAINER BASKET OR DUPLEX STYLE
	WY-XXXX	STRAINER WYE STYLE
	SM-XXXX	STATIC MIXER
T	TC	TRANSITION COUPLING
R	RC	RESTRAINED COUPLING
		WET WELL OR RESERVOIR VENT
		WEIR
	WB-XXXX	WASTE BIN

ABBREVIATION

ID	DESCRIPTION
AI	ARROW IDENTIFICATION (FLOW ARROW)
CIRC	CIRCULATION
CONT	CONTROL
COND	CONDUCTIVITY
DIA	DIAMETER
DP	DIFFERENTIAL PRESSURE
DEC	DECANT
DF	DRAIN (FLOOR)
DR	DRAIN (PROCESS)
DWG	DRAWING
ELEV	ELEVATION
EQ	EQUALIZATION
HWL	HIGH WATER LEVEL
HHWL	HIGH-HIGH WATER LEVEL
HOA	HAND/OFF/AUTO
HP	HORSE POWER
IND	INDICATE
LWL	LOW WATER LEVEL
LLWL	LOW-LOW WATER LEVEL
MAG	MAGNETIC
MAX	MAXIMUM
MIN	MINIMUM
MS	MOTOR STARTER
O/C	OPEN/CLOSED
OF	OVERFLOW
PLC	PROGRAMMABLE LOGIC CIRCUIT
POS	POSITION
Q	FLOW
REC	RECIRCULATION
SCH	SCHEDULE
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
TURB	TURBIDITY
TYP	TYPICAL
UV	ULTRAVIOLET
UVT	ULTRAVIOLET TRANSMITTANCE
VA	VACUUM
VAC	VOLTS AC
VDC	VOLTS DC
VE	VENTILATION
VFD	VARIABLE FREQUENCY DRIVE
VT	VERTICAL TURBINE PUMP
WTP	WATER TREATMENT PLANT
WWTP	WASTE WATER TREATMENT PLANT

PIPE TAG IDENTIFICATION SYSTEM



PIPE MATERIAL

ID	DESCRIPTION
ABS	ACRYLONITRILE BUTADIENE STYRENE
CPVC	CHLORINATE POLYVINYL CHLORIDE
CS	CARBON STEEL
CU	COPPER
DI	DUCTILE IRON
GLDI	GLASS LINED DUCTILE IRON
HDPE	HIGH DENSITY POLYETHYLENE
PEX	CROSS LINKED POLYETHYLENE
PVC	POLYVINYL CHLORIDE
SS	STAINLESS STEEL
TBG	TUBING
UPVC	UN-PLASTICIZED PVC (DRAIN PIPING)

COMMODITY

ID	DESCRIPTION
CENT	CENTRATE
CIP	CLEAN IN PLACE
COG	COAGULANT (ALUM)
DE	DISINFECTED EFFLUENT
DGS	DIGESTED SLUDGE
DRW	DRAIN (BUILDING FLOOR DRAINS)
FA	FOUL AIR (ODOUR CONTROL)
FSE	FILTERED SECONDARY EFFLUENT
GR	GRIT (DEWATERED)
GS	GRIT SLURRY
HYD	SODIUM HYDROXIDE (NaOH)
HYP	SODIUM HYPOCHLORITE (NaOCL)
IA	INSTRUMENT AIR
ML	MIXED LIQUOR
PA	PROCESS AIR
PE	PRIMARY EFFLUENT
PLY	POLYMER
POT	POTABLE WATER
PY	PRIMARY SCUM
PS	PRIMARY SLUDGE
RAS	RETURN ACTIVATED SLUDGE
REJ	FILTER REJECT (OR CONCENTRATE)
RS	RAW SEWAGE/RAW INFLUENT
RW	RECLAIMED WATER
SAN	SANITARY (BUILDING SEWER)
SE	SECONDARY EFFLUENT
SA	SERVICE AIR
SEP	SEPTAGE RECEIVING
SLD	SLUDGE DEWATERED
SP	PRIMARY SCUM
SRS	SCREENED RAW SEWAGE
SS	SECONDARY SLUDGE
SUP	SUPERNATANT
SW	SERVICE WATER (POTABLE QUALITY)
SY	SECONDARY SCUM
TA	TREATED AIR
TWAS	THICKENED WASTE ACTIVATED SLUDGE
VAC	VACUUM
WAS	WASTE ACTIVATED SLUDGE

COMPONENT AND INSTRUMENTATION TAG IDENTIFICATION SYSTEM

IDENTIFICATION SYSTEM GENERAL EXPLANATION:

- XXX–XXXX or XX–XXXX: ALL TAGS UTILIZE AN ALPHA–NUMERIC 5 OR 6 VALUE SYSTEM.
- XXX–XXXX: THE FIRST TWO OR THREE VALUES ARE ALPHA IDENTIFIERS AND CONFORM TO ANSI/ISA DESCRIPTIVE STANDARDS/GUIDELINES OR INDUSTRY FREE FORM METHODS (EXAMPLE: CV = CHECK VALVE AND LIT = LEVEL INDICATING TRANSMITTER).
- XX–XXXX: THE LAST FOUR DIGITS REPRESENT A SPECIFIC PROJECT PROCESS AREA OR GROUP AND DEFINED AS FOLLOWS:

XX–Xxxx FACILITY
XX–xXxx ID
XX–xxXX NUMERIC

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A	09/03/2019	ISSUED FOR INFORMATION	M.B.
B	13/04/2023	ELECTRICAL REVISION	A.W.

Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: S.DODD
Drawn by: B.BRIGGS

NORTH CULTUS WWTP

PID LEGEND

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-001	C

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I-111
FROM GRIT REMOVAL

I-150
FROM DEWATERING

450 FA PVC SCH40

500 FA PVC SCH40

500 FA PVC SCH40

I-170
TO ODOUR CONTROL

200 FA PVC SCH40

AE 1010 CH4
AE 1011 H2S
AE 1010
AE 1911

250 PVC SCH40

BV

250 PVC SCH40

BV

SS SCH10 (all piping upstream of grit system)

BV-1000

BV-1103

BV-1203

LIMIT OF VENDOR SUPPLIED EQUIPMENT

150 FA PVC SCH40

150 FA PVC SCH40

HS 1100

MS

VAC

M

HOA

I-112
MAIN BUILDING SANITARY WET WELL

75 RS PVC SCH80

FIT 1000

FE 1000

LSHH 1000

LSHH 1200

VENT

150 FA PVC SCH40

LSH 1100

VENT

SCREENINGS TO BIN

WB-1100

12 SW SS SCH10

100 RS HDPE

MARINA & BC PARKS

KV-1001

200 RS HPDE DR17

T

200 RS SS SCH40

FM

FM-1000

200 RS SS SCH40

250 RS SS SCH40

KV-1101

300 RS SS SCH40

KV-1102

MS-1100

300 SRS SS SCH40

I-111
TO GRIT REMOVAL

100 RS HDPE

FUTURE SOOWHALIE

KV-1002

75 RS PVC SCH80

75 RS PVC SCH80

250 RS SS SCH40

PV-1101

25 RS SS SCH40

DRAIN

19 SW SS SCH10

19 SW TBG

XXX VDC

S

SV-1101

100 RS HDPE

FUTURE EAST CULTUS 1

KV-1003

75 RS PVC SCH80

PV-1201

XXX VDC

S

SV-1100

T

19 SW TBG

PG 1100

100 RS HDPE

FUTURE EAST CULTUS 2

KV-1004

200 RS XXX XXXXX

KV-1201

300 RS SS SCH40

KV-1202

VENT

300 SRS SS SCH40

100 RS HDPE

FUTURE SUNNYSIDE EXPANSION

KV-1005

T-1000

EMERGENCY BYPASS WEIR

S-1200

25 RS SS SCH40

DRAIN

HOSE BIBB

SEWAGE FORCEMAIN MANIFOLD REFER TO DRAWINGS C-003

300 RS SS SCH40

300 SRS SS SCH40

I-111
EMERGENCY BYPASS TO SBRs

50 SW PVC SCH80

WY-1100

X
FROM SL1

200 RS HDPE DR17

KV-1006

75 POT HDPE DR17

T

75 POT SS SCH40

T

75 POT PVC SCH80

75 POT PVC SCH80

63 SW PVC SCH80

I-111
TO GRIT REMOVAL

POTABLE WATER

50 SW PVC SCH80

I-170
TO ODOUR CONTROL

50 SW PVC SCH80

I-140
TO DETWATERING

MECHANICAL SCREEN
MS-1100
6mm PERFORATED PLATE
CAPACITY : 77 L/s
POWER : 0.75 hp

MANUAL SCREEN
S-1200
25mm BAR SPACING

SCREENING BINS
WB-1100
CAPACITY : 1.5 m^3

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Fraser Valley Regional District

URBAN systems

Scale
NOT TO SCALE

Quality Control by M.BOULANGER
Designed by M.SCHAAD
Drawn by B.BRIGGS

NORTH CULTUS WWTP

HEADWORKS SCREEN P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-110	C

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I-112
FROM SANITARY LIFT STATION
100 FA PVC SCH40

112
FROM GRIT DEWATERING
150 FA PVC SCH40
200 FA PVC SCH40
I-110
TO SCREENING

BV-1300
BV-1350
150 FA PVC SCH80

LSH 1350
VENT

I-250
FROM AEROBIC DIGESTER 1
100 SUP SS SCH10

I-251
FROM AEROBIC DIGESTER 2
100 SUP SS SCH10

I-151
FROM DEWATERING
150 CENT PVC SCH80
KV-1310

I-120
FROM SBR NaOH PUMPS
12 HYD PVC SCH80
BL-1311

SG-1351
300 SRS PVC DR25
250 SRS PVC DR25
I-210
TO SBR 1

SG-1352
300 SRS PVC DR25
250 SRS PVC DR25
I-211
TO SBR 2

T-1350

150 FA PVC SCH40

350 SRS HDPE DR17

I-110
FROM HEADWORKS EMERGENCY BYPASS
300 SRS SS SCH40

300 SRS SS SCH40

350 SRS SS SCH10

I-112
FROM GRIT CLASSIFIER
150 SRS PVC SCH80

PV-1303
HS 1300
MS
VAC
A
M
HOA
VENT

KV-1300
KV-1350
KV-1320

150 SRS SS SCH40

I-110
FROM SCREEN
300 SRS SS SCH40
KV-1301
600 SRS SS SCH10
350 SRS SS SCH10
KV-1302
350 SRS SS SCH10

S
XXX VDC
SV-1300
38 SW TBG
38 SW SS SCH10

LIMIT OF VENDOR SUPPLIED EQUIPMENT

50 SRS SS SCH40
DRAIN
GV-1300

50 SW PVC SCH80
PG 1310
WS-1310

100 GS GLDI PC350
I-112
TO GRIT EQUIPMENT

FLUSH

I-110
POTABLE WATER
63 SW PVC SCH80
19 SW PVC SCH80
19 SW PVC SCH80
I-112
TO CLASSIFIER

HOSE BIB

GRIT VORTEX REMOVAL
GV-1300
CAPACITY : 109.5 L/s
POWER : 0.5 hp

SBR SPLITTER BOX

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Fraser Valley Regional District

URBAN systems

Scale
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Quality Control by M.BOULANGER
Designed by M.SCHAAD
Drawn by B.BRIGGS

NORTH CULTUS WWTP

HEADWORKS GRIT REMOVAL P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-111	C

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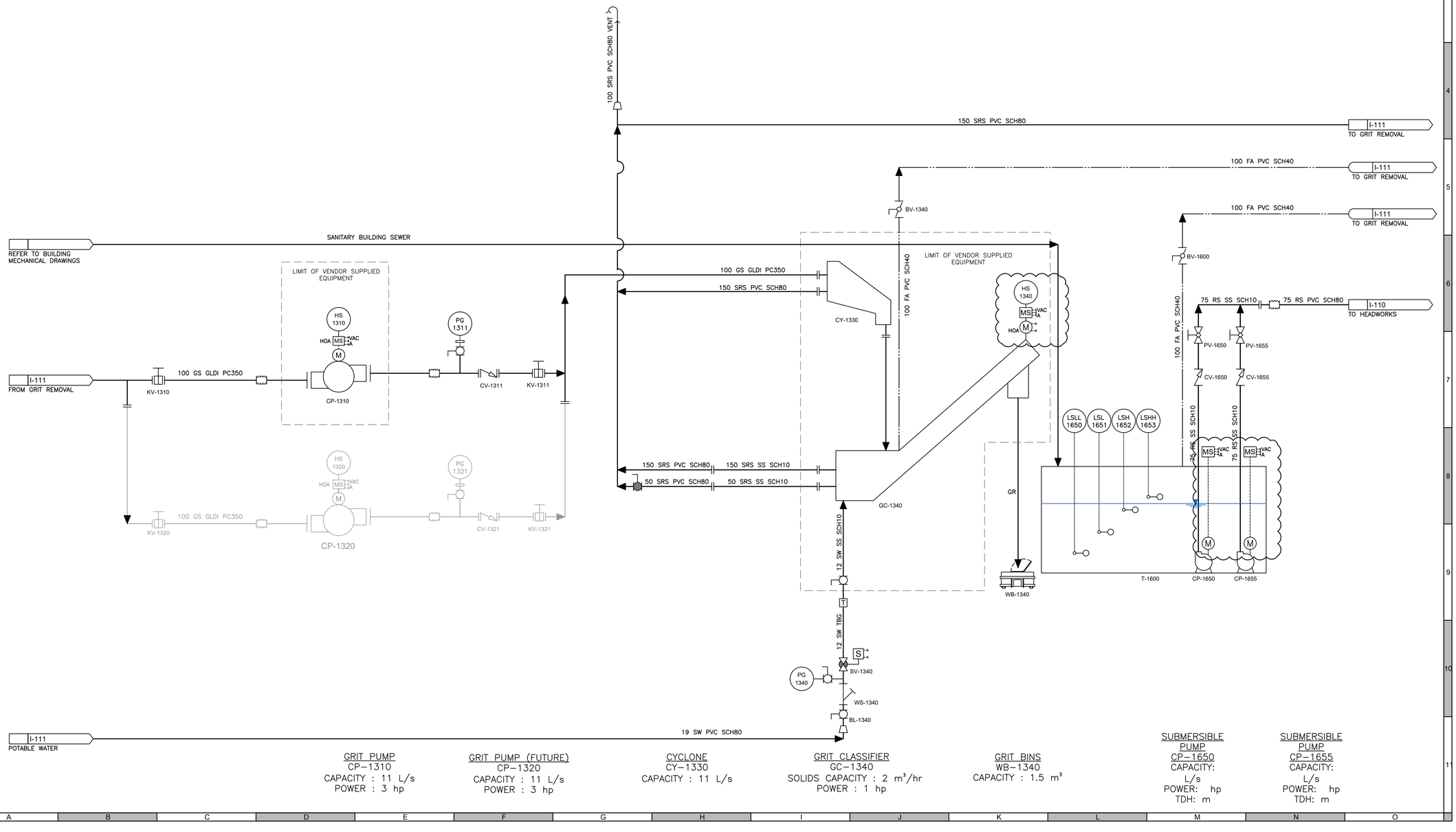

GRIT PUMP
CP–1310
CAPACITY : 11 L/s
POWER : 3 hp

GRIT PUMP (FUTURE)
CP–1320
CAPACITY : 11 L/s
POWER : 3 hp

CYCLONE
CY–1330
CAPACITY : 11 L/s

GRIT CLASSIFIER
GC–1340
SOLIDS CAPACITY : 2 m^3/hr
POWER : 1 hp

GRIT BINS
WB–1340
CAPACITY : 1.5 m^3

SUBMERSIBLE PUMP
CP–1650
CAPACITY: L/s
POWER: hp
TDH: m

SUBMERSIBLE PUMP
CP–1655
CAPACITY: L/s
POWER: hp
TDH: m

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: M.SCHAAD
Drawn by: B.BRIGGS

NORTH CULTUS WWTP

HEADWORKS GRIT AND WASTE PUMP P&ID

Sheet Number: # of 57
Project Number: 0999.0069.06
Drawing Number: I-112
Revision: C

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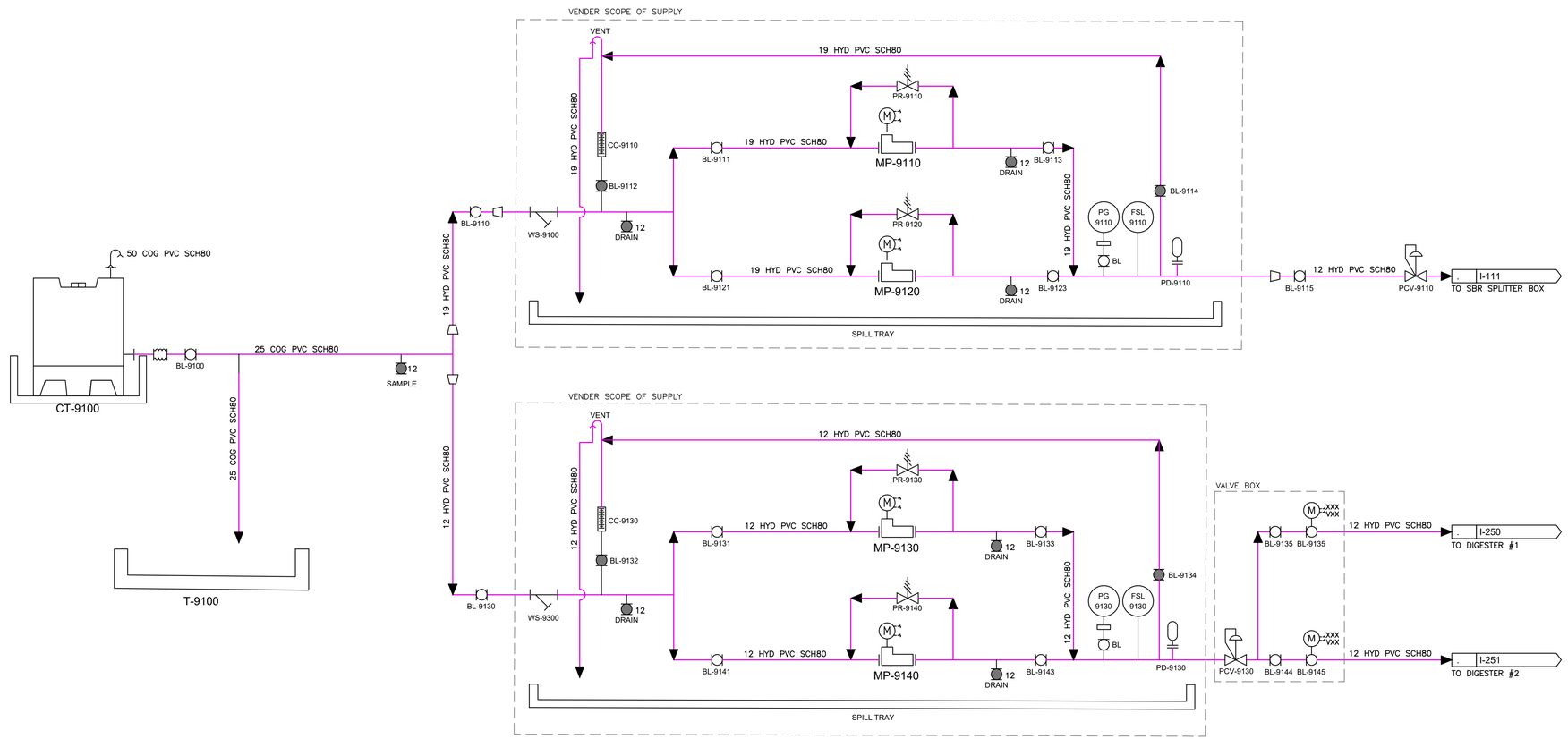

CHEMICAL TOTE
CT-9100
CAPACITY: 1.1m3

CHEMICAL SPILL CONTAINMENT
T-9100
CAPACITY: 1.21m3

SBR NaOH PUMP 1
MP-9110
CAPACITY: 104 L/h
TDH: 21m

SBR NaOH PUMP 2
MP-9120
CAPACITY: 104 L/h
TDH: 21m

DIGESTER NaOH PUMP 1
MP-9130
CAPACITY: 3.7 L/h
TDH: 21m

DIGESTER NaOH PUMP 2
MP-9140
CAPACITY: 3.7 L/h
TDH: 21m

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Quality Control by: M.BOULANGER
Designed by: J.REYNOLDS
Drawn by: T. PURCER

NORTH CULTUS WWTP
pH CONTROL SYSTEM P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-120	B

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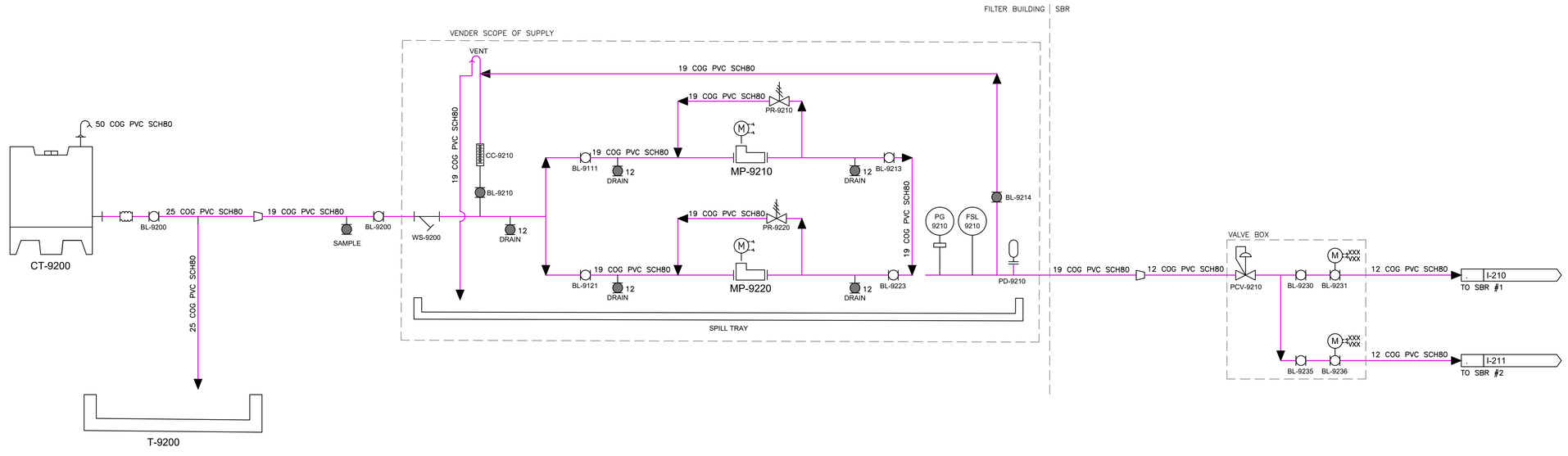

CHEMICAL TOTE
CT-9200
CAPACITY: 1.0m3

CHEMICAL SPILL CONTAINMENT
T-9200
CAPACITY: 1.1m3

ALUM PUMP 1
MP-9210
TDH: 21m
CAPACITY: 80 L/h

ALUM PUMP 2
MP-9220
TDH: 21m
CAPACITY: 80 L/h

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SURVEY INFORMATION
Prepared by: ON-SITE ENGINEERING
Coordinate System: PROJECT SPECIFIC
Compilation Date: April 2, 2019

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URBAN systems

Scale
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Quality Control by	M.BOULANGER
Designed by	J.REYNOLDS
Drawn by	T. PURCER

NORTH CULTUS WWTP
P-REMOVAL CHEMICAL SYSTEM P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-130	B

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NOTES:

1. MOTOR STARTER IS PART OF VENDOR SUPPLIED PACKAGE.

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE
Quality Control by: M.SMITH
Designed by: J.REYNOLDS
Drawn by: B.BRIGGS

NORTH CULTUS WWTP

CENTRIFUGE FEED SYSTEM P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-140	C

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NOTES:

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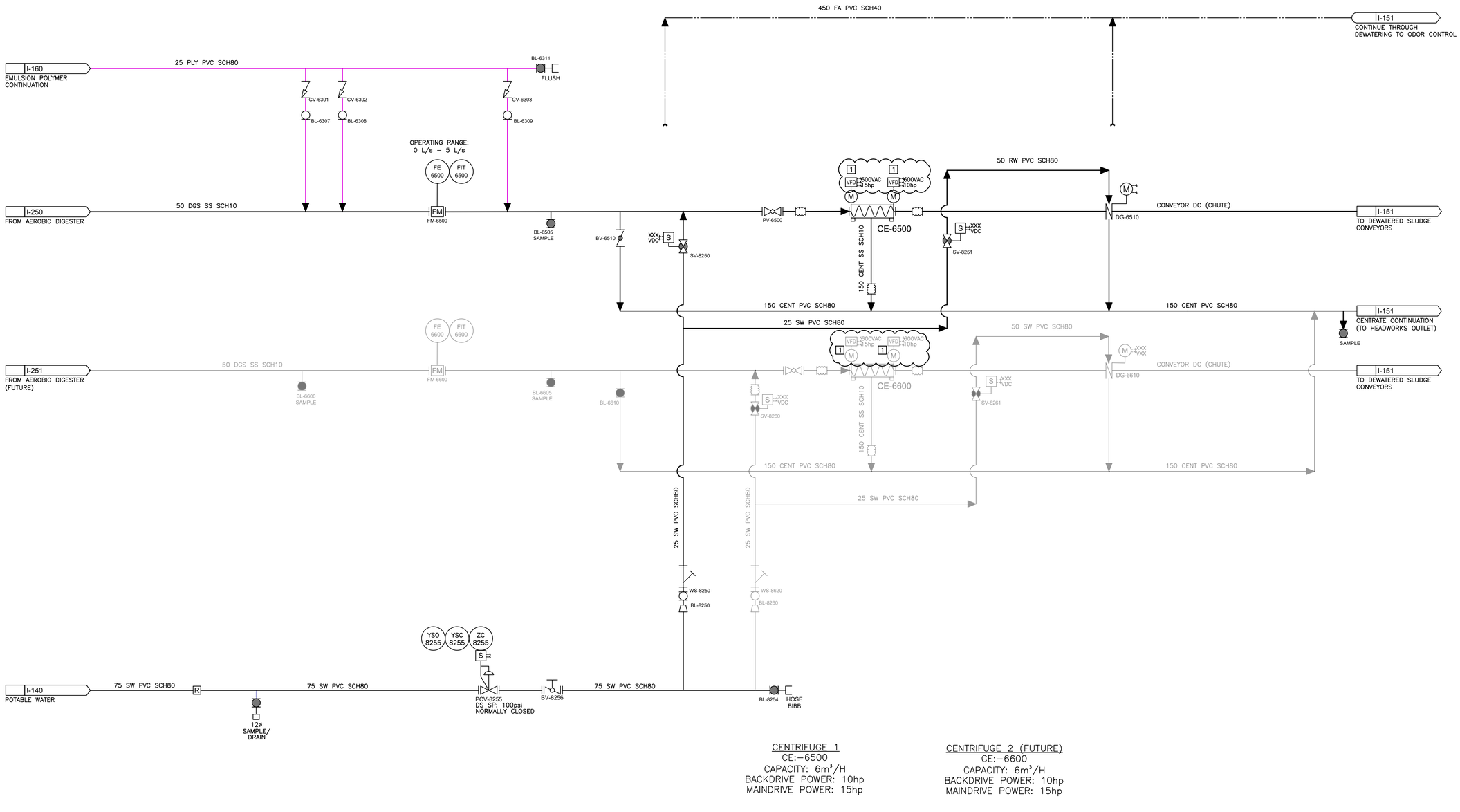

CENTRIFUGE 1
CE:–6500
CAPACITY: 6m³/H
BACKDRIVE POWER: 10hp
MAINDRIVE POWER: 15hp

CENTRIFUGE 2 (FUTURE)
CE:–6600
CAPACITY: 6m³/H
BACKDRIVE POWER: 10hp
MAINDRIVE POWER: 15hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.SMITH
Designed by: J.REYNOLDS
Drawn by: B.BRIGGS

NORTH CULTUS WWTP

CENTRUFUGE P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-150	C

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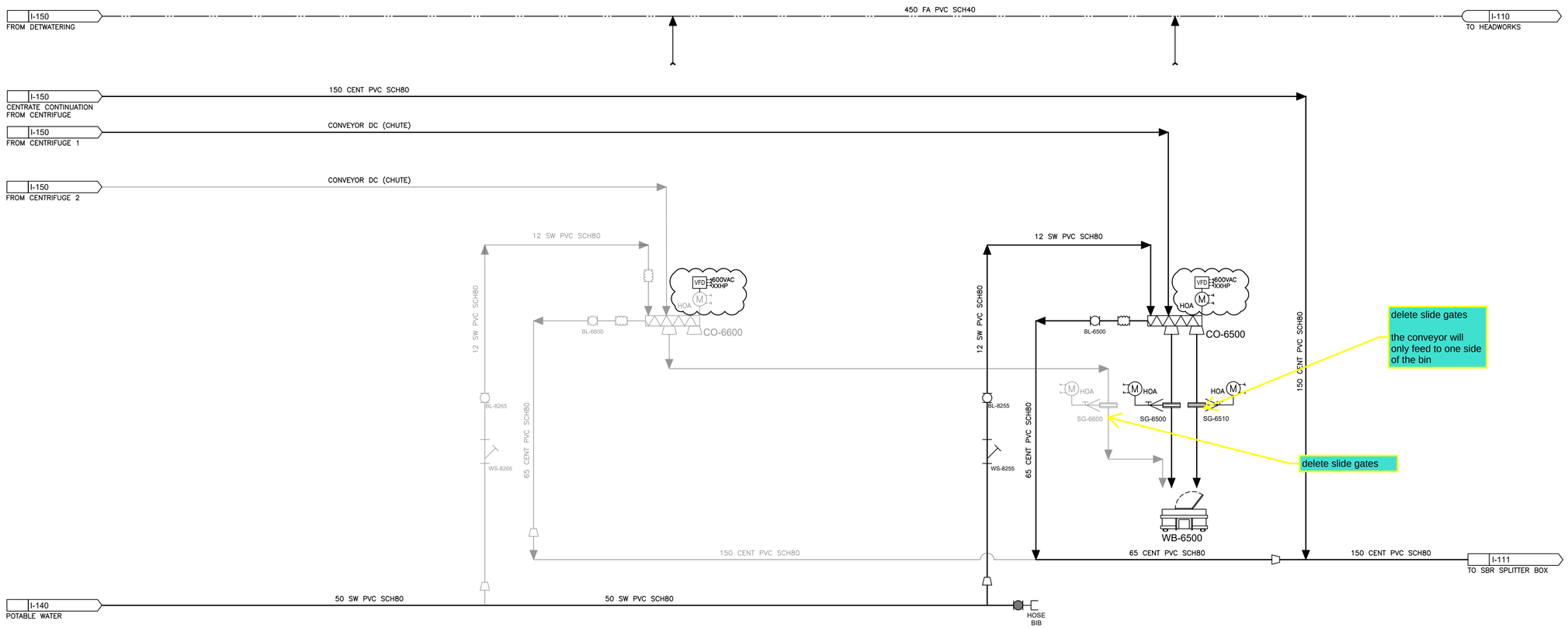

NOTES:
1. CLEANOUTS WILL BE REQUIRED ON SERVICE WATER DRAIN LINES FROM THE CONVEYOR.

CONVEYOR (FUTURE)
CO:-6600
CAPACITY: 260 kg/h
POWER: xx hp

CONVEYOR
CO:-6500
CAPACITY: 260 kg/h
POWER: xx hp

DEWATERED SLUDGE BIN
WB:-6500
CAPACITY: 18 m3

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Fraser Valley Regional District

URBAN systems

Scale
NOT TO SCALE

Quality Control by M.SMITH
Designed by J.REYNOLDS
Drawn by B.BRIGGS

NORTH CULTUS WWTP

DEWATERED SLUDGE STORAGE P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-151	C

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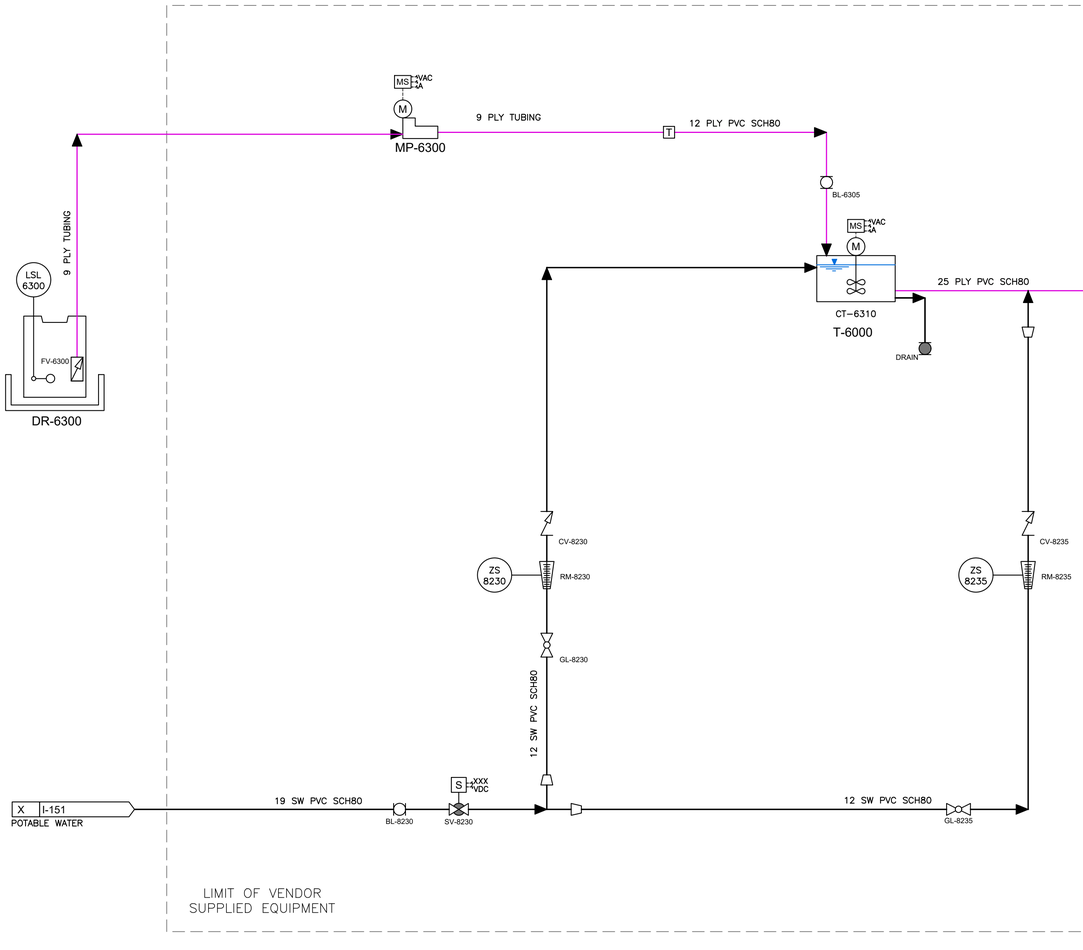

POLYMER DRUM
CT:–6300
CAPACITY: 0.2 m3
SPILL CONTAINMENT: 0.2 m3

POLYMER FEED PUMP
MP:–6300
CAPACITY: 4.5 L/h
MAX RPM: 30

POLYMER MIXER
MX:–6300
CAPACITY: 3000 L/h
POWER: 0.18 hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.SMITH
Designed by	J.REYNOLDS
Drawn by	B.BRIGGS

NORTH CULTUS WWTP

CENTRIFUGE POLYMER SYSTEM P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-160	C

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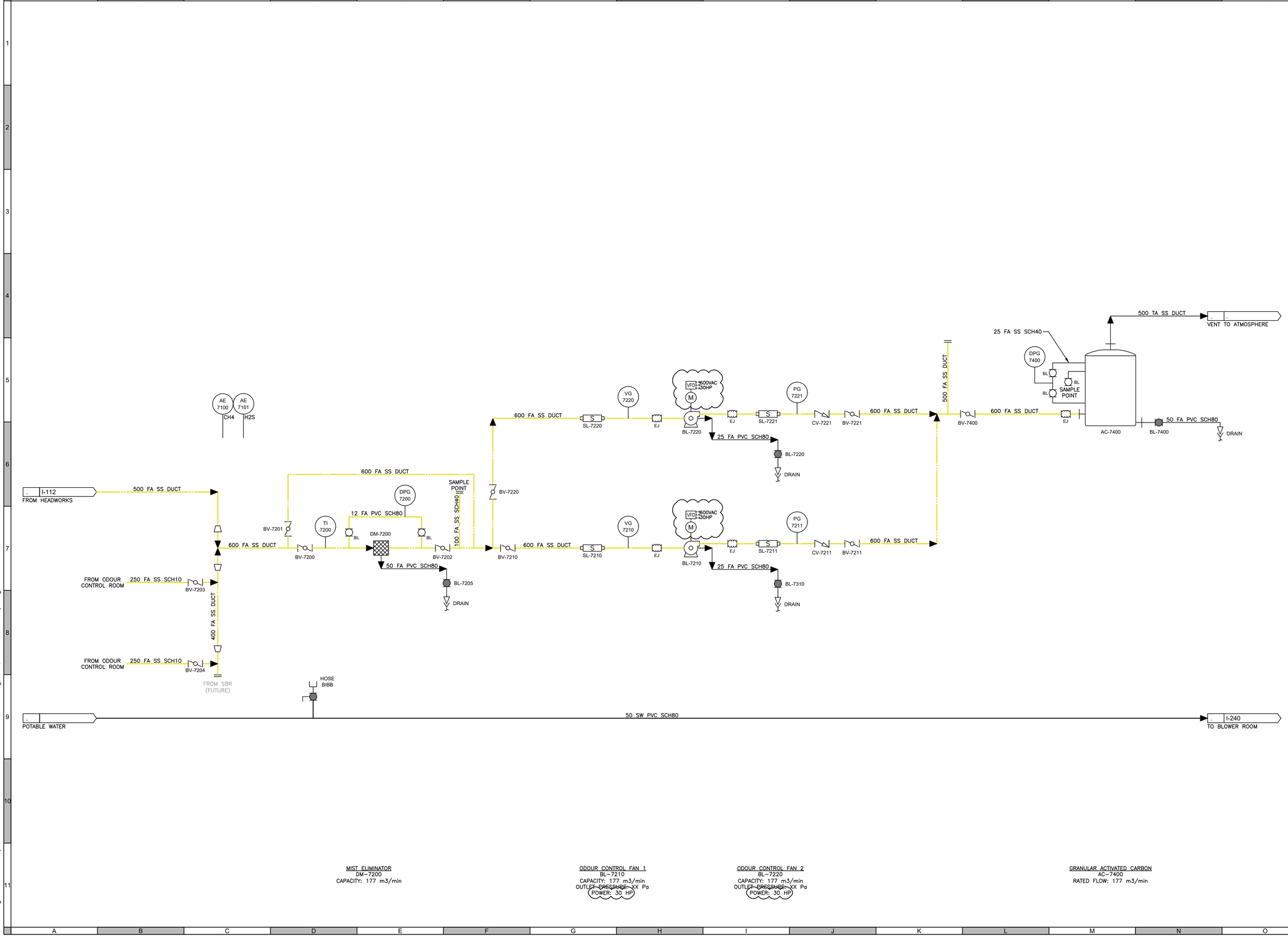

MIST ELIMINATOR
DM-7200
CAPACITY: 177 m3/min

ODOUR CONTROL FAN 1
BL-7210
CAPACITY: 177 m3/min
OUTLET PRESSURE XX Pa
POWER: 30 HP

ODOUR CONTROL FAN 2
BL-7220
CAPACITY: 177 m3/min
OUTLET PRESSURE XX Pa
POWER: 30 HP

GRANULAR ACTIVATED CARBON
AC-7400
RATED FLOW: 177 m3/min

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#	Date	Issue / Revision	App
A	2019/03/22	ISSUED FOR INFORMATION	J.R.
B	09/03/2019	ISSUED FOR INFORMATION	M.B.
C	19/06/2020	ISSUED FOR INFORMATION	M.B.
D	27/07/2020	ISSUED FOR INFORMATION	M.B.
E	13/04/2023	ELECTRICAL REVISION	A.W.

Fraser Valley Regional District

URBAN systems

Scale
NOT TO SCALE

Quality Control by M.BOULANGER
Designed by J. REYNOLDS
Drawn by MURDO SMITH

NORTH CULTUS WWTP

ODOUR CONTROL P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-170	E

ISSUED FOR INFORMATION

C:\Users\logan.minard\Desktop\PID CAD Files\PID-0999006902-ODOUR-CONTROL.dwg, I-170, 2023-04-14 02:44 pm logan.minard

NOTES:

1. MOTOR STARTER IS PART OF VENDOR SUPPLIED PACKAGE.
2. MOTOR STARTER SHIPPED LOOSE.

X I-130 FROM P–REMOVAL — 12 COG PVC SCH80 — X I-211 TO SBR #2

I-240 FROM SBR BLOWERS — 150 PA SS SCH10 — I-211 CONTINUATION TO SBR #2

100 FA PVC SCH40 — I-170 TO OUDOR CONTROL

100 WAS PVC DR25 — X I-250 TO AEROBIC DIGESTERS

X I-112 FROM HEADWORKS — 250 SRS PVC DR25

250 SRS PVC DR25 — 250 SRS SS SCH40

100 FA PVC SCH40 — BV-2100 — EJ-2100

150 PA SS SCH10 — BV-2101 — SV-2100 — BL-2105

BV-2102 — 100 PA SS SCH10 — 100 PA PVC SCH40 — 19 PA PVC SCH80

EJ

BV-2103 — SV-2101 — BL-2106 — BV-2104 — SV-2102 — BL-2107 — BV-2105 — SV-2103 — BL-2108

12 COG PVC SCH80

LSHH 2101 — LIT 2100 — LE 2100 — AIT 2100 — AE 2100 — DO

MX-2110 — TD

100 WAS SS SCH40 — 200 SE SS SCH40 — DE-2130 — HS 2120 — SPD 2120 — SP-2120

T-2100

BL-2103 HB — 75 SW PVC SCH80 — GV-2101

FROM SBR 2 — I-310 TO EQ TANK

POTABLE WATER — 75 SW PVC DR25

SBR TANK #1
T–2100
CAPACITY (FWL): 523 m3

SUBMERSIBLE MIXER
MX–2110
POWER: 4 hp

SUBMERSIBLE PUMP
SP–2120
CAPACITY: 7.6 L/s
TDH: 6.0 m
POWER: 2.2 hp

DECANTER
DE–2130
POWER: 0.25 hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: M. SCHAAD
Drawn by: T. PURCER

NORTH CULTUS WWTP
SEQUENCING BATCH REACTOR
#1 P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-210	B

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NOTES:

1. MOTOR STARTER IS PART OF VENDOR SUPPLIED PACKAGE.
2. MOTOR STARTER SHIPPED LOOSE.

X I-130 — FROM SBR #1 P—REMOVAL CONNECTION — 12 COG PVC SCH80

I-210 — FROM SBR #1 FOUL AIR CONNECTION — 100 FA PVC SCH40 — 100 FA PVC SCH40 — I-170 TO OUDOR CONTROL

X I-210 — FROM SBR #1 WAS PUMP — 100 WAS PVC DR25 — 100 WAS PVC DR25 — X I-250 TO AEROBIC DIGESTERS

I-240 — FROM SBR BLOWERS — 150 PA SS SCH10

X I-112 — FROM HEADWORKS — 250 SRS PVC DR25

250 SRS PVC DR25 — T — 250 SRS SS SCH40

100 FA PVC SCH40 — BV-2200 — EJ-2200

150 PA SS SCH10 — BV-2200 — EJ — SV-2200 — BL-2205 — SV-2201 — BL-2206 — SV-2202 — BL-2207 — SV-2203 — BL-2208

BV-2202 — BV-2203 — BV-2204 — BV-2205

100 PA SS SCH10 — T — 100 PA PVC SCH40 — 19 PA PVC SCH80

12 COG PVC SCH80

75 WAS SS SCH40 — T

LSHH 2201 — LIT 2200 — LE 2200 — AIT 2200 — AE 2200 — DO

1 MS VAC HOA — MX-2210 — TD

1 2 VFD HOA — DE-2230 — HS 2220 — SPD 2220 — 1 MS VAC HOA — SP-2220

200 SE SS SCH40 — I-310 TO EQ TANK

SBR TANK #2	SUBMERSIBLE MIXER	SUBMERSIBLE PUMP	DECANTER
T-2200	MX-2210	SP-2220	DE-2230
CAPACITY (FWL): 523 m3	POWER: 4 hp	CAPACITY: 7.0 L/s TDH: 6.0 m POWER: 2.2 hp	POWER: 0.25 hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M. SCHAAD
Drawn by	T. PURCER

NORTH CULTUS WWTP
SEQUENCING BATCH REACTOR #2 P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-211	B

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VENDER SCOPE OF SUPPLY

TSH 2510
DPI 2510
AF-2510
PSL 2510
VFD
M
HOA
BR-2510
PI 2511
TSH 2511
TI 2511
PR-2511
SL-2510
SL-2511
CV-2511
BV-2510
BV-2511
EJ
150_PA_SS_SCH10
100_PA_SS_SCH10

VENDER SCOPE OF SUPPLY

TSH 2520
DPI 2520
AF-2520
PSL 2520
BR-2520
PI 2521
TSH 2521
TI 2521
PR-2521
SL-2520
SL-2521
CV-2521
BV-2520
BV-2521

VENDER SCOPE OF SUPPLY

TSH 2530
DPI 2530
AF-2530
PSL 2530
BR-2530
PI 2531
TSH 2531
TI 2531
PR-2531
SL-2530
SL-2531
CV-2531
BV-2530
BV-2531

DRAIN
BV-2541
BV-2543
BV-2512
BV-2513
250_PA_SS_SCH10
I-210
TO SBR 1 & 2
I-260
COMMON AIR HEADER
I-260
TO DIGESTER BLOWERS

POTABLE WATER
50_SW_PVC_SCH80
HOSE BIBB

SBR BLOWER No. 1
BR-2510
CAPACITY: 289 Nm3/h
OUTLET PRESSURE: 60.3 kPa
POWER: 15 hp

SBR BLOWER No. 2
BR-2520
CAPACITY: 289 Nm3/h
OUTLET PRESSURE: 60.3 kPa
POWER: 15 hp

SRB BLOWER No. 3
BR-2530
CAPACITY: 289 Nm3/h
OUTLET PRESSURE: 60.3 kPa
POWER: 15 hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

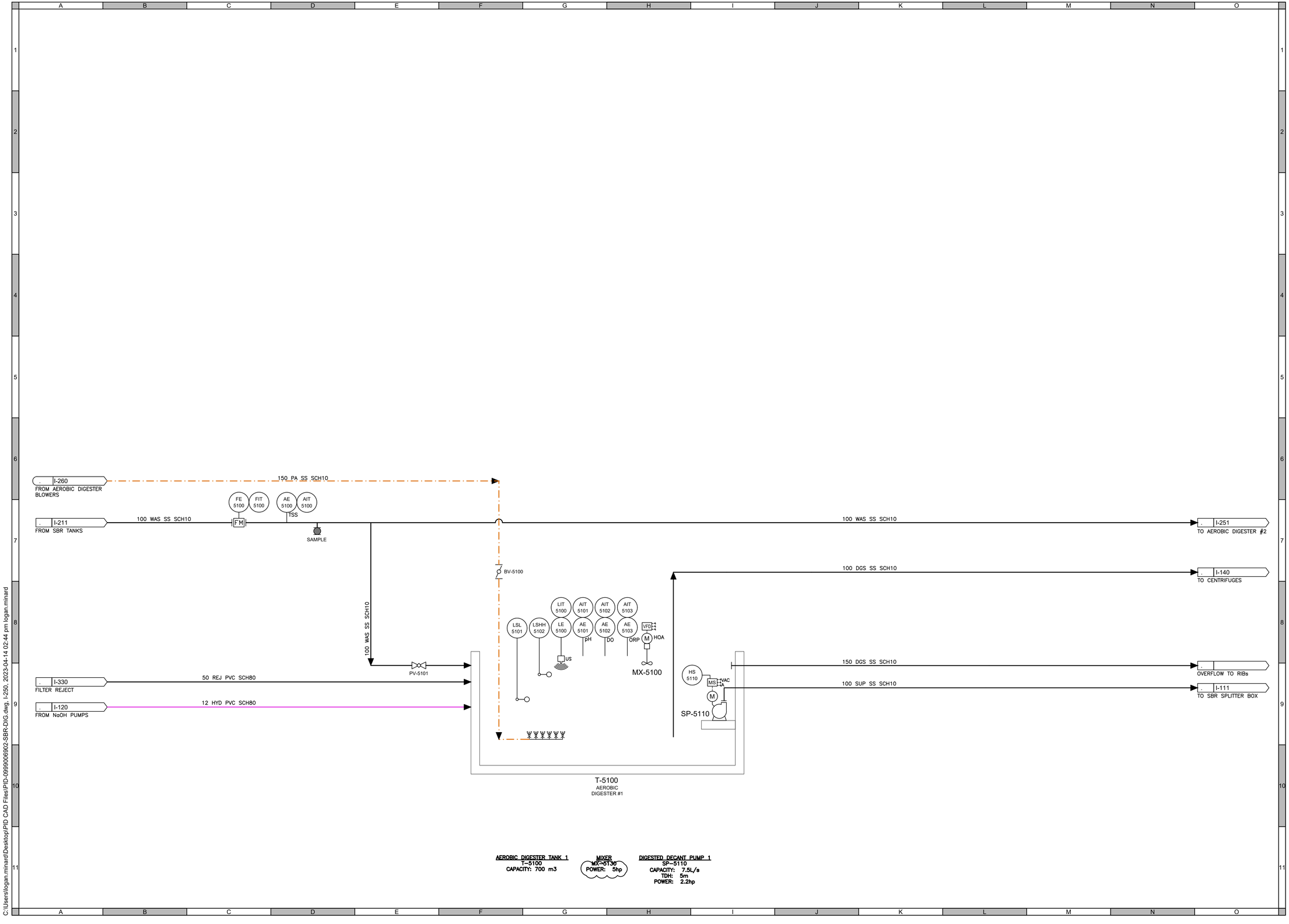
Quality Control by: M.BOULANGER
Designed by: M.SCHAAD
Drawn by: MURDO SMITH

NORTH CULTUS WWTP

SBR BLOWER P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-240	C



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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M. SCHAAD
Drawn by	T. PURCER

NORTH CULTUS WWTP

AEROBIC DIGESTER #1 P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-250	B

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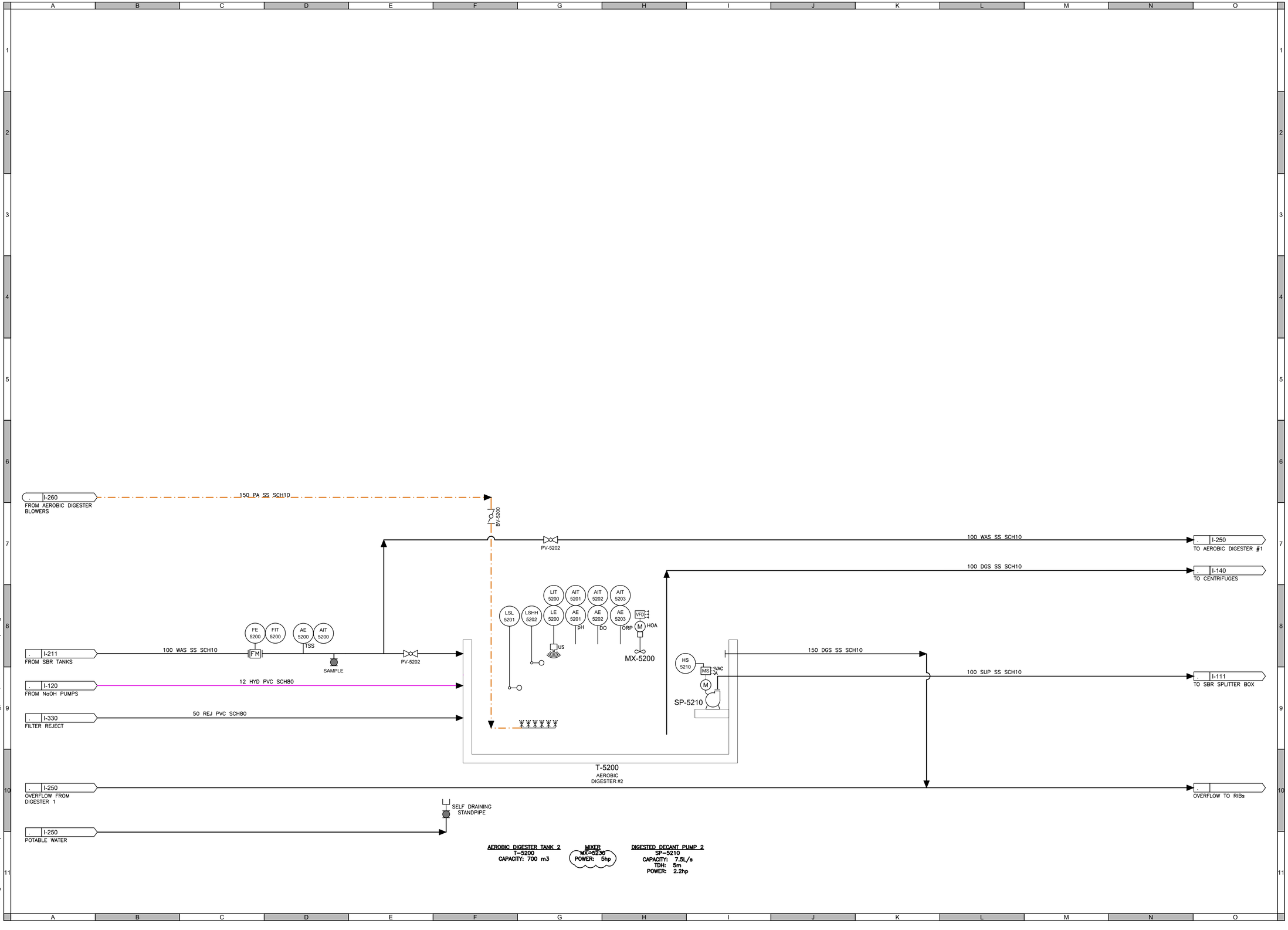

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Fraser Valley Regional District

URBAN systems

Scale
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Quality Control by M.BOULANGER
Designed by M. SCHAAD
Drawn by T. PURCER

NORTH CULTUS WWTP
AEROBIC DIGESTER #2 P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-251	B

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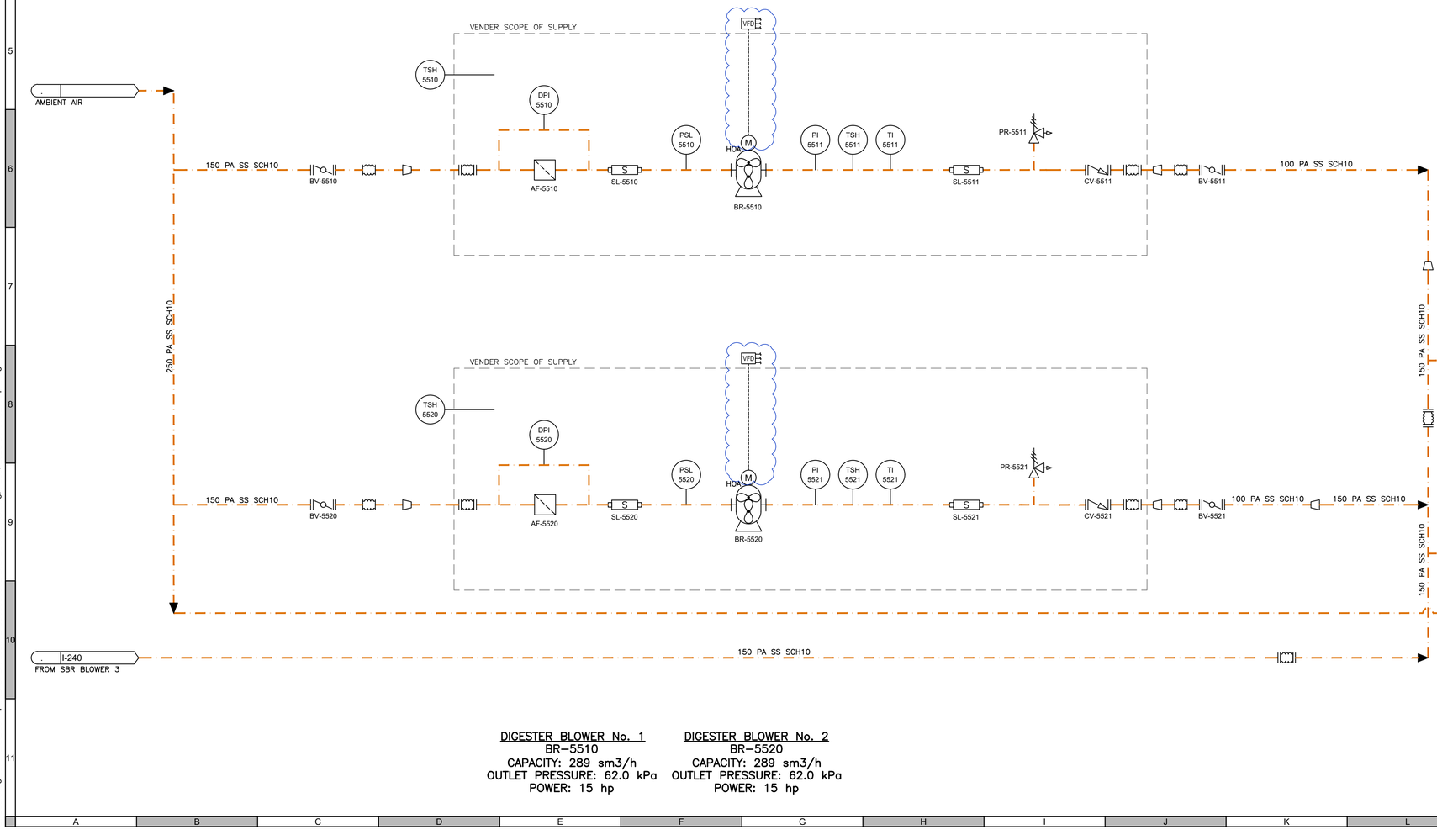

DIGESTER BLOWER No. 1
BR-5510
CAPACITY: 289 sm3/h
OUTLET PRESSURE: 62.0 kPa
POWER: 15 hp

DIGESTER BLOWER No. 2
BR-5520
CAPACITY: 289 sm3/h
OUTLET PRESSURE: 62.0 kPa
POWER: 15 hp

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M. SCHAAD
Drawn by	MURDO SMITH

NORTH CULTUS WWTP

DIGESTER BLOWER P&ID

Sheet Number	# of 57

Project Number	Drawing Number	Revision
0999.0069.02	I-260	C

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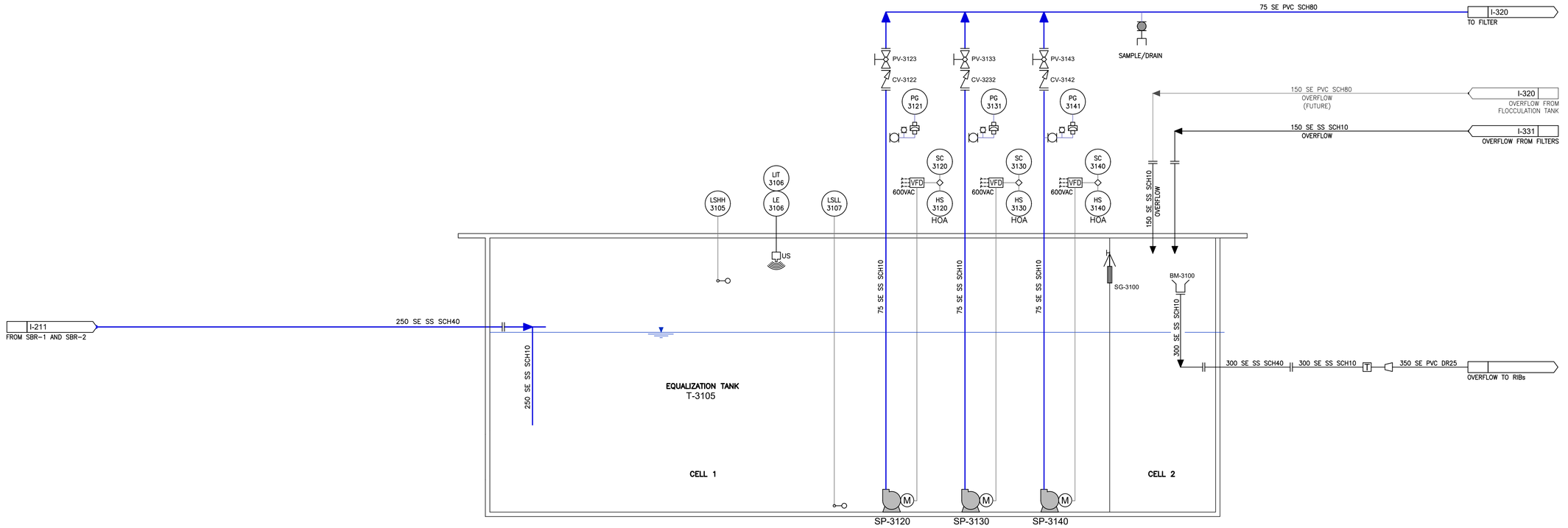

EQUALIZATION TANK
TAG: T-3105
ACTIVE DEPTH: 4.8m
ACTIVE STORAGE: 205m³

EQUALIZATION PUMPS
TAGS: SP-3120/3130/3140
SUBMERSIBLE SOLIDS HANDLING
CONFIGURATION: 2 DUTY, 1 STANDBY
DESIGN FLOW: 5.0 L/sec
TDH: ~9.8m
POWER: ~7.5HP
VOLT: 600AC

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.SMITH
Designed by: M.SCHAAD
Drawn by: S.DODD

NORTH CULTUS WWTP
EQUALIZATION TANK P&ID

Sheet Number: # of 57
Project Number: 0999.0069.06
Drawing Number: I-310
Revision: B

ISSUED FOR INFORMATION

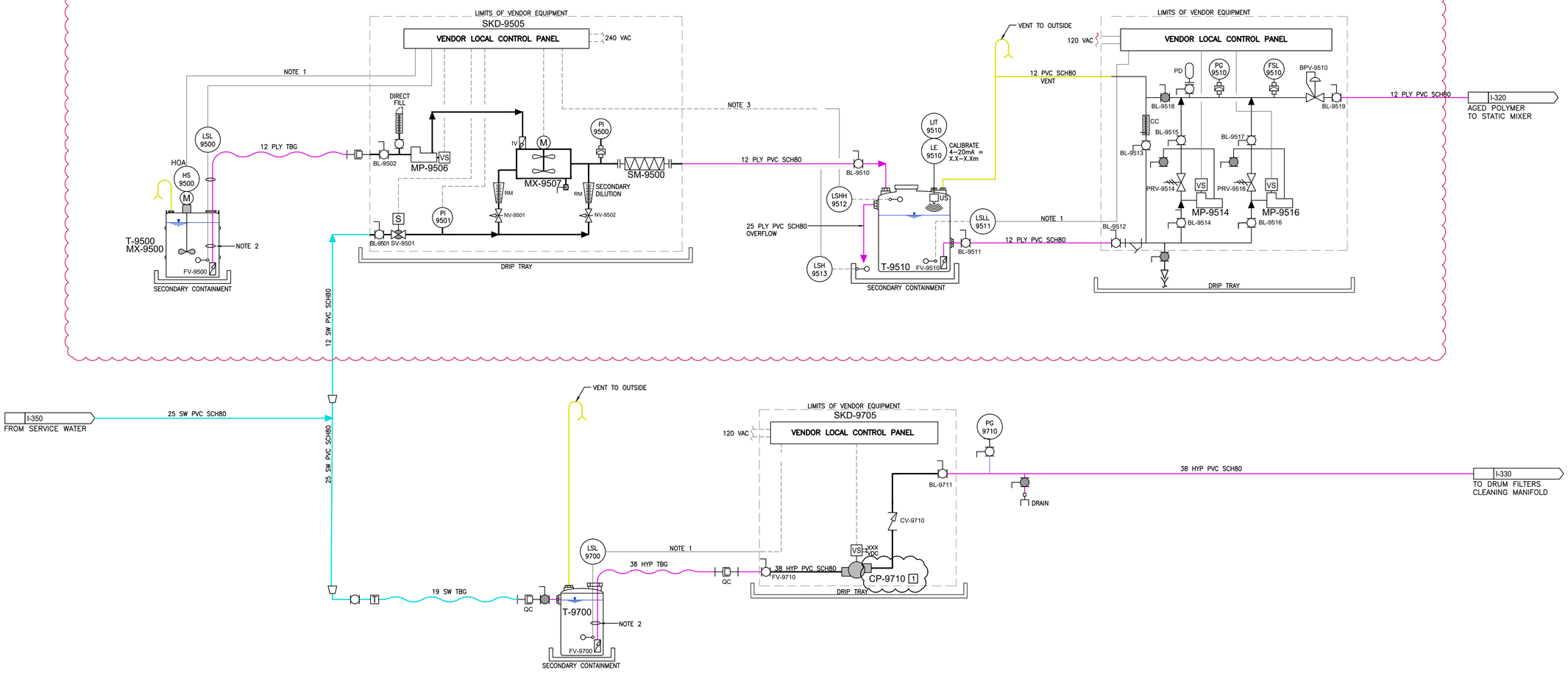
NOTES:

1. TANK/CONTAINER LOW LEVEL SWITCH TO DRY CONTACT INPUT ON VENDOR SUPPLIED CONTROL PANEL TO PROVIDE PUMP CUT-OUT. ALARM TO BE RELAYED THROUGH VENDOR PANEL TO PLC.
2. PVC PIPE C/W FOOT VALVE. LOW LEVEL FLOAT SWITCH TO BE ATTACHED TO SUCTION PIPE WITH NYLON ZIP TIES. PROVIDE HOSE BARB AT TOP OF PIPE FOR TUBING CONNECTION.
3. HIGH-HIGH-LEVEL AGING TANK ALARM TO DRY CONTACT INPUT ON VENDOR SUPPLIED MAKE-DOWN SKID CONTROL PANEL AND INITIATE IMMEDIATE SHUTDOWN OF MAKE-DOWN SYSTEM INCLUDING SERVICE WATER FEED.

NOTES:

1 FILTER MEDIA CLEANING PUMP MOTOR STARTER TO BE PROVIDED AS PART OF DRUM FILTER CONTROL PANEL.

POLYMER MAKE-DOWN AND DOSING SYSTEM INSTALLATION WILL BE INITIALLY DEFERRED. SYSTEM MAY BE NECESSARY IF EFFLUENT QUALITY OBJECTS CANNOT BE ACHIEVED WITHOUT FLOCCULATION.



BULK POLYMER EMULSION STORAGE

TAG: T-9500
TANK TYPE: POLY
VOLUME: 200L
CONCENTRATION: 20%

DRUM STORED ON PALLET
STYLE SECONDARY CONTAINMENT

CONTAINS MIXER (MX-9500)
CONTROLLED FROM SKD-9505 VENDOR PANEL

POLYMER MAKE-DOWN SKID

BULK POLYMER (NEAT) DEMAND: 0.005 TO 0.2 L/hr
SERVICE WATER DEMAND: 1 TO 100 L/hr

BULK POLYMER DRUM MIXER
120VAC, 0.5HP
PERISTALTIC FEED PUMP
120VAC, 0.5HP
ACTIVATION MIXER
240VAC, 1HP

FILTER MEDIA CLEANING SOLUTION DAY TANK

TAG: T-9700
TYPE: POLY
VOLUME: 200L
CHEMICAL TYPE: SODIUM HYPOCHLORITE
CONCENTRATION: 3.0%

FILTER MEDIA CLEANING PUMP

PUMP TYPE: CENTRIFUGAL
POWER: 3 hp

ACTIVATED POLYMER AGING TANK

TAG: T-9510
VOLUME: 500L
POLYMER CONCENTRATION: 0.5 TO 1.0%

AGED POLYMER METERING SKID

PUMP TAGS: MP-9514, P-9516
SKID TYPE: DUPLEX
PUMP TYPE: DIAPHRAGM
FLOW RANGE: 10 TO 1500mL/min

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Fraser Valley Regional District

URBAN systems

Scale
NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M.BOULANGER
Drawn by	MURDO SMITH

NORTH CULTUS WWTP
FILTRATION CHEMICAL SYSTEMS P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-315	B

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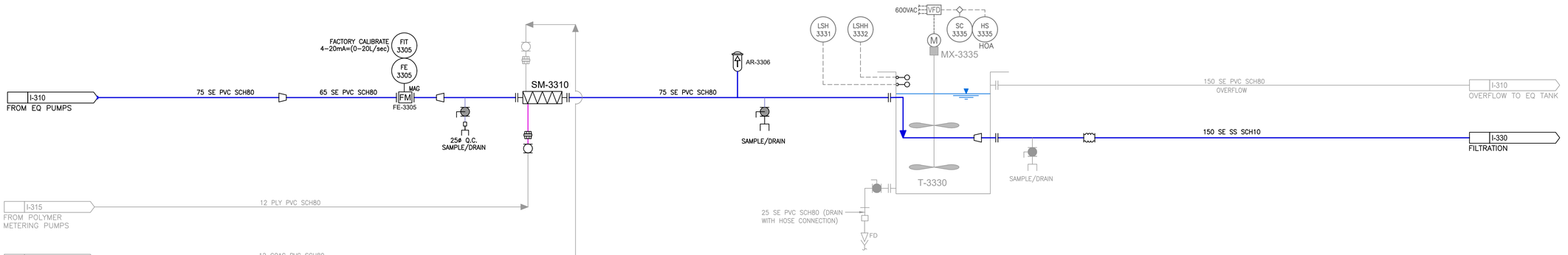

STATIC MIXER 1

TAG: SM-3310
TYPE: WAFER
SIZE: 6S
CHEMICAL PORT 1: EMULSIFIED POLYMER
CHEMICAL PORT 2: COAGULANT (FUTURE)
CoV:
CONNECTION: 12ø INJECTION
MATERIAL: SS

FLOCCULATION TANK

TAG: T-3330
NOTE 1 – VOLUME: ≈2.80m³
TYPE: OPEN TOP

FLOCCULATION MIXER

TAG: MX-3335
POWER: 0.50HP
TYPE: TOP MOUNTED AGITATOR C/W
SUPPORT FRAME

NOTES:

1. CONSERVATIVELY SIZED. REVIEW WHEN PROCURING IN THE FUTURE.

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M.BOULANGER
Drawn by	MURDO SMITH

NORTH CULTUS WWTP
FLOCCULATION P&ID

Sheet Number # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-320	B

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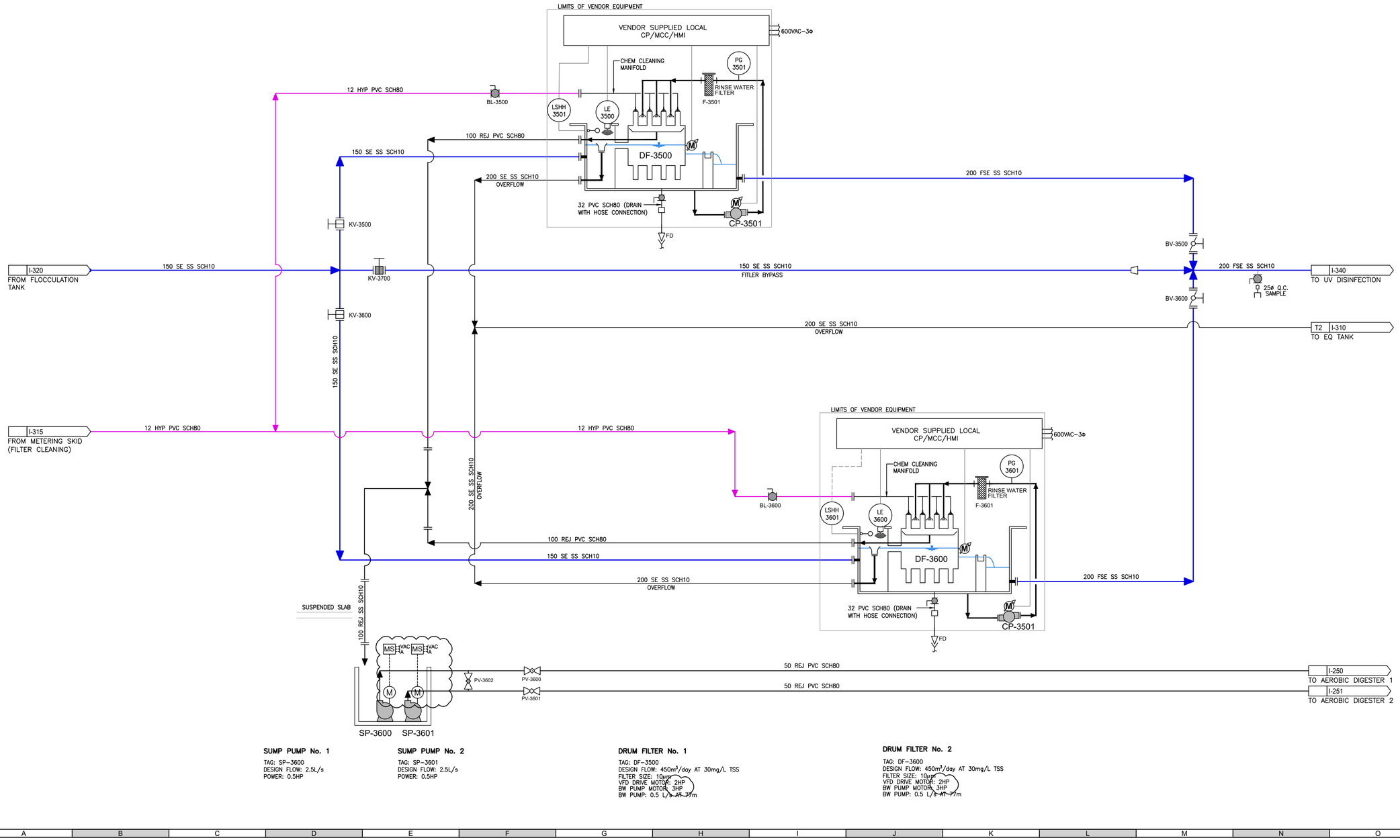

SUMP PUMP No. 1

TAG: SP-3600
DESIGN FLOW: 2.5L/s
POWER: 0.5HP

SUMP PUMP No. 2

TAG: SP-3601
DESIGN FLOW: 2.5L/s
POWER: 0.5HP

DRUM FILTER No. 1

TAG: DF-3500
DESIGN FLOW: 450m³/day AT 30mg/L TSS
FILTER SIZE: 10µm
VFD DRIVE MOTOR: 2HP
BW PUMP MOTOR: 3HP
BW PUMP: 0.5 L/s AT 7m

DRUM FILTER No. 2

TAG: DF-3600
DESIGN FLOW: 450m³/day AT 30mg/L TSS
FILTER SIZE: 10µm
VFD DRIVE MOTOR: 2HP
BW PUMP MOTOR: 3HP
BW PUMP: 0.5 L/s AT 7m

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Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by	M.BOULANGER
Designed by	M.BOULANGER
Drawn by	MURDO SMITH

NORTH CULTUS WWTP
TERTIARY FILTRATION P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-330	B

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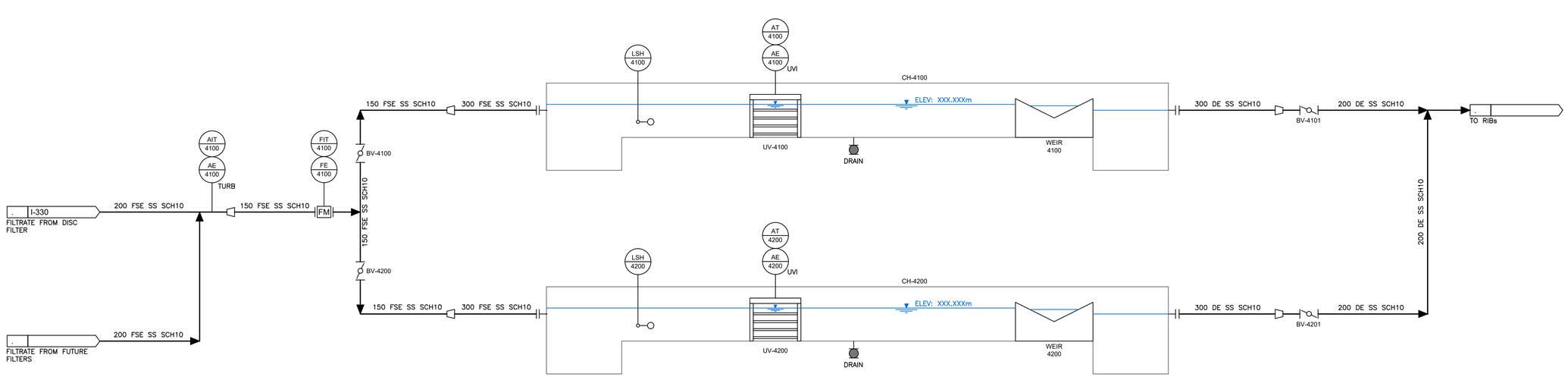

UV CHANNEL 1
UV-4100
CAPACITY: 750 m3/d
POWER: 2.1 kW

UV CHANNEL 2
UV-4200
CAPACITY: 750 m3/d
POWER: 2.1 kW

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#	Date	Issue / Revision	App
A	----	ISSUED FOR INFORMATION	J.R.
B	09/03/2019	ISSUED FOR INFORMATION	M.B.
C	13/04/2023	ELECTRICAL REVISION	A.W.

Fraser Valley Regional District

URBAN systems

Scale: NOT TO SCALE

Quality Control by: M.BOULANGER
Designed by: J.REYNOLDS
Drawn by: B.BRIGGS

NORTH CULTUS WWTP

UV P&ID

Sheet Number: # of 57

Project Number	Drawing Number	Revision
0999.0069.06	I-340	C

ISSUED FOR INFORMATION

C:\Users\logan.minard\Desktop\PID CAD Files\PID-0999006902-UV.dwg, I-340, 2023-04-14 02:44 pm logan.minard

AREA ENLARGEMENT 1
1:250

0 1:250 10m

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PERMIT TO PRACTICE NUMBER:
1000208

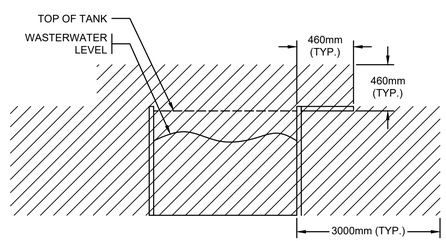
LEGEND

- DENOTES C.E.C CLASS 1, ZONE 1
- DENOTES C.E.C CLASS 1, ZONE 2

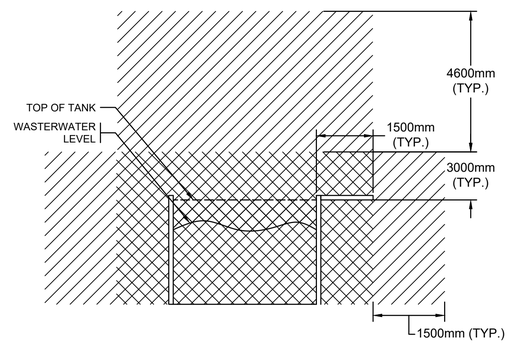
LOCATION	VENTILATION	FLAMMABLE MATERIAL	GAS DETECTION	CLASS	ZONE	EXTENT OF CLASSIFICATION	GAS GROUP	AUTO-IGNITION TEMPERATURE
DEWATERING ROOM	6 ACH	SEWER GAS	NO	UNCLASSIFIED			IIA	600°C
NaOH ROOM	NNV	SEWER GAS	NO	UNCLASSIFIED			IIA	600°C
HEADWORKS	12 ACH	SEWER GAS	NO	CLASS I	ZONE 2	ENCLOSED SPACE	IIA	600°C
WASTE WET WELL	NNV	SEWER GAS	NO	CLASS I	ZONE 2	ENCLOSED SPACE	IIA	600°C
ODOUR CONTROL ROOM	6 ACH	SEWER GAS	NO	CLASS I	ZONE 2	AREAS WITHIN 0.9m OF LEAKAGE SOURCES	IIA	600°C
BLOWER ROOM	NNV	SEWER GAS	NO	UNCLASSIFIED			IIA	600°C
SEQUENCING BATCH REACTORS	OPEN	SEWER GAS	NO	CLASS I	ZONE 2	ABOVE TANK: V: 0.46m H: 0.46m AT GRADE: V: 0.46m H: 3m	IIA	600°C
EQUALIZATION TANK	OPEN	SEWER GAS	NO	CLASS I	ZONE 2	ABOVE TANK: V: 0.46m H: 0.46m AT GRADE: V: 0.46m H: 3m	IIA	600°C
DIGESTORS	OPEN	SEWER GAS	NO	CLASS I	ZONE 1/ZONE 2	ZONE 1: TANK INTERIOR ABOVE TANK: V: 3m H: 1.5m ZONE 2: SURROUNDING ZONE 1 ENVELOPE: V: 4.6m H: 1.5m	IIA	600°C
FILTER BUILDING	NNV	SEWER GAS	NO	UNCLASSIFIED			IIA	600°C
RECLAIMED WATER WET WELL	NNV	N/A	NO	UNCLASSIFIED			IIA	600°C

1 - EXTENT OF CLASSIFICATION ENVELOPE DISTANCE IS MEASURE FROM THE FACE OF EQUIPMENT WALLS AND/OR OPEN CHANNELS
NNV – NOT NORMALLY VENTILATED
ACH – AIR CHANGES PER HOUR

DETAIL 1 HAZARDOUS AREA CLASSIFICATIONS
N.T.S.



DETAIL 2 OPEN TANK EXTENT OF CLASSIFICATION
N.T.S.



DETAIL 3 OPEN TANK EXTENT OF CLASSIFICATION
N.T.S.

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www.pbxeng.com

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ISSUED FOR REVIEW
APRIL 06, 2023
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Professional Seals

#	Date	Issue / Revision	App
1	MAR 2023	ISSUED FOR REVIEW	AW
2	APR 2023	ISSUED FOR REVIEW	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale SCALE NOT SELECTED 1:XXX

Quality Control by IN
Designed by AW
Drawn by PBX

NORTH CULTUS WWTP
HAZARDOUS AREA CLASSIFICATION

Sheet Number 1 of 7
Project Number 230190
Drawing Number E000
Revision ----

NOT FOR CONSTRUCTION

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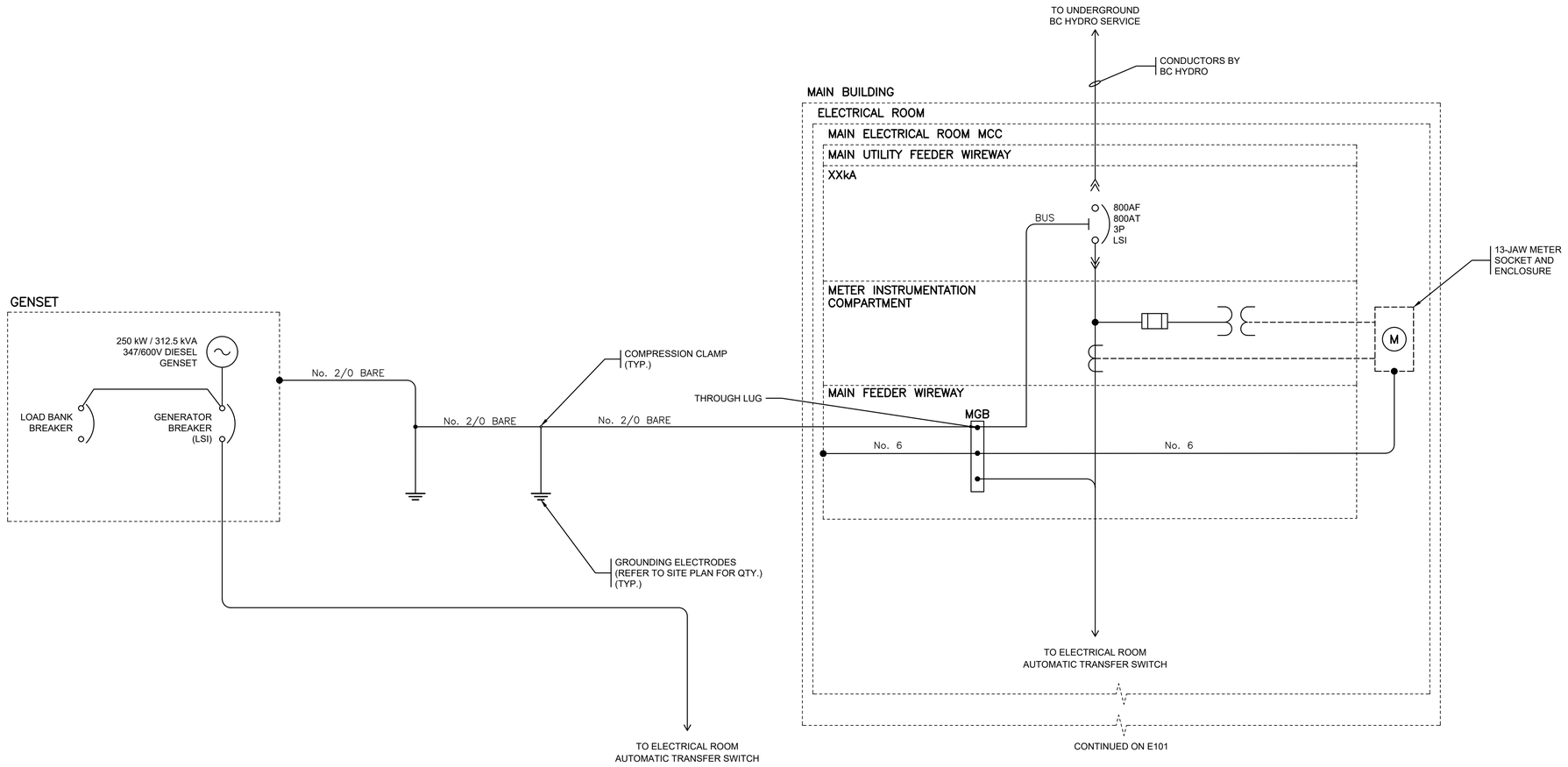
PERMIT TO PRACTICE NUMBER:
1000208



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APRIL 14, 2023
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Professional Seals

#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale SCALE NOT SELECTED
1:XXX

Quality Control by	IN
Designed by	AW
Drawn by	PBX

NORTH CULTUS WWTP
SINGLE LINE DIAGRAM (1 OF 5)

Sheet Number		1 of 7
Project Number	Drawing Number	Revision
230190	E100	1

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PBX ENGINEERING LTD.
PERMIT TO PRACTICE NUMBER:
1000208

MAIN BUILDING

ELECTRICAL ROOM

MAIN ELECTRICAL ROOM MCC

FROM GENSET

FROM HYDRO SERVICE ENTRANCE

ATS

800A/3P
600V
SOLID NEUTRAL

347/600V, 3PH., 4W, XXXA, XXkA

XXA XP

XFMR

347/600V
30kVA
120/240V

TO MGB

120V PANELBOARD

120/240V, 1PH., 3W, 200A, XXkA

5% LINE REACTOR

VFD

DV/DT FILTER

DRAWING CONTINUED ON E102

GRIT REMOVAL CONTROL PANEL

POLYMER CONTROL PANEL

NaOH CONTROL PANEL

VENDOR SUPPLIED EQUIPMENT

BLOWER CONTROL CABINET

0.75	0.5	3	3	1	XX	XX	XX	0.18	XX	XX	XX	XX	15	15	15	15	15	30	30
MECHANICAL SCREEN (MS-1100)	GRIT VORTEX REMOVAL (GV-1300)	GRIT PUMP (CP-1310)	GRIT PUMP (FUTURE) (CP-1320)	GRIT CLASSIFIER (GC-1340)	SUBMERSIBLE PUMP 1 (CP-1650)	SUBMERSIBLE PUMP 2 (CP-1655)	POLYMER FEED PUMP (MP-6300)	POLYMER MIXER (MX-6300)	SBR NaOH PUMP 1 (MP-9110)	SBR NaOH PUMP 2 (MP-9120)	DIGESTER NaOH PUMP 1 (MP-9130)	DIGESTER NaOH PUMP 2 (MP-9140)	SBR BLOWER 1 (BR-2510)	SBR BLOWER 2 (BR-2520)	SBR BLOWER 3 (BR-2530)	DIGESTER BLOWER 1 (BR-5510)	DIGESTER BLOWER 2 (BR-5520)	ODOUR CONTROL FAN 1 (BL-7210)	ODOUR CONTROL FAN 2 (BL-7220)

WET WELL TANK (T-1600)

POLYMER DRUM (CT-6300)

BUILDING HEATING

BUILDING VENTILATION

HEADWORKS

DEWATERING ROOM

NaOH ROOM

BLOWER ROOM

ODOUR CONTROL ROOM

MECHANICAL ROOM

LEGEND

	LIGHT LINETYPE DENOTES FUTURE EQUIPMENT
	BOLD DENOTES EQUIPMENT SUPPLIED AND INSTALLED BY CONTRACTOR
	BLUE LINETYPE DENOTES VENDOR SUPPLIED EQUIPMENT INSTALLED BY CONTRACTOR

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APRIL 14, 2023
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Professional Seals

#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale SCALE NOT SELECTED 1:XXX

Quality Control by	IN
Designed by	AW
Drawn by	PBX

NORTH CULTUS WWTP
SINGLE LINE DIAGRAM (2 OF 5)

Sheet Number	2 of 7
Project Number	230190
Drawing Number	E101
Revision	1

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MAIN BUILDING

ELECTRICAL ROOM

DRAWING CONTINUED ON E101

DRAWING CONTINUED ON E103

MAIN ELECTRICAL ROOM MCC

347/600V, 3PH., 4W, XXXA, XXkA

XXA XP

5% LINE REACTOR

VFD

DV/DT FILTER

3 DGS FEED PUMP 1 (CP-6100)

3 DGS FEED PUMP 2 (CP-6110)

15 CENTRIFUGE 1 (MAIN DRIVE) (CE-6500)

10 CENTRIFUGE 1 (BACK DRIVE) (CE-6500)

XX SLUDGE CONVEYOR (CO-6500)

5 AEROBIC DIGESTER MIXER 1 (MX-5130)

2.2 DIGESTER SLUDGE PUMP 1 (SP-5110)

AEROBIC DIGESTER #1 (T-5100)

5 AEROBIC DIGESTER MIXER 2 (MX-5230)

2.2 DIGESTER SLUDGE PUMP 2 (SP-5210)

AEROBIC DIGESTER #2 (T-5200)

CENTRIFUGE CONTROL PANEL

CENTRIFUGE CONTROL PANEL (FUTURE)

3 DGS FEED PUMP 3 (FUTURE) (CP-6200)

15 CENTRIFUGE 2 (MAIN DRIVE) (CE-6600) (FUTURE)

10 CENTRIFUGE 2 (BACK DRIVE) (CE-6600) (FUTURE)

XX SLUDGE CONVEYOR (FUTURE) (CO-6600)

DEWATERING ROOM

LEGEND	
	LIGHT GREY DENOTES FUTURE PROPOSED EQUIPMENT
	BOLD DENOTES PROPOSED EQUIPMENT TO BE INSTALLED
	BLUE LINETYPE DENOTES VENDOR SUPPLIED EQUIPMENT INSTALLED BY CONTRACTOR

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#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale 1:XXX SCALE NOT SELECTED

Quality Control by IN
Designed by AW
Drawn by PBX

NORTH CULTUS WWTP
SINGLE LINE DIAGRAM (3 OF 5)

Sheet Number 3 of 7
Project Number 230190
Drawing Number E102
Revision 1

NOT FOR CONSTRUCTION

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PERMIT TO PRACTICE NUMBER:
1000208

MAIN BUILDING

ELECTRICAL ROOM

DRAWING CONTINUED ON E102

MAIN ELECTRICAL ROOM MCC

347/600V, 3PH., 4W, XXXA, XXkA

XXA XP

5% LINE REACTOR

VFD

DV/DT FILTER

SBR CONTROL PANEL

4 SBR TANK 1 SUBMERSIBLE MIXER (MX-2110)

2.2 SLUDGE WASTING PUMP 1 (SP-2120)

0.25 SBR TANK 1 DECANTER (DE-2130)

SBR TANK 1 (T-2100)

4 SBR TANK 2 SUBMERSIBLE MIXER (MX-2210)

2.2 SLUDGE WASTING PUMP 2 (SP-2220)

0.25 SBR TANK 2 DECANTER (DE-2230)

SBR TANK 2 (T-2200)

7.5 EQUALIZATION PUMP 1 (SP-3120)

7.5 EQUALIZATION PUMP 2 (SP-3130)

7.5 EQUALIZATION PUMP 3 (SP-3140)

EQUALIZATION TANK (T-3105)

TO FILTER BUILDING

LEGEND

LIGHT GREY DENOTES FUTURE PROPOSED EQUIPMENT	
BOLD DENOTES PROPOSED EQUIPMENT TO BE INSTALLED	
BLUE LINETYPE DENOTES VENDOR SUPPLIED EQUIPMENT INSTALLED BY CONTRACTOR	

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#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale 1:XXX SCALE NOT SELECTED

Quality Control by	IN
Designed by	AW
Drawn by	PBX

NORTH CULTUS WWTP
SINGLE LINE DIAGRAM (4 OF 5)

Sheet Number	4 of 7

Project Number	Drawing Number	Revision
230190	E103	1

NOT FOR CONSTRUCTION

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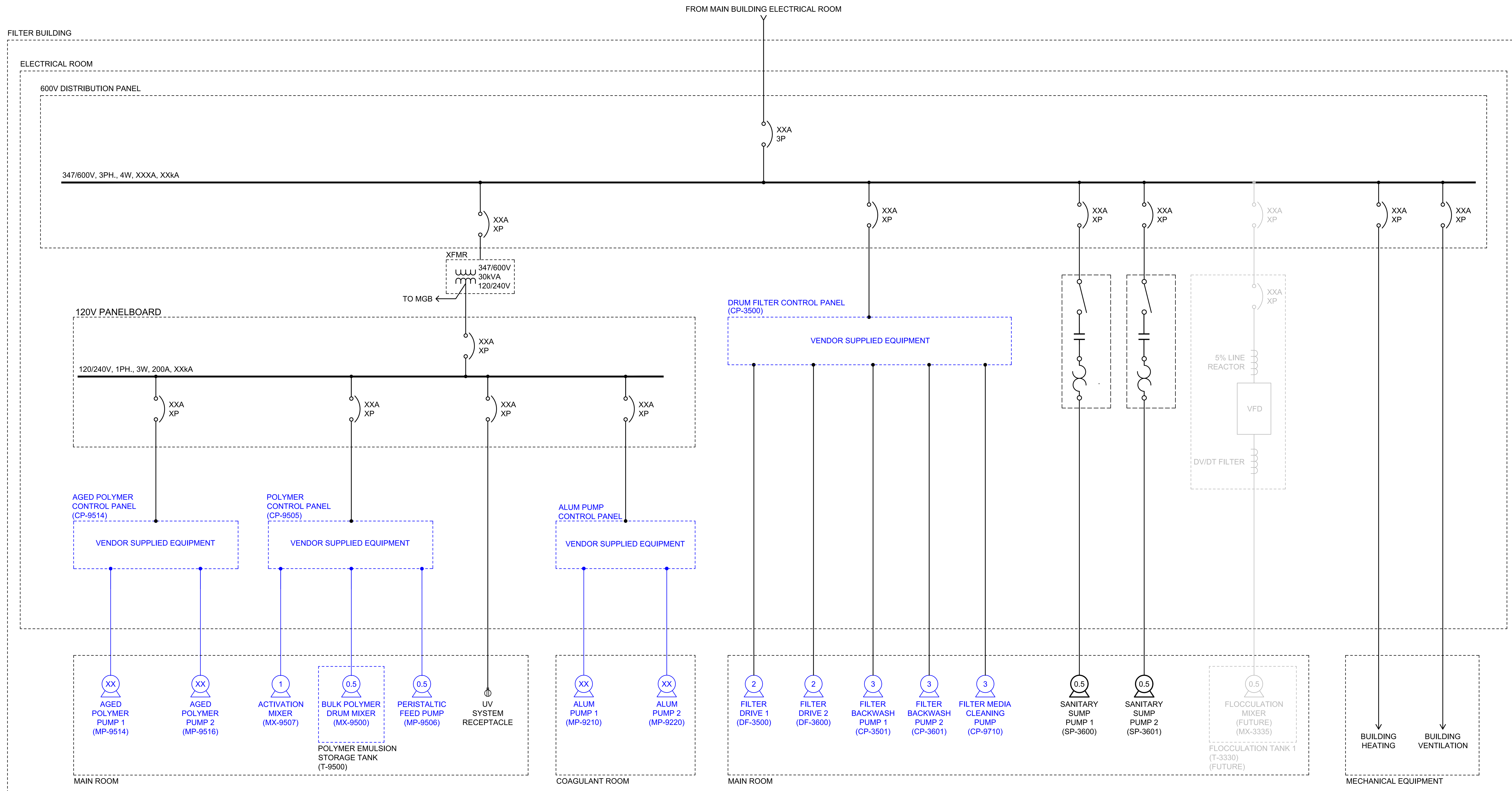
PERMIT TO PRACTICE NUMBER:
1000208



LEGEND	
(light grey line)	LIGHT GREY DENOTES FUTURE PROPOSED EQUIPMENT
(bold line)	BOLD DENOTES PROPOSED EQUIPMENT TO BE INSTALLED
(blue line)	BLUE LINETYPE DENOTES VENDOR SUPPLIED EQUIPMENT INSTALLED BY CONTRACTOR

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#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW

FVRD Cultus Lake WWTP

URBAN systems

Scale 1:XXX SCALE NOT SELECTED

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Designed by AW
Drawn by PBX

NORTH CULTUS WWTP
SINGLE LINE DIAGRAM (5 OF 5)

Sheet Number 5 of 7
Project Number 230190 | Drawing Number E104 | Revision 1

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PERMIT TO PRACTICE NUMBER:
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CABLE LEGEND

- HIGH SPEED DATA (RS485, RS232, POTS)
- COAXIAL CABLE
- CONTROL CABLE
- ETHERNET (CAT 6)
- POWER OVER ETHERNET (CAT 6)
- COMPUTER CABLE/ANALOG SIGNAL

NOTES:

1. ASSUMED COMMUNICATIONS PROTOCOLS BETWEEN DEVICES LISTED, COMMUNICATION PROTOCOLS TO BE CONFIRMED.

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#	Date	Issue / Revision	App
1	APR 2023	ISSUED FOR VALIDATION	AW
----	----	----	----

FVRD Cultus Lake WWTP

URBAN systems

Scale 1:XXX SCALE NOT SELECTED

Quality Control by IN
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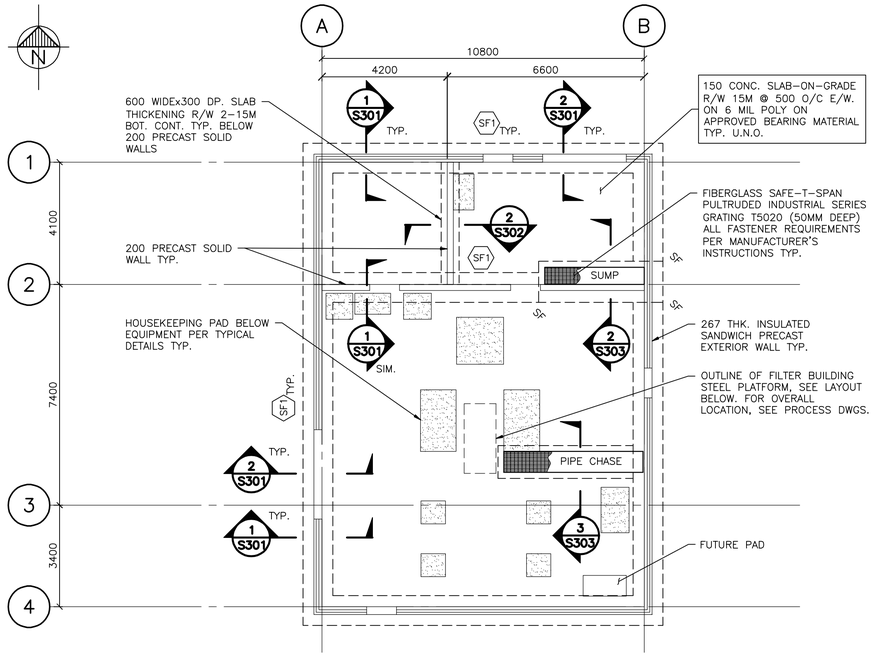
Drawn by PBX

NORTH CULTUS WWTP
NETWORK DIAGRAM

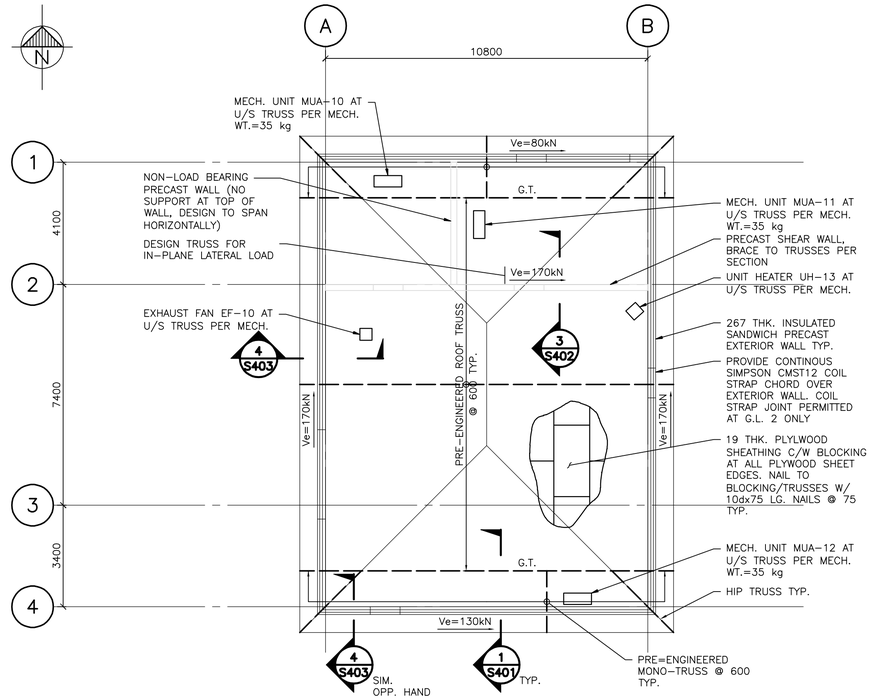
Sheet Number # of 7
Project Number 230190
Drawing Number E200
Revision ----

NOT FOR CONSTRUCTION



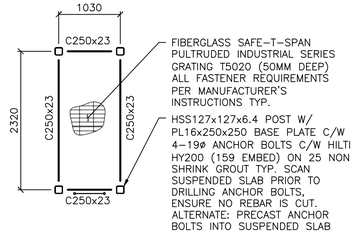
FILTER BUILDING – FOUNDATION PLAN

1:100



FILTER BUILDING – ROOF FRAMING PLAN

1:100



FILTER BUILDING – STEEL PLATFORM FRAMING

1:50

STRIP FOOTING SCHEDULE		
FTG. TYPE	FOOTING SIZE (WIDTH x DEPTH)	FOOTING REINFORCING BOT. (U.N.O.)
SF1	1000 x 300	4-15M LONG. + 15M @ 300 TRANS.

FILTER BUILDING NOTES:

1. REFER TO CIVIL, PROCESS, MECHANICAL & ELECTRICAL DRAWINGS FOR FOUNDATION & PRECAST WALL PENETRATIONS & KNOCKOUT LOCATIONS. REFER TO FVRD PIPING SUPPORT ENGINEERED DRAWINGS FOR REQUIRED EMBEDS IN PRECAST WALLS & DESIGN FORCES
2. GRATING AND STEEL MANUFACTURERS TO COORDINATE GRATING TO STEEL CONNECTIONS.
3. BLOCK OUTS IN WALLS FOR GRAVITY FLOW PIPE CONNECTIONS ASSUME THAT PIPES WILL BE INSTALLED AFTER THE WALL IS CAST IN PLACE. PROVIDE AN OUTSIDE THRUST BLOCK CAST WITH PIPE TO ADDITIONALLY RESTRAIN WALL PIPE CONNECTION. REFER TO PROCESS AND/OR CIVIL DRAWINGS FOR CONNECTION REQUIREMENTS IN CASE THE PIPES ARE CAST INTO THE WALL WITH WALL CONCRETE POUR. IN THIS CASE, LARGER BLOCKOUTS AND THRUST BLOCKS ARE NOT NEEDED. REFER TO TYPICAL DETAIL FOR THRUST BLOCK SIZE & REINFORCING.
4. VE EARHQUAKE FORCES RDRO = 2.0 x 1.4.
5. ALL PAD DIMENSIONS AND EQUIPMENT WEIGHTS AS SHOWN ARE FOR DESIGN PURPOSE AND TO BE VERIFIED. EQUIPMENT WEIGHTS DO NOT INCLUDE WEIGHT OF HOUSEKEEPING PAD. NOTIFY CWMM TO REVIEW SLAB IF THE ACTUAL SIZES AND WEIGHTS ARE OVER THE NUMBERS AS SHOWN ON THIS PLAN.

Professional Seals

K6687

CWMM CONSULTING ENGINEERS LTD.
200-1854 Kirschner Rd.
Kelowna, B. C.
Canada, V1Y 4N6
Tel: (250) 868-2308
Fax: (250) 868-2374
EGBC PERMIT TO PRACTICE #1000193

#	Date	Issue / Revision	App
A	2023/04/20	Review	ED

Fraser Valley Regional District

URBAN systems

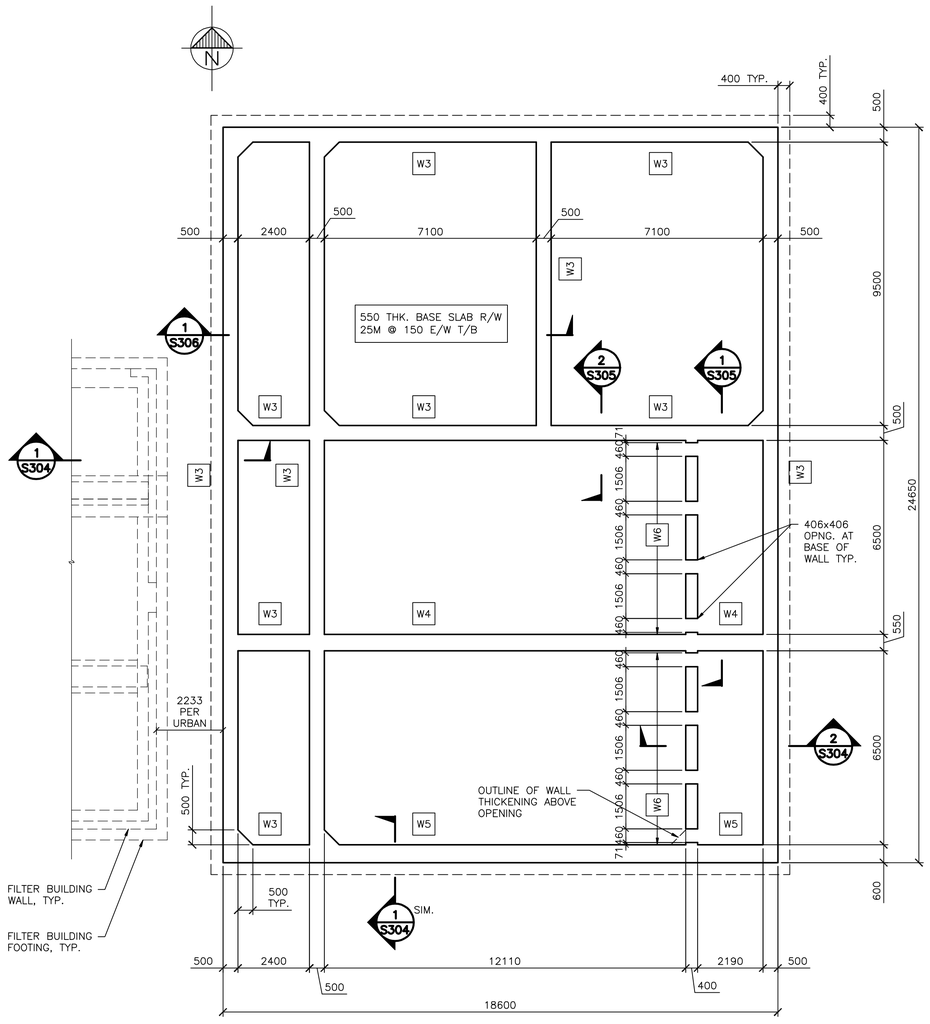
Scale: AS SHOWN

Quality Control by: ED
Designed by: ED
Drawn by: MCL

NORTH CULTUS WWTP
FILTER BUILDING PLANS

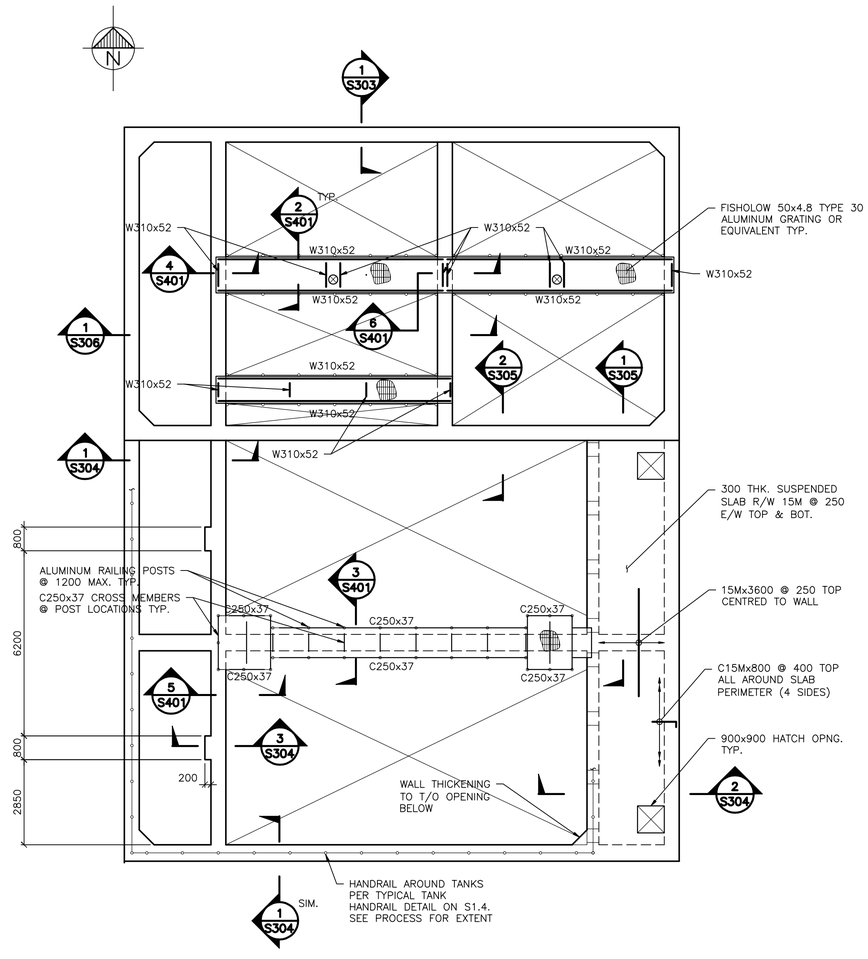
Sheet Number: -

Project Number	Drawing Number	Revision
0999.0069.02	S203	-



SBR/DIGESTER TANK – BASE PLAN

1:100



SBR/DIGESTER TANK – CATWALK PLAN

1:100

CONC. WALL SCHEDULE

WALL TYPE	WALL THICKNESS	REINFORCING
W1	200	15M @ 200 E.W. CENTERED
W2	300	20M @ 125 VERT. 15M @ 125 HORIZ.
W3*	500	25M @ 125 E.F. VERT. 25M @ 125 E.F. HORIZ.
W4*	550	25M @ 125 E.F. VERT. 25M @ 125 E.F. HORIZ.
W5*	600	25M @ 125 E.F. VERT. 25M @ 125 E.F. HORIZ.
W6*	400	25M @ 125 E.F. VERT. 25M @ 125 E.F. HORIZ.

NOTE: * DENOTES WALL HORIZONTAL BAR SPACING TO BE @ 100 WITHIN TOP 2000 OF WALL TYP.

SBR/DIGESTER TANK NOTES:

1. REFER TO CIVIL, PROCESS, MECHANICAL & ELECTRICAL DRAWINGS FOR FOUNDATION & PRECAST WALL PENETRATIONS & KNOCKOUT LOCATIONS. REFER TO FVRD PIPING SUPPORT ENGINEERED DRAWINGS FOR REQUIRED EMBEDS IN PRECAST WALLS & DESIGN FORCES
2. GRATING AND STEEL MANUFACTURERS TO COORDINATE GRATING TO STEEL CONNECTIONS.
3. BLOCK OUTS IN WALLS FOR GRAVITY FLOW PIPE CONNECTIONS ASSUME THAT PIPES WILL BE INSTALLED AFTER THE WALL IS CAST IN PLACE. PROVIDE AN OUTSIDE THRUST BLOCK CAST WITH PIPE TO ADDITIONALLY RESTRAIN WALL PIPE CONNECTION. REFER TO PROCESS AND/OR CIVIL DRAWINGS FOR CONNECTION REQUIREMENTS IN CASE THE PIPES ARE CAST INTO THE WALL WITH WALL CONCRETE POUR. IN THIS CASE, LARGER BLOCKOUTS AND THRUST BLOCKS ARE NOT NEEDED. REFER TO TYPICAL DETAIL FOR THRUST BLOCK SIZE & REINFORCING.
4. STEEL MEMBERS TO BE HOT DIP GALVANIZED
5. PROTECTION OF CONNECTIONS OF DISSIMILAR METALS (ALUMINUM TO STEEL) AGAINST GALVANIC CORROSION IS THE RESPONSIBILITY OF THE SPECIALTY PROFESSIONAL ENGINEER OF THOSE COMPONENTS. SUBMIT SEALED RAILING SHOP DRAWINGS FOR REVIEW.
6. PROVIDE NEOPRENE GASKET BETWEEN ALUMINUM GRATING & GALVANIZED STEEL BEAMS

Professional Seals

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EGBC PERMIT TO PRACTICE #1000195

#	Date	Issue / Revision	App
A	2023/04/20	Review	ED

Fraser Valley Regional District

URBAN systems

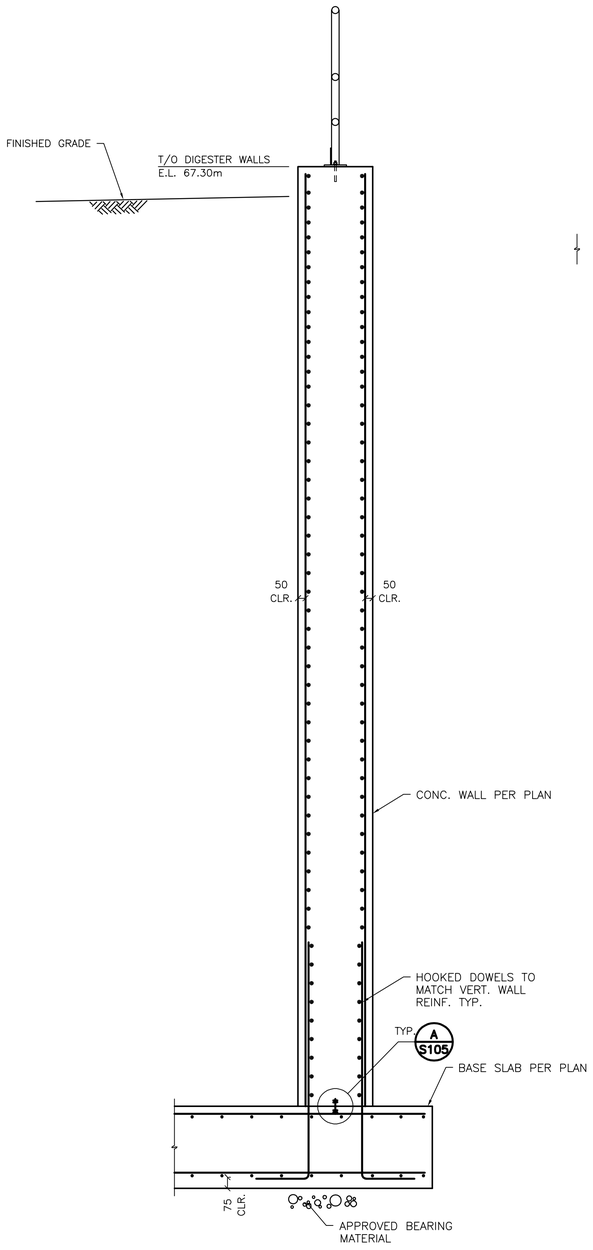
Scale: AS SHOWN

Quality Control by: ED
Designed by: ED
Drawn by: MCL

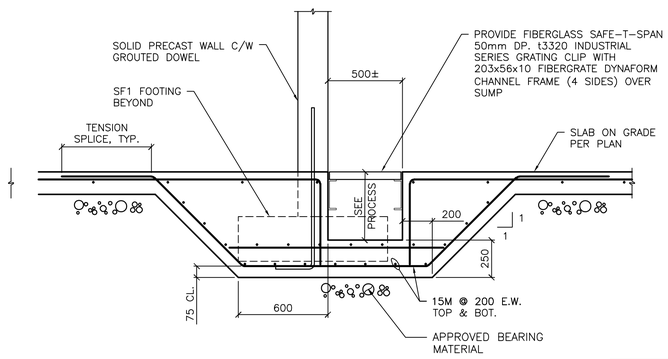
NORTH CULTUS WWTP
SBR/DIGESTER TANK PLANS

Sheet Number: -

Project Number	Drawing Number	Revision
0999.0069.02	S204	-

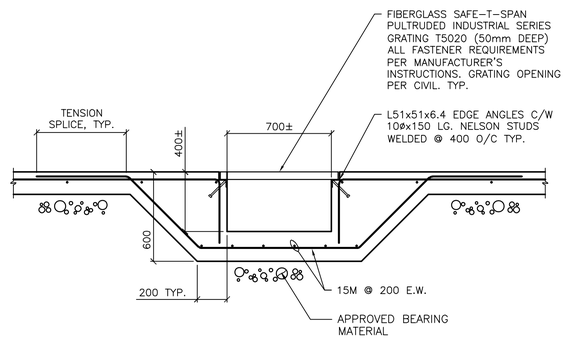


1 S204 SECTION
1:20



2 S203 SECTION
1:20

VERIFY ALL DIMENSIONS WITH PROCESS & CIVIL DRAWINGS



3 S203 SECTION
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ATTENTION
This drawing is prepared for the sole use of
-
No representations of any kind are made by Urban Systems Ltd. or its employees to any party with whom Urban Systems Ltd. does not have a contract.

WARNING
Utilities or structures shown on this drawing were compiled from information supplied by various parties and may not be complete or accurate. Expose and conclusively confirm the location in the field all underground utilities and structures indicated on this drawing, all underground utilities in the area of the proposed work and any utilities or structures reasonably apparent from an inspection of the proposed work. Urban Systems Ltd. assumes no responsibility for loss or damage caused by third party negligence or failure to comply with the above.

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#	Date	Issue / Revision	App
A	2023/04/20	Review	ED

Fraser Valley Regional District

URBAN systems

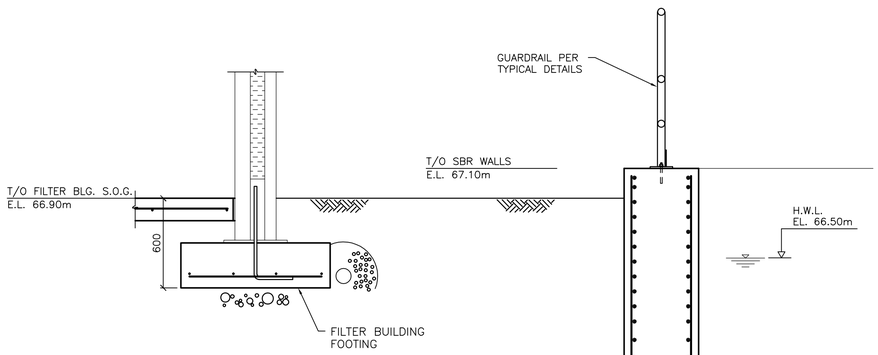
Scale AS SHOWN

Quality Control by ED
Designed by ED
Drawn by MCL

NORTH CULTUS WWTP
SECTIONS

Sheet Number -

Project Number	Drawing Number	Revision
0999.0069.02	S303	-



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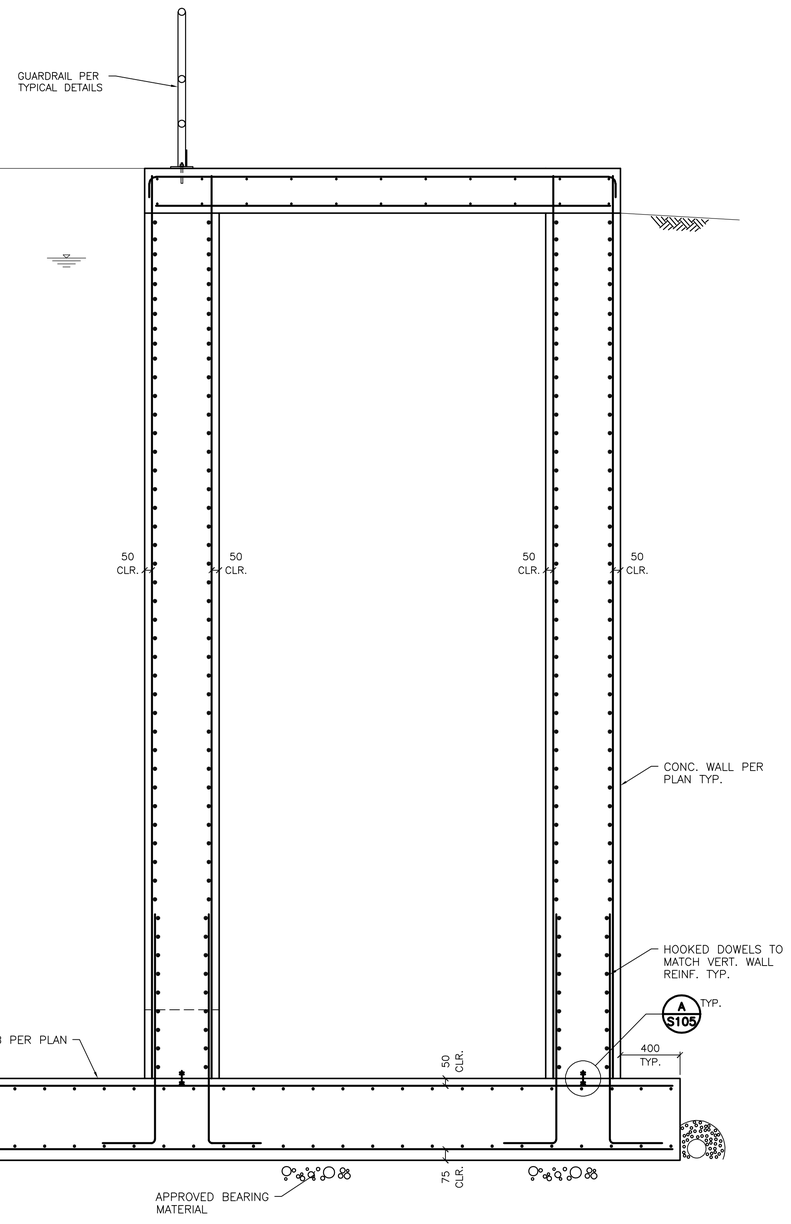

2 S204 SECTION 1:20

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NORTH CULTUS WWTP
SECTIONS

Sheet Number -

Project Number	Drawing Number	Revision
0999.0069.02	S304	-

1.0 GENERAL

1.1 GENERAL REQUIREMENTS
.1 This section covers all items common to all sections of Division 15.
.2 The General Contract Conditions, Supplements and Amendments shall govern.
.3 This Contractor shall visit the site prior to submitting a bid to make himself fully aware of all conditions that could affect the work. No allowance for extra work shall be approved if such extra work could have been determined from a thorough site examination.
.4 All work performed herein shall be in accordance with the project documents and their intent, complete with all necessary materials to provide a complete fully functional mechanical system.

1.2 STANDARDS
.1 All work shall be carried out in conformance with the following standards and regulations:
- BC Building Code
- BC Plumbing Code
- SMACNA Documents as applicable
- Canadian Natural Gas and/or Propane Installation Code
- Canadian Standards Association
- ASHRAE Codes and Standards
- Workers Compensation Act

1.3 PRODUCTS and MATERIALS
.1 The manufacturer's details and procedures for installation shall be followed in installing all components.
.2 Installed components shall be new and of the same quality as that of the specification.
.3 Install equipment, rectangular clean outs and similar items parallel and/or perpendicular to building lines.
.4 Install all equipment to minimize the amount of transmitted vibration to adjacent areas.

1.4 WORKMANSHIP
.1 The workmanship of this contract shall be performed in accordance with established practices and standards of the construction and consultant industry.
.2 This contractor shall employ only qualified personnel holding a valid province of British Columbia Trades Certificate for each particular trade. All apprentices shall be supervised by a fully qualified journeyman for each particular trade.
.3 This contractor shall coordinate all work with all other trades employed on this project to avoid any conflicts that may arise. All requirements shall be stated to the general contractor well in advance of performing the work of this contract.
.4 This contractor shall assume all responsibility for the execution of the work of this division and for any damages that may result due to workmanship below the standard of this specification.

1.5 TESTS
.1 Give 48 hours notice of all tests to the Consultant.
.2 Perform tests of materials and equipment as required to meet the above referenced codes and standards and as directed by the Authority having Jurisdiction.
.3 Insulate and conceal work only after testing and approval of such test by the Consultant.

1.6 WARRANTY
.1 At Substantial Completion of the work of this contract provide the owner with a written warranty for all materials and workmanship for a period of one year, including one winter period and one summer period of operation.

1.7 SHOP DRAWINGS and PRODUCT DATA
.1 Submit to the consultant for review three copies of shop drawings and product data for each major piece of equipment.
.2 Shop drawings and product data shall include:
.1 Mounting arrangements.
.2 Operating and maintenance clearances.
.3 Dimensioned drawings depicting the size and arrangement of each component.
.4 Capacity and performance characteristics of each component.

1.8 CUTTING, PATCHING, CORING, and CANNING
.1 Clearly identify and mark all openings required through the structure for all mechanical services of this contract.
.2 Coordinate all opening with all other trades and divisions of this contract.
.3 Openings through the structure shall not be made without obtaining permission of the Consultant.

1.9 OPERATION and MAINTENANCE MANUALS
.1 At substantial completion of the project provide three copies of completed manuals for the operation and maintenance of the systems provided under this division. Also, provide one digital copy of the complete manual on CD for the Consultant.
.2 Manual to be approved and deposited with the Consultant prior to final submission.
.3 Maintenance Manual shall include:
.1 Operational data including, control schematics, description of each system, operation instructions for each system, trouble shooting instructions for each system, and valve schedules for each system.
.2 Maintenance data to include, servicing, maintenance, operation, and trouble-shooting instructions for each system.
.3 Performance data shall include equipment manufacturer's performance data sheets with point of operation as left at completion of project.
.4 Contractors warranty certificate.
.5 Fire damper drop test certificate.
.6 Backflow prevention test certificate.

1.10 CLEANING
.1 Clean interior and exterior of all systems including strainers.
.2 Vacuum interior of ductwork and all air handling units.
.3 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition, including replacement of all filters in air and piping systems.

1.11 AS-BUILT DRAWINGS
.1 Consultant will provide one set of drawings for field mark up as the work progresses.
.2 As-Built drawings shall be available for reference and inspection purposes.
.3 Prior to start of TAB, finalize production of As-Built drawings by having the information on the drawings transferred to the original AutoCAD database drawings.
.4 Contractor shall allow for costs to transfer "As-Builts" to original AutoCAD database.

2.0 SEISMIC RESTRAINTS

2.1 GENERAL
.1 Seismic restraints shall be installed to meet the requirements of SMACNA – Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Installations, NFPA, and the B.C. Building Code.
.2 Provide restraints for all piping, ductwork and equipment of this contract to the requirements listed above.
.3 Seismic restraints may only be deleted where permitted by the referenced Codes and Standards.

1.0 GENERAL (Cont'd)

3.0 INSULATION SYSTEMS

3.1 GENERAL
.1 Installer of insulation systems shall be a specialist in performing the work of this section, and have at least three years of experience in this type of work.
.2 Insulation to have a maximum flame spread rating of 25 and a maximum smoke developed rating of 50 in accordance with CAN/ULC S102.
.3 Perform all work of this section in accordance with B.C.I.C.A. manual.

3.2 PRODUCTS and INSTALLATIONS
.1 Insulate all new combustion air ductwork, and last five feet (5'-0") of exhaust air ductwork in all conditioned areas with 1" of Manson Alley FSK Wrap with vapour barrier.
.2 Insulate all new supply, return, and exhaust air ductwork in unheated areas with 2" of Manson Alley FSK wrap with vapour barrier.
.3 Insulate all new supply and return air ductwork with 1" of manson Alley FSK wrap with vapour barrier.
.4 Install 1" of Manson Akousti-Liner R acoustic insulation for five feet (5'-0") up and downstream of all air handling equipment.
.5 Insulate all domestic hot and cold piping with 1" Manson Alley 'K' pipe insulation with APT jacket.
.6 Domestic cold water and shall be provided with continuous insulation, as specified, and shall be installed with oversize hangers. Sheet metal saddles shall be provided on pipe sizes over 2" (50 mm).

4.0 PLUMBING SYSTEMS

4.1 GENERAL
.1 All plumbing shall be installed and tested to the requirements of the BC Plumbing Code and the authority having jurisdiction.
.2 At completion of the work all piping systems shall be flushed out, disinfected, and rinsed to the requirements of the Authority having Jurisdiction and to the approval of the Consultant.
.4 All exposed plumbing piping shall be chrome plated.
.5 All piping shall be graded to facilitate draining of systems.
.6 Assemble all piping using fittings manufactured to ANSI standards.
.7 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.
.8 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.
.9 Isolate equipment, fixtures and branches with ball valves.
.10 Install buried pipe on a 6" bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 6" of clean washed sand.
.11 Floor drains and trench drains: to CAN3-B79.
.12 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

4.2 FIRE STOPPING
.1 Where pipes penetrate horizontal or vertical Fire Partitions, Fire Walls, Rated Floor Assemblies or Smoke Partitions, install a ULC listed fire stop system with a rating equivalent to that of the partition. Fire Stop systems must provide an effective barrier against the spread of fire, smoke and gases. They must be installed as per manufacturer's instructions and the installation details of their listing.
.2 Fire stop systems are to meet the requirements of the authority having jurisdiction and the owner's underwriters. Fire stop systems details are to be approved by the consultant prior to installation.
.3 Contractor to provide documentation that includes the following:
.1 Manufacturer's name
.2 Their design number
.3 AutoCAD Drawing
.4 Standard reference (CAN4-S115-M)
.5 Subsequent requirements (F, FT, FTH, W ratings)
.6 Specific materials, compatibility, application and installation instructions (core hole size)
.7 Additional requirements (i.e., 50 Pa. for combustible piping)
.8 Onsite Training and Support by Manufacturer
.9 Specific materials, compatibility, application and installation

4.3 PIPE and FITTINGS
.1 Domestic Water Service – Outside
.1 PVC water pipe to CAN3-B137.3-M.
.2 Ductile iron pipe to CSA B137.3.
.3 High Density Polyethylene water piping to CAN/CSA B137.1
.4 Crosslinked polyethylene piping to CAN/CSA-B137.5 with no joints or fittings underground or underslab.
.5 Cast-iron water pipe to ANSI/AWWA C151/A21.51
.2 Domestic Water Pipe Buried – Inside
.1 Crosslinked polyethylene piping to CAN/CSA-B137.5 with no joints or fittings underground or underslab.
.3 Domestic Water Pipe, Hot and Cold-Inside
.1 Type 'K' or 'L' Hard drawn copper tubing to ASTM B88 with cast brass or wrought copper fittings and non-lead solder.
.2 Crosslinked polyethylene pipe and fittings to CAN/CSA-B137.5.
.4 Sanitary and Storm Pipe-Outside/Buried
.1 ABS-DWV pipe to CAN/CSA-B181.1-M.
.2 PVC-DWV pipe to CAN/CSAB181.2-M.
.5 Sanitary and Storm Pipe-Inside
.1 PVC-DWV pipe to CAN/CSA-B181.2-M System 15
System 15-XFR piping shall be used where piping is in a return air plenum.
.6 Valves
.1 Gate Valves
.1 Requirements common to all gate valves, unless specified otherwise:
.1 Standard specification: MSS SP-80
.2 Bonnet: with hex. shoulders
.3 Connections: with hex. shoulders
.4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
.5 Packing: high-grade non-asbestos packing.
.6 Handwheel: non-ferrous. Nut: bronze to ASTM B62.
.2 Globe Valves
.1 Requirements common to all globe valves, unless specified, otherwise:
.1 Standard specification: MSS SP-80
.2 Bonnet: with hex. shoulders
.3 Connections: with hex. shoulders
.4 Pressure testing: to MSS SP-80. Tests to be hydrostatic
.5 Stuffing box: threaded to bonnet with gland follower, packing nut, high-grade non-asbestos packing.
.6 Handwheel: non-ferrous. Nut: bronze to ASTM B62.

4.0 PLUMBING SYSTEMS (Cont'd)

4.3 PIPE and FITTINGS
.3 Check Valves
.1 Requirements common to all check valves, unless specified otherwise:
.1 Standard specification: MSS SP-80
.2 Connections: with hex. shoulders
.4 Silent Check Valves
.1 NPS 2 and under:
.1 Body: cast high tensile bronze to ASTM B62 with integral seat.
.2 Pressure rating: Class 125, WP = 125 psi steam, 200 psi WOG Class 150, WP = 150 psi steam, 300 psi WOG.
.3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
.4 Disc and seat: renewable rotating disc.
.5 Stainless steel spring, heavy duty.
.6 Seat: re-grindable.
.5 Ball Valves
.1 NPS 2 and under:
.1 Body and cap: cast high tensile bronze to ASTM B62.
.2 Pressure rating: Class 125, WP = 125 psi steam, 200 psi WOG.
.3 Connections: solder ends to ANSI
.4 Stem: tamperproof ball drive
.5 Stem packing nut: external to body.
.6 Ball and seat: replaceable stainless steel hard chrome solid ball and teflon seats.
.7 Stem seal: TFE with external packing nut.
.8 Operator: removable lever handle.

4.4 PRODUCTS
.1 FD-1: General duty floor drain; cast iron body round, adjustable head, sediment basket, nickel bronze strainer, and clamping collar.
Acceptable material: WATTS Ancon FD-200-A.
.1 FD-2: General duty floor drain; ABS body round, adjustable head, sediment basket, and 6" stainless steel strainer.
Acceptable material: WATTS Ancon FD-200.
.2 FFD-1: Combination funnel floor drain, cast iron body with seepage collection sump, nickel-bronze adjustable head strainer with integral funnel.
Acceptable material: WATTS Ancon FD-200-EF.
.3 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
.4 WC-1: Floor_mounted, flush tank. (1.6 GPF)
.1 Bowl: Vitreous china, floor mounted, Class Five flushing system, elongated rim, close-coupled, bolt caps.
.2 Closet tank: Vitreous china with, flapper type flush valve assembly factory set, and insulated tank.
.1 Acceptable material: Kohler 'Wellworth' Class Five Toilet K-3978.
.3 Seat: White, elongated, open front, moulded solid plastic, with cover, stainless steel check hinges, stainless steel or solid brass insert post.
.1 Acceptable material: Bemis 1950SS.
.5 L-1: Counter-top Lav
.1 Vitreous china basin, self-rimming with overflow, semi-oval bowl, supply openings on 4" centres, ADA compliant when installed in a 21" min. depth counter-top.
Size: 21"x17½"
.1 Acceptable material: American Standard "Cadet" 0419.444EC
.2 Trim: metal construction, single control lavatory faucet, pressure compensating spray, adjustable hot limit safety stop, ceramic disc valve cartridge. Vandal resistant 0.5 GPM aerator. Color coded flexible supply lines, chrome. Less drain, less pop-up hole and rod.
1. Acceptable materials: Amer. Standard Colony Pro 7075.054
.3 Supplied with braided supply lines, escutcheon plate, ball valve type fixture shut off, grid drain, offset and insulated p-trap, and insulated hot water supply.
.6 SH-1: Fibreglass Shower Enclosure
.1 Base: 1-piece 60"x30" Domeless shower enclosure, with center drain. High gloss acrylic with fibreglass reinforcement. Integral toiletry shelves, moulded in floor pattern, recess flange. Without seat.
.1 Acceptable Materials: Maax SS3060
.2 Trim: Polished Chrome Single handle shower trim, metal lever handle. To be ordered with double ceramic pressure balance cartridge, with high limit screwdriver stops, ceramic mixing valve and balancing spool, with integrated check valves. Water Saving. To be ordered with 1.5GPM Low Flow Showerhead, chrome. With standard shower arm and flange.
.1 Acceptable materials: American Standard Colony Pro Water Saving Pressure Balance Shower only trim kit, less showerhead, less valve. Model : TU075507XH, with optional Flash Rough-in Valve model RU101SS (with screwdriver stops), FloWise Square Water Saving Showerhead, 1.5GPM, model 1660.811, with optional shower
.7 MS-1: Mop Sink
.1 One piece moulded stone mop sink complete with factory installed stainless steel drain body.
Size: 24" x 24" x 10" deep.
.1 Acceptable materials: Mustee 63M
.2 Trim: Chrome plated rough brass, heavy duty service sink faucet, 8" centres, adjustable threaded flanges, integral stops, four-arm handles, vacuum breaker nozzle with pail hook, 3/4" hose thread, and top brace for wall mounting.
.1 Acceptable materials: Symmons S-2490
.3 Accessories:
.1 Hose and bracket: Mustee 65.700
.8 ES-1 & ES-11: Emergency Shower – Combination Drench Shower/Eyewash:
.1 Eyewash includes polypropylene spray heads with integral 1.6gpm flow control, protected by flip open covers that open when the product is activated by cast aluminum powder coated flag handle with ABS plastic bowl.
.2 Shower includes ABS plastic shower head with integral 20gpm flow control, activated by stainless steel pull rod.
.3 Unit shall include ANSI compliant sign.
.4 Emergency Fixture Thermostatic Mixing Valve: Bi-metal thermostat, integral strainer checkstops on inlets, adjustable set point within temperature range, dial thermometer, built-in cold water bypass, positive shutoff of hot supply when cold supply is lost.
.5 Acceptable material: Guardian Safety Station with Eyewash, all PVC combination shower and Eyewash, Model G1992-FC20 c/w Guardian G3700 tempering valve and AP 275-200 electric alarm.
.9 HWT-1 & 11: Electric hot water tank with recovery rate of 25gph based on 100°F rise and 6kW input.
.1 Tank: 119 gallons, Vitraglas vitreous enamel lined tank, stainless steel inlet, ASME rated T&P relief valve, 28½"ø x 65" high, non-CFC foam insulation, adjustable electronic thermostat, 3 immersed INCOLOY elements, four magnesium anode rods and hand hole cleanout, Hydrojet Sediment Reduction System and Energy Cut Off. HWT to maintain 140°F.
.2 Electric: 6kw, 208-3-60, 16.7A.
.3 3 year warranty certificate.
.4 Acceptable material: Bradford White E32-120R-3.

5.0 LOW PRESSURE DUCTWORK – METALLIC TO 2" STATIC PRESSURE

5.1 GENERAL
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible, 1985.
.2 SMACNA HVAC Duct Leakage Test Manual, 1985.
.3 ANSI/NFPA 90A-1989, Installation of Air Conditioning and Ventilating Systems.
.4 ANSI/NFPA 90B-1989, Installation of Warm Air Heating and Air Conditioning Systems.
.5 ANSI/NFPA 96-1991, Vapour Removal from Cooking Equipment.
.6 Install breakaway joints in ductwork on each side of fire separation.
.7 Apply sealant to outside of joint to manufacturer's recommendations.
.8 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturer's recommendations.
.9 For supply, return, and exhaust systems, locate balancing dampers in each branch duct.
.10 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
.11 Install fire dampers in accordance with ANSI/NFPA 90A and in accordance with conditions of the ULC damper. Maintain integrity of fire separation. Install access door adjacent to each damper.

5.2 MATERIALS
.1 Galvanized Steel (Admin Area and Filter Building Only)
.1 Lock forming quality: to ASTM A525M, Z90 zinc coating.
.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.
.3 Joints: to ASHRAE and SMACNA and/or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint shall be considered to be a class A seal.
.2 Stainless Steel (Throughout Dewateering, Headworks, Odour Control, NaOH and Blower Rooms)
.1 To ASTM A 480/A 480M, Type 304.
.2 Finish: No. 4.
.3 Thickness, fabrication and reinforcement: to ASHRAE SMACNA as indicated.
.4 Joints: to ASHRAE and SMACNA be continuous inert gas welded.
.3 Flexible Connections
.1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
.2 Material: Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40°F to plus 194°F, density of .27 lbs/ft².
.4 Access Doors in Ducts
.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame.
.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame and 1" thick rigid glass fibre insulation.
.3 Gaskets: neoprene.
.5 Turning Vanes
.1 Factory or shop fabricated single thickness and double thickness with trailing edge, to recommendations of SMACNA and as indicated.
.6 Single Blade Dampers
.1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
.2 Size and configuration to recommendations of SMACNA, except maximum height 4".
.3 Locking quadrant with shaft extension to accommodate insulation thickness.
.4 Inside and outside nylon end bearings.
.5 Channel frame of same material as adjacent duct, complete with angle stop.
.7 Multi-Bladed Dampers
.1 Factory manufactured of material compatible with duct.
.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
.3 Maximum blade height: 4".
.4 Bearings: self-lubricating nylon.
.5 Linkage: shaft extension with locking quadrant.
.6 Channel frame of same material as adjacent duct, complete with angle stop.
.8 Hangers and Supports
.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 20".
.2 Hanger configuration: to ASHRAE and SMACNA.
.3 Hangers: stainless steel angle with galvanized steel rods to ASHRAE and SMACNA
.9 Fittings
.1 Fabrication: to SMACNA.
.2 Radiused elbows:
.1 Rectangular: standard radius and or short radius with single thickness turning vanes. Centreline radius: 1.5 times width of duct.
.2 Round: smooth radius 5 piece. Centreline radius: 1.5 times diameter.
.3 Mitred elbows, rectangular:
.1 To 16": with single thickness turning vanes.
.2 Over 16": with double thickness turning vanes.
.4 Branches:
.1 Rectangular main and branch: with 45° entry on branch.
.2 Round main and branch: enter main duct at 45° with conical connection.
.3 Provide volume control damper in branch duct near connection to main duct.
.4 Main duct branches: with splitter damper.
.5 Transitions:
.1 Diverging: 20° maximum included angle.
.2 Converging: 30° maximum included angle.
.6 Offsets:
.1 Full radiused elbows as indicated.
.7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.
.10 Sealing: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.

Specification to be Revised when re-design is complete

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Professional Seals

#	Date	Issue / Revision	App
1	190521	Issued for Review / Coordination	DM
2	190605	Issued for Review / Coordination	DM
3	190619	Issued for Review / Coordination	DM
4	190704	Issued for Building Permit	DM
5	190719	Issued for Construction	DM
6	190809	Re-Issued for Construction	DM

URBAN systems

Scale

Quality Control by DM
Designed by DM
Drawn by GO

CULTUS LAKE

MECHANICAL SPECIFICATIONS

Sheet Number 5 of 12

Project Number	Drawing Number	Revision
18159	M100	6

6.0 TERMINAL AIR DEVICES

6.1 GENERAL
.1 ASTM E90-90, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
.2 Grilles, registers and diffusers of same generic type to be product of one manufacturer.
.3 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.
.4 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.
.5 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

6.2 MATERIALS
.1 Fixed Louvres-Aluminum
.1 Construction: welded with exposed joints ground flush and smooth.
.2 Material: extruded aluminum alloy 6063-T5.
.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of five feet (5'-0").
.4 Frame, head, sill and jamb: 4" deep one piece extruded aluminum, minimum 1/10" thick with approved caulking slot, integral to unit.
.5 Mullions: at five feet (5'-0") maximum centres.
.6 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
.7 Screen: 1/2" exhaust, 3/4" intake mesh, 1/16"ø wire aluminum birdscreen on inside face of louvres in formed U-frame.
.8 Finish: factory applied enamel.
.2 Grilles and Registers - Aluminum
.1 To meet capacity, pressure drop, terminal velocity, throw, noise level.
.2 Frames:
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board and as specified.
.3 Concealed fasteners.

7.0 EQUIPMENT

7.1 GENERAL
.1 Install in accordance with manufacturer's instructions, regulations of authorities having jurisdiction and to Canadian Electric Code.

7.2 PRODUCTS
.1 Heat Recovery Ventilator (HRV-1)
.1 General: CSA approved heat recovery ventilator complete with supply and exhaust fans, cross-flow heat recovery core, controls, access door, filters.
.2 HX core: Patented aluminum core, 68% efficiency minimum, less than 5% cross leakage.
.3 Access door: standard
.4 Drain Connections: Two 1/2" OD.
.5 Disconnect switch: factory supplied and installed.
.6 Motors/Blowers: ECM motors with sealed bearings, 5 speed motor, each airstream has one centrifugal blower.
.7 Filters: washable air filters in exhaust and supply airstreams.
.8 Electrical: 120V, single phase.
.9 Weight: 52 lbs.
.10 Defrost: Recirculating damper defrost system.
.11 Cabinet: 20 gauge pre-painted galvanized steel, insulated to prevent exterior condensation.
.12 Acceptable material: LifeBreath Model METRO 1200 ECM.
.2 Fans
.1 Statically and dynamically balanced. Constructed in conformity with AMCA 99.
.2 Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.
.3 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51, unit to bear AMCA certified rating seal.
.4 Bearings: sealed lifetime bearings of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.
.5 Explosion proof option when indicated on exhaust fan schedule.

.1 Roof Top Units
.1 General: CSA roof top natural gas fired DX cooling units, down-flow supply and return, factory assembled, fully wired and charged with R-410A refrigeration, factory run tested, economizer (where indicated), roof curb, disconnect switches and magnetic starters.
.2 Casing: Zinc coated heavy gauge, galvanized steel. Exposed surfaces shall be finished with a weather resistant baked enamel finish. Unit shall be constructed to allow all maintenance to be performed from one side. Access panels shall have lifting handles and appropriate fastening for conditions.
.3 Filters: MERV 11 - 1" throwaway standard.
.4 Compressors: Direct drive hermetic, reciprocating type compressors, with centrifugal oil pump, motor shall be suction gas cooled, crankcase heater, internal temperature and current sensitive motor loads, internal spring isolation, low pressure switch. Refrigerant circuits shall have independent fixed orifice expansion devices, service ports and refrigerant line filter factory installed.
.5 Evaporators and condenser coils: Internally finned 3/8" copper tubes mechanically bonded to aluminum plate fin. Coils shall be factory tested.
.6 Heat exchanger: Drum and tube aluminized steel heat exchanger with forced combustion blower, pilotless hot surface ignitor, natural gas burner, three attempt safety feature.
.7 Fans - Indoor: Direct drive, FC centrifugal fan.
.8 Fans - Outdoor: Direct drive, statically and dynamically balanced, permanently lubricated.
.9 Controls: Unit shall be factory wired and shall come with Microprocessor controls to function with indoor and outdoor temperature measuring sensors.
.10 Roof curb: Manufacturer's roof curb shall allow for direct connection of rectangular supply and return ductwork. Minimum height of 12".
.11 Economizer: Fully modulating outdoor air economizer with minimum air setting, dampers, operators, barometric relief, factory installed enthalpy and differential enthalpy control.
.12 Capacity: See schedules.
.13 Electrical: See schedules.

.7 Unit Heaters (Electric)
.1 General: CSA certification, electric unit heaters.
.2 Construction: 18 and 20 gauge steel. Adjustable Louvres to direct airflow. High limit temperature control with automatic reset. Horizontal wall or ceiling mounting using one of two supplied brackets. Large and easily accessible control panel.
.3 Controls: Contractor is to supply a wall mounted programmable thermostat.
.4 Explosion proof models when indicated in unit heater schedule
.5 Acceptable Material: Ouellet, refer to schedules

7.0 EQUIPMENT (Cont'd)

7.2 PRODUCTS
.3 Belt Drive Roof Upblast Centrifugal Exhaust Fans
.1 Statically and dynamically balanced. Constructed in conformity with AMCA 99.
.2 Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.
.3 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51, unit to bear AMCA certified rating seal.
.4 General Description: Discharge air up and away from the mounting surface, upblast fan shall be for roof mounted applications, each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number.
.5 Wheel: Non-stick coating material, non-overloading, backward inclined centrifugal, statically and dynamically balanced in accordance to AMCA Standard 204-205, the wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency.
.6 Motors: Explosion resistant enclosure, to be heavy duty ball bearing type to match with the fan load and furnished at the specific voltage and phase, mounted on vibration isolators, out of the airstream, fresh air drawn into the motor compartment through an area free of discharge contaminants for motor cooling, accessible for maintenance.
.7 Shafts and Bearings: Fan shaft shall be ground and polished solid steel with an anti corrosive coating, permanently sealed bearings or pillow block ball bearings, bearing shall be selected for a minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed, bearings are 100% factory tested, fan shaft first critical speed is at least 25 percent over maximum operating speed.
.8 Housing: Constructed of heavy gauge aluminum includes exterior housing, curb cap, windband, and motor compartment housing (Galvanized material is not acceptable), shall have a rigid internal support structure, windband to be one piece uniquely spun aluminum construction and maintain original material thickness throughout the housing, windband to include an integral rolled bead for strength, curb cap base to be fully welded to windband to ensure a leak proof construction (Tack welding, bolting and caulking are not acceptable), curb cap to have integral deep spun inlet venturi and pre-punched mounting holes to ensure correct attachment to curb, drive frame assemblies shall be constructed of heavy gauge steel and mounted on vibration isolators, breather tube shall be 10 square inches in size for fresh air motor cooling, and designed to allow wiring to be run through it.
.9 Vibration Isolation: Double studded or pedestal style true isolators, no metal to metal contact, sized to match the weight of each fan.
.10 Disconnect Switches: NEMA rated 7 and 9, positive electrical shut-off, wired from fan motor to junction box installed within motor compartment.
.11 Drive Assembly: Belts, pulleys, and keys oversized for a minimum of 150% of driven horsepower, belts: static free and oil resistant, fully machined cast iron type, keyed and securely attached to the wheel and motor shafts, the motor pulley shall be adjustable for final system balancing, readily accessible for maintenance.
.12 Drain Trough: Allows for one-point drainage of water, grease, and other residues.
.13 Options/Accessories:
Auto Belt Tensioner: Automatic tensioning device that adjusts for the correct belt tension (only for single drives)
Birdscreen: Aluminum, protects fan discharge.
Curb Extension: 1SB Aluminum uncoated.
Curb Seal: Foam seal, mounted between the fan curb cap and the roof curb.
Drain Connection: constructed of aluminum and allows singe-point drainage of grease, water, or other residues.
Finishes: Hi-Pro Polyester, Variable Frequency Drive: Factory
Variable Frequency Drive: Factory programmed, mounted and wired, input speed programmed, mounted and wired, input speed control 0-10VDC, 24 VDC damper power output, motor to be VFD rated, compatible with induction and permanent magnet motors acceleration/deceleration time, and minimum & maximum motor frequency, R^2 filtering for 3 phase input at 600V, NEMA 7 and 9 enclosure, LED indication for power, run and fault.

.10 Make-up Air Unit, MUA-1
.1 General: CSA certification, factory packaged complete with controls. Unit to consist of cabinet and frame, VFD supply fan, electric heat, inlet damper, purge system, controls to permit interlock to dour control system.
.2 Construction: Standard weatherproofed, heavy duty cabinet design with factory finish and 1" (25mm) foil faced fibreglass insulation liner. DWDI fan with adjustable V-belt drive. Filter frame with 2" (50mm) disposable filters in metal frames. Access panels to all components. Motorized damper with end switch and two position damper motor, inlet damper and outside air intake with bird screen. Integral evaporative cooler with ambient control and 1/2" water supply sloped to drain.
.3 Acceptable Material: Engineered Air LM/6/K

.5 Mini Make-up Air Units, MUA-10 to MUA-12
.1 Construction: Galvanized steel frame, nickel-chromium alloy heater elements, fan speed controller, duct temperature sensor, fan, dmaper, washable filter, power and control terminals, disconnect switch, SCR Controller.
.1 Electrical: see schedule
.2 Size: see schedule
.3 Acceptable Material: Thermolec, refer to schedules

8.0 TESTING ADJUSTING AND BALANCING

8.1 Test to verify proper and safe operation, determine actual point of performance, and evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
8.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions.
8.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.
8.4 Notify Consultant 7 days prior to start of TAB.
8.5 Start TAB only when building is essentially completed, including:
.1 Installation of ceilings, doors, windows and other construction affecting TAB.
.2 Application of weather-stripping, sealing and caulking.
.3 All pressure, leakage and other tests specified elsewhere Division 15.
.4 All provisions for TAB installed and operational.
.5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
.1 Proper thermal overload protection in place for electrical equipment.
.2 Air systems:
.1 Filters in place, clean.
.2 Duct systems clean.
.3 Ducts, airshafts, ceiling plenums are airtight to within specified tolerances.
.4 Correct fan rotation.
.5 Fire, smoke, volume control dampers installed and open.
.6 Coil fins combed, clean.
.7 Access doors, installed, closed.
.8 All outlets installed, volume control dampers open.
8.6 Do TAB to following tolerances of design values:
.1 HVAC systems: plus 5%, minus 5%.
8.7 TAB report to show all results in SI units and to include:
.1 Project record drawings.
.2 System schematics.
.3 Contractors warranty certificate.
.4 Fire damper drop test certificate.
.5 Backflow prevention test certificate.
8.8 Submit 1 copy of TAB Report to Consultant for verification and approval, in English in D-ring binder, complete with index tabs.

9.0 AUTOMATIC CONTROLS

9.1 GENERAL
.1 Work Included
.1 Control devices, wiring, components, transformers, and all other material to provide a fully functional Automatic Control System.
.2 Instructions to Owner
.1 At completion of project, provide a ONE day (or as necessary) instruction period for operating staff to familiarize themselves with operation, calibration, and maintenance of entire Automatic Control System.

9.2 PRODUCTS
.1 General
.1 Provide all Automatic Controls consisting of, but not limited to; thermostats, automatic dampers, damper actuators, carbon dioxide sensors, humidity sensors, relays, transformers, and all other apparatus required to operate all mechanical equipment to the level of the sequences of operation and satisfaction of the Consultant.
.2 Wiring and Conduit
.1 All wiring shall be installed in EMT conduit as per Division 16 specifications.
.2 Low voltage wiring shall be minimum 18 gauge copper conductor
.3 Line voltage wiring shall be to the requirements of Division 16 specifications.
.3 Thermostat (Line Voltage - Heating & Cooling) Reverse Acting
.1 Line voltage, wall-mounted thermostat, for Ventilation with:
.1 Full load rating: 6A at 120 V.
.2 Temperature setting range: 50°F to 84°F.
.3 Thermometer range: 45°F to 84°F.
.4 Markings in 5 degree increments.
.5 Differential temperature fixed at 2.0°F.
.4 Programmable Thermostat (Low Voltage)
.1 Low voltage wall thermostat:
.1 7 day programming with 2 occupied/unoccupied periods per day.
.2 Individual temperature setpoints for up to 2 heat, 2 cool systems:
.1 Occupied heat and cool.
.2 Unoccupied heat and cool.
.3 Proportional plus integral control with automatic heat/cool change over.
.4 Input voltage: 20 to 30 Vac, 60 Hz.
.5 Temperature Range: 40 to 110°F.
.6 Acceptable Material: Honeywell VisionPRO 8000, TB8220U1003 complete with Subbase.

Specification to be Revised when re-design is complete

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Professional Seals

#	Date	Issue / Revision	App
1	190521	Issued for Review / Coordination	DM
2	190605	Issued for Review / Coordination	DM
3	190619	Issued for Review / Coordination	DM
4	190704	Issued for Building Permit	DM
5	190719	Issued for Construction	DM
6	190809	Re-Issued for Construction	DM

URBAN systems

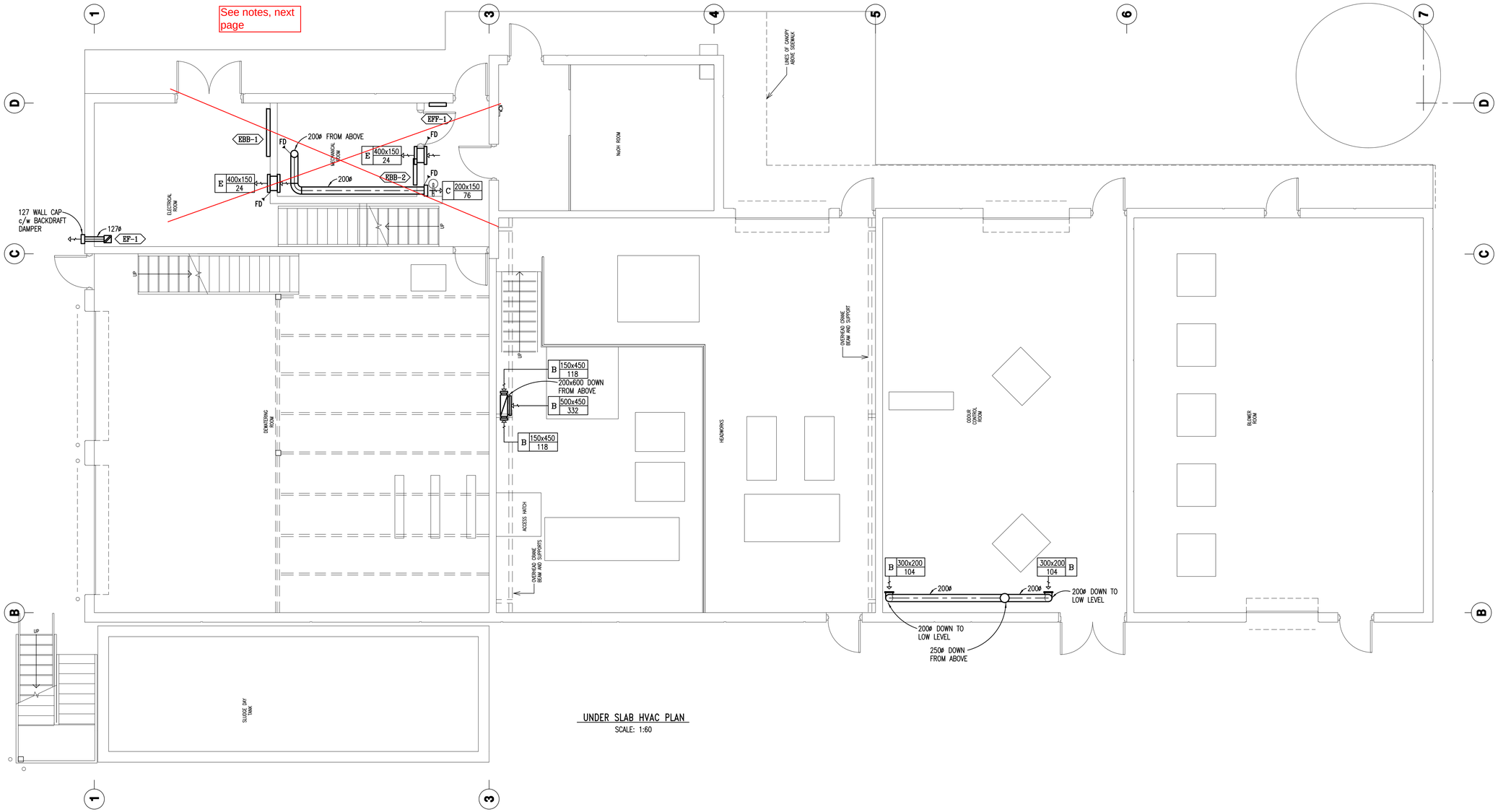
Scale

Quality Control by DM
Designed by DM
Drawn by GO

CULTUS LAKE

MECHANICAL SPECIFICATIONS

Sheet Number 6 of 12
Project Number 18159
Drawing Number M101
Revision 6



UNDER SLAB HVAC PLAN
SCALE: 1:60

SYMBOL LEGEND	
	NEW RECTANGULAR DUCTWORK
	NEW CIRCULAR DUCTWORK
	RETURN DUCT (UP & DOWN)
	SUPPLY DUCT (UP & DOWN)
	EXHAUST FAN
	BALANCING DAMPER
	SUPPLY/RETURN AIR INDICATOR
	EQUIPMENT TAG
T	THERMOSTAT
S SIZE / CFM	DIFFUSER/GRILLE TAG

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URBAN systems

Scale: AS SHOWN

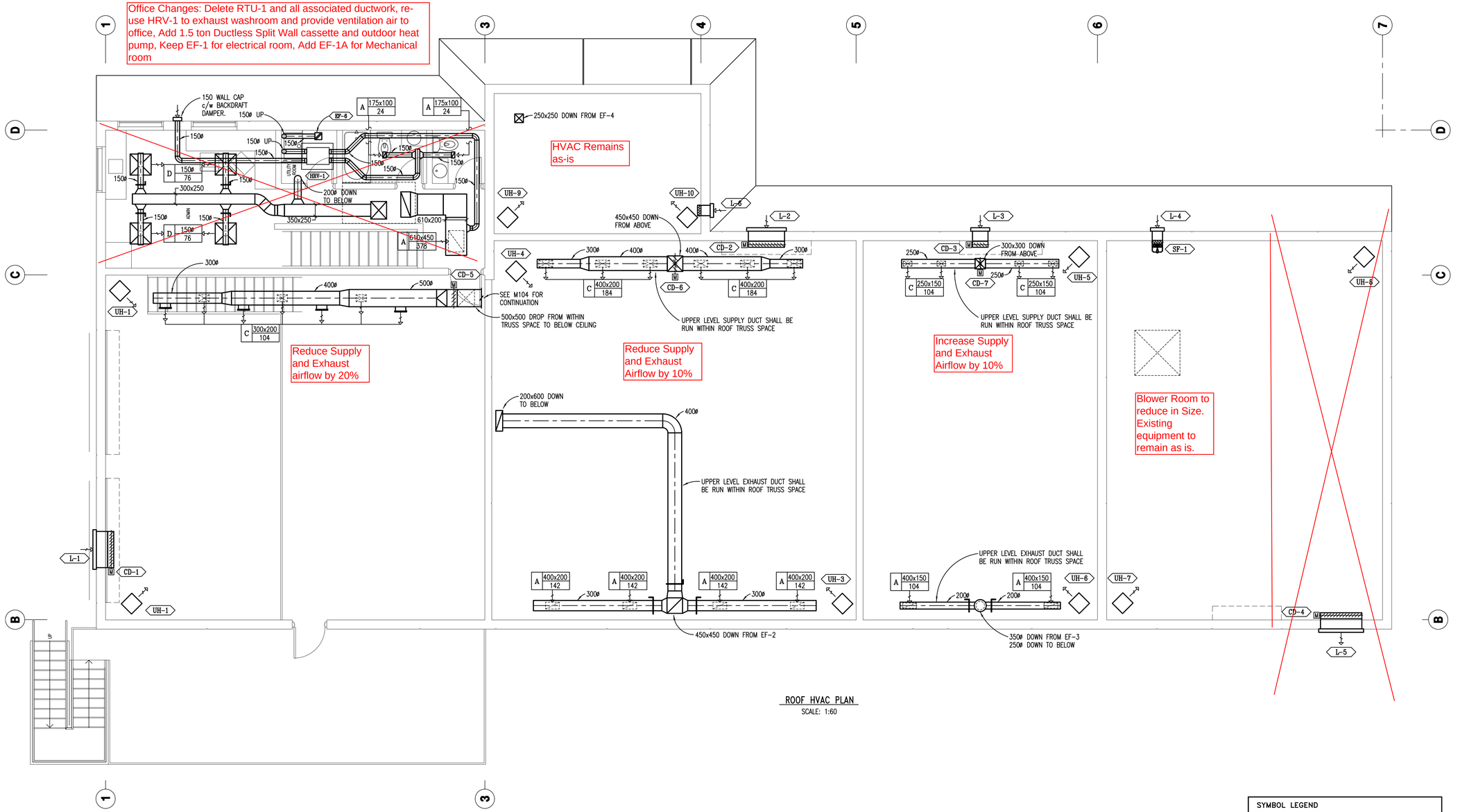
Quality Control by	DM
Designed by	DM
Drawn by	GO

CULTUS LAKE

MAIN FLOOR HVAC PLAN

Sheet Number		1 of 12
Project Number	Drawing Number	Revision
18159	M102	6

Office Changes: Delete RTU-1 and all associated ductwork, re-use HRV-1 to exhaust washroom and provide ventilation air to office, Add 1.5 ton Ductless Split Wall cassette and outdoor heat pump, Keep EF-1 for electrical room, Add EF-1A for Mechanical room



ROOF HVAC PLAN
SCALE: 1:60

SYMBOL LEGEND	
	NEW RECTANGULAR DUCTWORK
	NEW CIRCULAR DUCTWORK
RET	RETURN DUCT (UP & DOWN)
SUP	SUPPLY DUCT (UP & DOWN)
	EXHAUST FAN
	BALANCING DAMPER
	SUPPLY/RETURN AIR INDICATOR
–	EQUIPMENT TAG
T	THERMOSTAT
S SIZE CFM	DIFFUSER/GRILLE TAG

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URBAN systems

Scale

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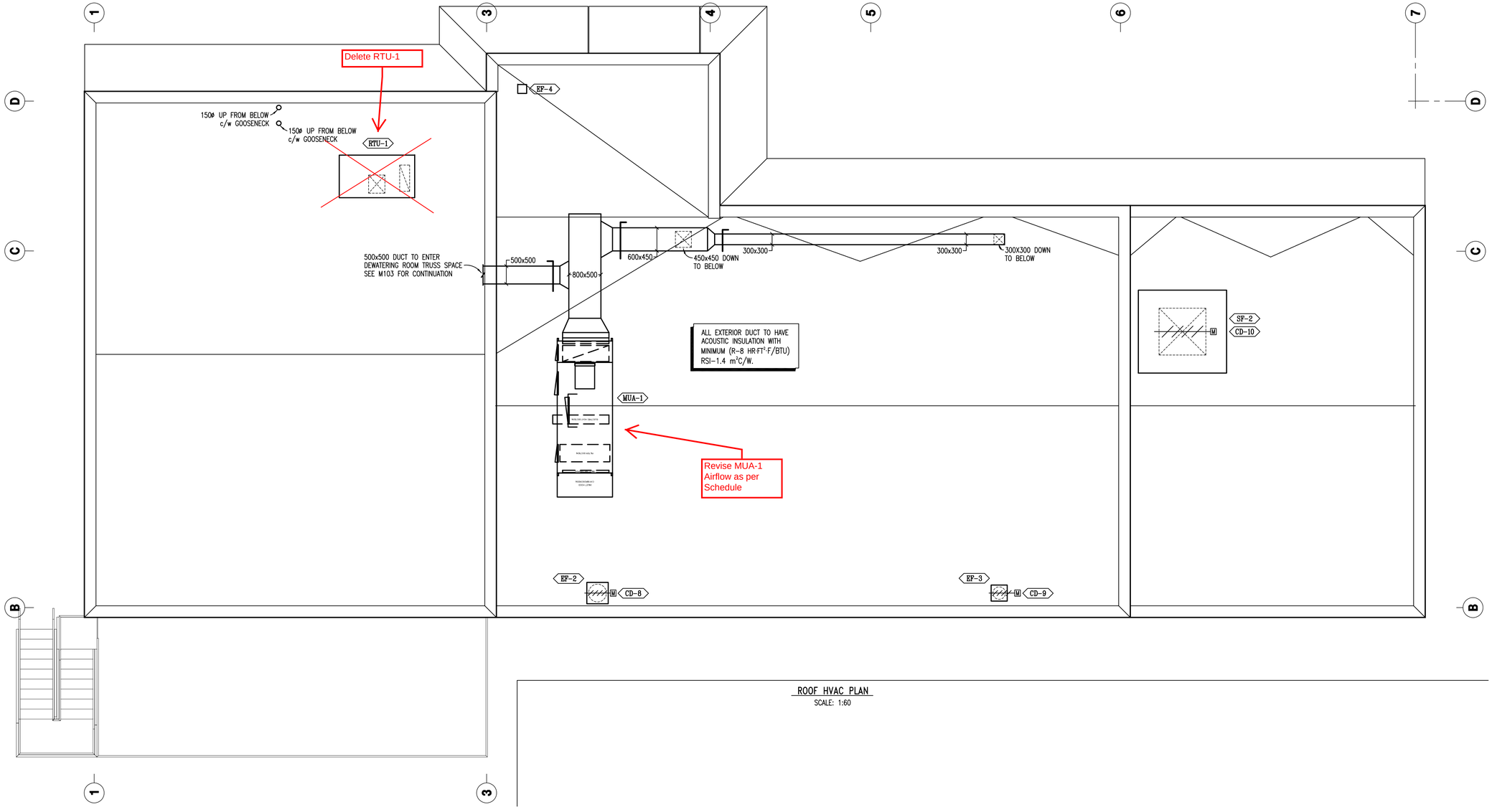
Drawn by GO

CULTUS LAKE

SECOND FLOOR HVAC PLAN

Sheet Number 2 of 12

Project Number	Drawing Number	Revision
18159	M103	6



ROOF HVAC PLAN
SCALE: 1:60

SYMBOL LEGEND	
	NEW RECTANGULAR DUCTWORK
	NEW CIRCULAR DUCTWORK
24"x12"	RETURN DUCT (UP & DOWN)
24"x12"	SUPPLY DUCT (UP & DOWN)
	EXHAUST FAN
	BALANCING DAMPER
	SUPPLY/RETURN AIR INDICATOR
–	EQUIPMENT TAG
T	THERMOSTAT
S SIZE / CFM	DIFFUSER/GRILLE TAG

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URBAN systems

Scale

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CULTUS LAKE

ROOF HVAC PLAN

Sheet Number		3 of 12
Project Number	Drawing Number	Revision
18159	M104	6

HEAT RECOVERY VENTILATOR SCHEDULE

ITEM	MANUFACTURER	MODEL	SUPPLY AIRFLOW (cfm)	SUPPLY E.S.P. ("w.c.)	SUPPLY WATTS	EXHAUST AIRFLOW (cfm)	EXHAUST E.S.P. ("w.c.)	EXHAUST WATTS	SENSIBLE RECOVERY EFFICIENCY	VOLTS	Hz	PH	OPTIONS/REMARKS
HRV-1	LIFEBREATH	METRO 120D-ECM	100	0.5	79	100	0.5	79	65	120	60	1	HORIZONTAL UNIT, SINGLE SPEED, ENERGY STAR

MAKE-UP AIR UNIT SCHEDULE

ITEM	MANUFACTURER	MODEL	HEAT INPUT ~~(MBh)~~	CFM (L/s)	EXTERNAL S.P. ("w.c.)	BLOWER HP	Volts	Ph	Hz	OPTIONS
MUA-1	ENGINEERED AIR	LM6/K/0	~~56.0~~ 50 KW	~~5800 (2738)~~ 5200 (2455)	0.75	5.0	600	3	60	ROOF CURB, END DISCHARGE, UP DISCHARGE PURGE, LOW LEAKAGE CONTROL DAMPERS, REMOTE PANEL, DISCHARGE AIR TEMPERATURE SENSOR, AIR PROVING SWITCH, VFD.

LOUVRE SCHEDULE

TYPE	MANUFACTURER	MODEL	CFM (L/s)	LOCATION	SIZE (WxH)	OPTIONS
L-1	GREENHECK	EDD-401	2600 (1228)	DEWATERING	42x24 (1065x610)	c/w CONTROL DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-2	GREENHECK	EDD-401	2350 (1110)	HEADWORKS	42x24 (1065x610)	c/w CONTROL DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-3	GREENHECK	EDD-401	880 (416)	ODOUR CONTROL	18x24 (457x610)	c/w CONTROL DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-4	GREENHECK	EDD-401	6000 (2832)	BLOWER ROOM	12x12 (300x300)	c/w BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-5	GREENHECK	EDD-401	6000 (2832)	BLOWER ROOM	48x48 (1219x1219)	c/w CONTROL DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-6	GREENHECK	EDD-401	400 (189)	pH CONTROL ROOM	12x12 (300x300)	c/w BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING

SUPPLY FAN SCHEDULE

ITEM	MANUFACTURER	MODEL	AREA OF SERVICE	AIRFLOW CFM (L/s)	S.P. ("w.c.)	AMPS	WATTS	HP	Volts	Ph	Hz	Rpm	OPTIONS / REMARKS	CONTROLS
SF-1	GREENHECK	S1-10-428-P	BLOWER ROOM SUPPLY	175 (82.6)	0.375	1/20	–	–	208	1	60	–	c/w CONTROL DAMPER	REVERSE ACTING THERMOSTAT
SF-2	GREENHECK	RS2-24-622-B7	BLOWER ROOM VENTILATION	5600 (2643)	0.375	3/4	–	–	208	1	60	–	c/w BACKDRAFT DAMPER	CONTINUOUS

EXHAUST FAN SCHEDULE

ITEM	MANUFACTURER	MODEL	AREA OF SERVICE	AIRFLOW CFM (L/s)	S.P. ("w.c.)	AMPS	WATTS	HP	Volts	Ph	Hz	Rpm	OPTIONS / REMARKS	CONTROLS
EF-1	GREENHECK	SP-80-VG	ELEC/MECH	50 (24)	0.5	–	6.1	–	120	1	60	935	c/w BACKDRAFT DAMPER	CONTINUOUS OPERATION
EF-2	GREENHECK	CUBE 141-7	HEADWORKS 2175 cfm	~~2350 (1110)~~	0.5	–	–	3/4	208	1	60	–	c/w CONTROL DAMPER, EXPLOSION PROOF	INITIATE ON H_2S/CH_4 ALARM
EF-3	GREENHECK	CUBE 101-4	ODOUR CONTROL 970 cfm	~~880 (416)~~	0.375	–	–	1/4	120	1	60	–	c/w CONTROL DAMPER, EXPLOSION PROOF	INITIATE ON H_2S/CH_4 ALARM
EF-4	GREENHECK	CUE 080-VG	NaOH ROOM	300 (142)	0.375	–	–	1/10	120	1	60	–	c/w CONTROL DAMPER, VFD	CONTINUOUS OPERATION

Delete RTU-1

ROOFTOP EQUIPMENT SCHEDULE

ITEM	MANUFACTURER	MODEL	HEAT NOMINAL (MBH)	HEAT OUTPUT (MBH)	COOLING OUTPUT (MBH)	CFM	EXTERNAL S.P. ("w.c.)	MINIMUM FRESH AIR (cfm)	BLOWER HP	ELECTRICAL Volts	Ph	Hz	OPTIONS
~~RTU-1~~	~~LENNOX~~	~~KGB024S4D~~	10.0	7.5	24.6	800	0.5	0	1/4	208	1	60	c/w 14" Roof Curb, Economizer, Programmable 7 Day Thermostat, Condensate Trap, 2" Merv 8 Filters

UNIT HEATER SCHEDULE

ITEM	MANUFACTURER	MODEL	LOCATION	HEAT INPUT (MBH)	BLOWER HP	AMPS (115 Volt)	Volts	Ph	Hz	OPTIONS
UH-1	OULLET	OHX05038	DEWATERING	5.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-2	OULLET	OHX05038	DEWATERING	5.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-3	OULLET	OHX05038	HEADWORKS	3.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-4	OULLET	OHX05038	HEADWORKS	3.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-5	OULLET	OHX05038	ODOUR CONTROL	3.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-6	OULLET	OHX05038	ODOUR CONTROL	3.0	1/4	–	208	3	60	c/w Explosion Proof, Wall Mount Thermostat, Mounting Bracket, Disconnect, Heresite Baked Phenolic Coating of Heat Exchange Core, Louvres, Fan Blades, Fan Guard and Cabinet.
UH-7	OULLET	OAS05038AM	BLOWER	5.0	1/30	–	208	3	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades
UH-8	OULLET	OAS05038AM	BLOWER	5.0	1/30	–	208	3	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades
UH-9	OULLET	OAS02008AM	pH CONTROL	2.0	1/30	–	208	1	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades
UH-10	OULLET	OAS02008AM	pH CONTROL	2.0	1/30	–	208	1	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades

CONTROL DAMPER SCHEDULE

TYPE	MANUFACTURER	MODEL	AREA SERVED	SIZE (WxH)	REMARKS
CD-1	GREENHECK	VCD-18	L-1	42x24 (1065x610)	c/w 24 VOLT EXPLOSION PROOF ACTUATOR
CD-2	GREENHECK	VCD-18	L-2	42x24 (1065x610)	
CD-3	GREENHECK	VCD-18	L-3	18x24 (457x610)	
CD-4	GREENHECK	VCD-18	L-5	48x48 (1219x1219)	c/w 24 VOLT ACTUATOR
CD-5	GREENHECK	VCD-18	Dewatering Supply	20x20 (500x500)	c/w 24 VOLT EXPLOSION PROOF ACTUATOR
CD-6	GREENHECK	VCD-18	Headworks Supply	18x18 (450x450)	
CD-7	GREENHECK	VCD-18	Odour Control Supply	10x10 (250x250)	
CD-8	GREENHECK	VCD-18	EF-2	18x18 (450x450)	c/w 24 VOLT EXPLOSION PROOF ACTUATOR
CD-9	GREENHECK	VCD-18	EF-3	14"ø (350ø)	
CD-10	GREENHECK	VCD-18	SF-2	52x52 (1312x1312)	c/w 24 VOLT ACTUATOR

DIFFUSER and REGISTER SCHEDULE

TYPE	MANUFACTURER	MODEL	OPTIONS/REMARKS
A	PRICE	635D/F/L/A/B12	c/w BALANCING DAMPER
B	PRICE	635D/F/S/A/B12	c/w BALANCING DAMPER
C	PRICE	620D/F/L/A/B12	c/w BALANCING DAMPER
D	PRICE	6"/24"x24"/SPD/31/B12	–
E	PRICE	–/ATG1/BF/B12	c/w FIRE DAMPER

ELECTRIC BASE BOARD HEATER SCHEDULE

ITEM	MANUFACTURER	MODEL	HEAT (W)	Volts	Ph	Hz	OPTIONS/REMARKS
EBB-1	OUELLET	RBH1008	1000	208	1	60	c/w Remote Thermostat, by Electrical
EBB-2	OUELLET	RBH0758	750	208	1	60	c/w Remote Thermostat, by Electrical
EBB-3	OUELLET	RBH0508	500	208	1	60	c/w Remote Thermostat, by Electrical
EBB-4	OUELLET	RBH0508	500	208	1	60	c/w Remote Thermostat, by Electrical
EBB-5	OUELLET	RBH0508	500	208	1	60	c/w Remote Thermostat, by Electrical

ELECTRIC FORCE FLOW HEATER SCHEDULE

ITEM	MANUFACTURER	MODEL	HEAT (W)	Volts	Ph	Hz	OPTIONS/REMARKS
EFF-1	OUELLET	OACU01500-T	1500	208	1	60	By Electrical

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Professional Seals

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URBAN systems

Scale

Quality Control by DM
Designed by DM
Drawn by GO

CULTUS LAKE

SCHEDULES

Sheet Number 4 of 12
Project Number 18159
Drawing Number M105
Revision 6

Revise main floor plumbing to accommodate new layout

INCOMING WATER SERVICE SEE CIVIL SITE DRAWING.

75 HDPE TO FILTER BUILDING SEE DWG P100.

SEE MECHANICAL ROOM DOMESTIC WATER PLAN FOR WATER LAYOUT.

150 PERFORATED FOUNDATION DRAIN PIPING. SEE INSTALLATION GENERAL ARRANGEMENTS. GENERAL CONTRACTOR IS TO SUPPLY AND INSTALL CRUSH GRAVEL DRAIN ROCK AND THE FILTER FABRIC. PLUMBING CONTRACTOR IS TO SUPPLY AND INSTALL THE PIPING.

RWL AMOUNT AND LOCATION TO BE COORDINATED WITH ARCHITECT AND GENERAL CONTRACTOR ON SITE. TRANSITION FROM RWL TO PVC AT 300 ABOVE GRADE WITH TRANSITION CAPS.

TO STORM SYSTEM

BACK WATER VALVE c/w INSPECTION CHAMBER

AIR COMPRESSOR SEE URBAN SYSTEMS DRAWINGS FOR SPECIFICATIONS

DROP DRAINAGE BELOW BEAM

75 SAN DOWN

TO SANITARY SUMP

150 PERFORATED FOUNDATION DRAIN PIPING. SEE INSTALLATION GENERAL ARRANGEMENTS. GENERAL CONTRACTOR IS TO SUPPLY AND INSTALL CRUSH GRAVEL DRAIN ROCK AND THE FILTER FABRIC. PLUMBING CONTRACTOR IS TO SUPPLY AND INSTALL THE PIPING.

RWL AMOUNT AND LOCATION TO BE COORDINATED WITH ARCHITECT AND GENERAL CONTRACTOR ON SITE. TRANSITION FROM RWL TO PVC AT 300 ABOVE GRADE WITH TRANSITION CAPS.

UNDER SLAB PLUMBING PLAN

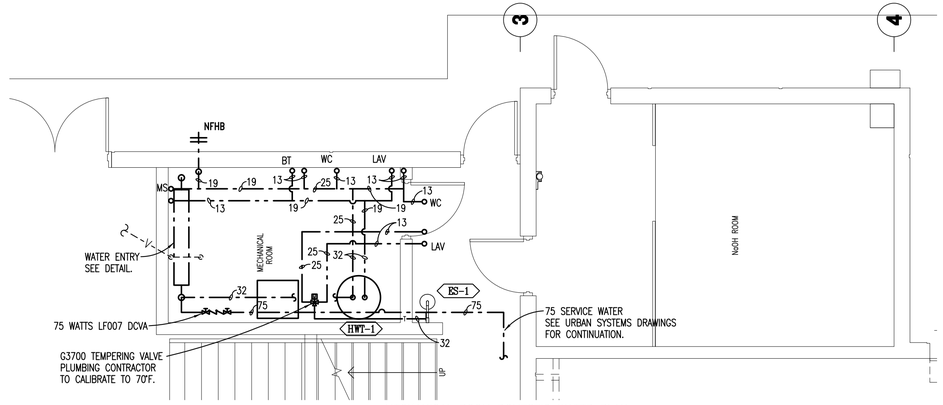
SCALE: 1:60

GENERAL PLUMBING NOTES:

1. WHERE DOMESTIC WATER PIPE SIZING IS NOT SHOWN TO FIXTURES, IT SHALL BE 13mm (1/2") UNLESS OTHERWISE NOTED.
2. ALL VENTING SHALL BE GATHERED AND TAKEN THROUGH ROOF IN ACCORDANCE WITH THE BC BUILDING CODE. PROVIDE A MINIMUM 75 VTR AND MAINTAIN A MINIMUM OF 10'-0" CLEARANCE FROM AIR INTAKES.
3. ALL FLOOR DRAINS SHALL BE TRAP PRIMED IN ACCORDANCE WITH THE BC BUILDING CODE.
4. WHERE DRAINAGE PIPING IS LOCATED IN AN OUTSIDE WALL, PROVIDE INSULATION AND VAPOUR BARRIER BEHIND PIPE TO 50mm (2") MINIMUM CLEAR.
5. VERIFY ALL INVERTS ON SITE PRIOR TO INSTALLATION OF SANITARY DRAINAGE PIPING.

SYMBOL LEGEND

	DOMESTIC COLD WATER
	DOMESTIC HOT WATER
	TEMPERED WATER
SAN	SANITARY, ABOVE GRADE
US-SAN	SANITARY, BELOW GRADE
ST	STORM
X	PERIMETER DRAINAGE
V	SANITARY VENT
HB	HOSE BIBB
CO	CLEANOUT
	GATE VALVE
	UNION
	CHECK VALVE
	THREEWAY VALVE (MOTORIZED)



MECHANICAL ROOM DOMESTIC WATER PLAN

SCALE: 1:50

HPF ENGINEERING LTD.
101-1402 McGill Road
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Email: draft@hpfengineering.com
Consultant's Project No.: 18159

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URBAN systems

Scale: AS SHOWN

Quality Control by	DM
Designed by	GO
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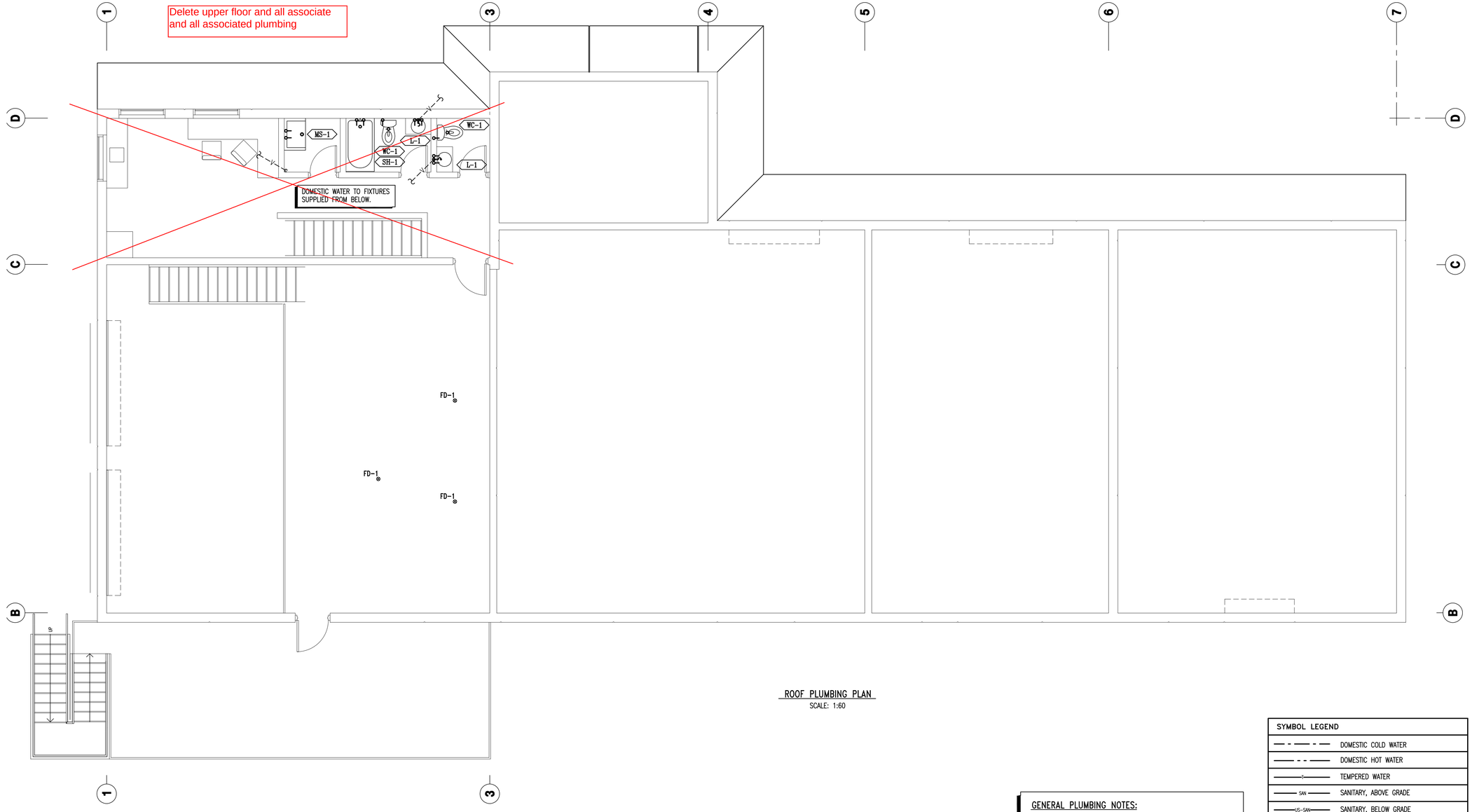
CULTUS LAKE

MAIN FLOOR PLUMBING PLANS

Sheet Number		7 of 12
Project Number	Drawing Number	Revision
18159	M110	6

Delete upper floor and all associate and all associated plumbing



ROOF PLUMBING PLAN
SCALE: 1:60

GENERAL PLUMBING NOTES:

1. WHERE DOMESTIC WATER PIPE SIZING IS NOT SHOWN TO FIXTURES, IT SHALL BE 13mm (1/2") UNLESS OTHERWISE NOTED.
2. ALL VENTING SHALL BE GATHERED AND TAKEN THROUGH ROOF IN ACCORDANCE WITH THE BC BUILDING CODE. PROVIDE A MINIMUM 75 VTR AND MAINTAIN A MINIMUM OF 10'-0" CLEARANCE FROM AIR INTAKES.
3. ALL FLOOR DRAINS SHALL BE TRAP PRIMED IN ACCORDANCE WITH THE BC BUILDING CODE.
4. WHERE DRAINAGE PIPING IS LOCATED IN AN OUTSIDE WALL, PROVIDE INSULATION AND VAPOUR BARRIER BEHIND PIPE TO 50mm (2") MINIMUM CLEAR.
5. VERIFY ALL INVERTS ON SITE PRIOR TO INSTALLATION OF SANITARY DRAINAGE PIPING.

SYMBOL LEGEND	
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	DOMESTIC HOT WATER
	TEMPERED WATER
SAN	SANITARY, ABOVE GRADE
US-SAN	SANITARY, BELOW GRADE
ST	STORM
X	PERIMETER DRAINAGE
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HB	HOSE BIBB
CO	CLEANOUT
	GATE VALVE
	UNION
	CHECK VALVE
	THREEWAY VALVE (MOTORIZED)

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URBAN systems

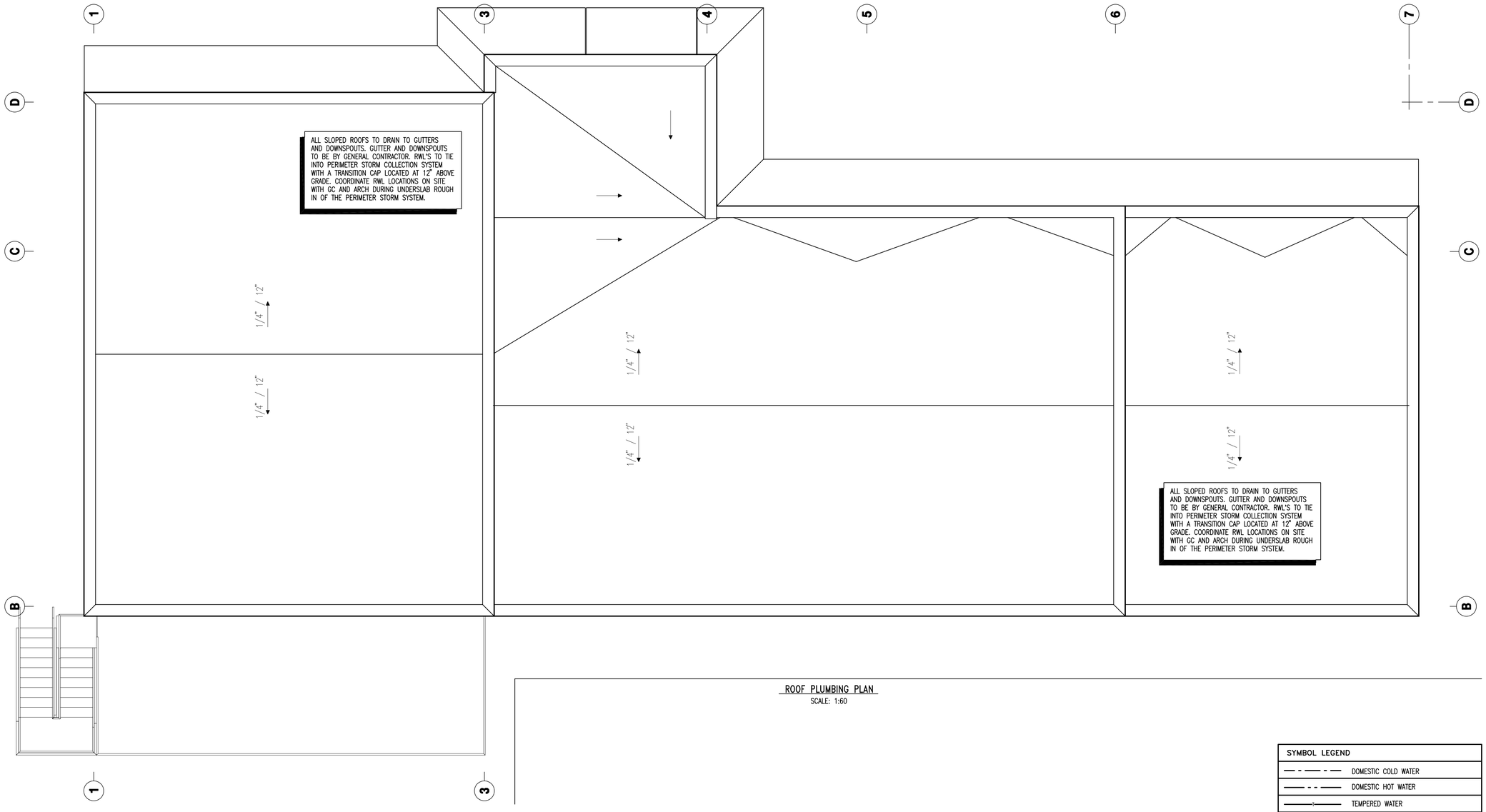
Scale

Quality Control by	DM
Designed by	GO
Drawn by	GO

CULTUS LAKE

SECOND FLOOR PLUMBING PLAN

Sheet Number		8 of 12
Project Number	Drawing Number	Revision
18159	M111	6



ROOF PLUMBING PLAN
SCALE: 1:60

GENERAL PLUMBING NOTES:

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	DOMESTIC HOT WATER
	TEMPERED WATER
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US-SAN	SANITARY, BELOW GRADE
ST	STORM
X	PERIMETER DRAINAGE
V	SANITARY VENT
HB	HOSE BIBB
CO	CLEANOUT
	GATE VALVE
	UNION
	CHECK VALVE
	THREEWAY VALVE (MOTORIZED)

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URBAN systems

Scale

Quality Control by	DM
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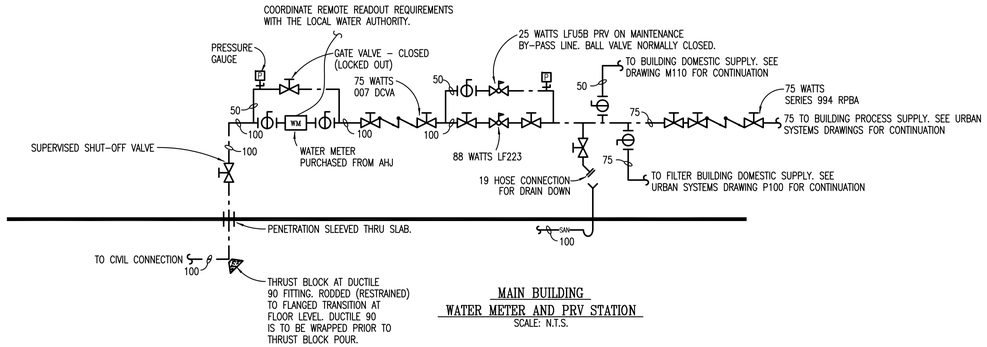
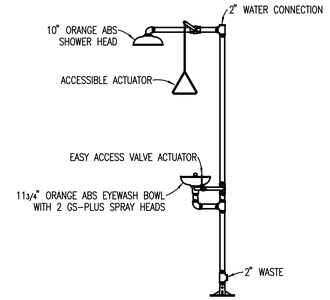
CULTUS LAKE

ROOF PLUMBING PLAN

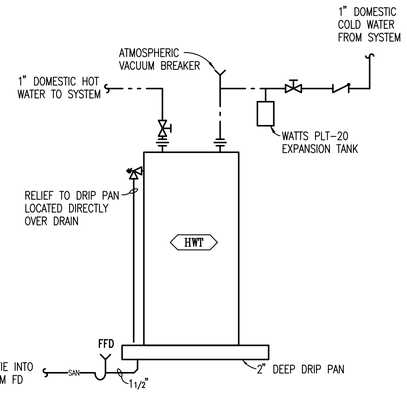
Sheet Number		9 of 12
Project Number	Drawing Number	Revision
18159	M112	6



MAIN BUILDING
WATER METER AND PRV STATION
SCALE: N.T.S.



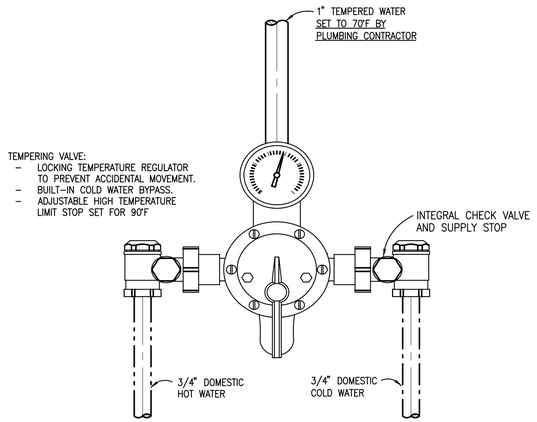
EMERGENCY STATION
GENERAL ARRANGEMENT
SCALE: N.T.S.



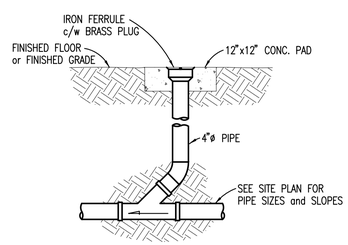
HOT WATER TANK
GENERAL ARRANGEMENT
SCALE: N.T.S.

COMBINATION SHOWER/EYEWASH SCHEDULE							
ITEM	MANUFACTURER	MODEL	LOCATION	FLOW (gpm)	INLET	WASTE	OPTIONS
ES-1	GAURDIAN	G1992	OUTSIDE MECH ROOM	20	1 1/4"	–	c/w G3700 Tempering valve, AP275-200 Electric Alarm with Flashing Light & Horn

HOT WATER TANK SCHEDULE								
ITEM	MANUFACTURER	MODEL	AREA of SERVICE	ELECTRIC (input kW)	STORAGE (GAL)	EWT (°F)	LWT (°F)	OPTIONS/REMARKS
HWT-1	BRADFOR WHITE	E32-120R-3	DOMESTIC HOT WATER	6	119	40.0	140.0	c/w Drain pan

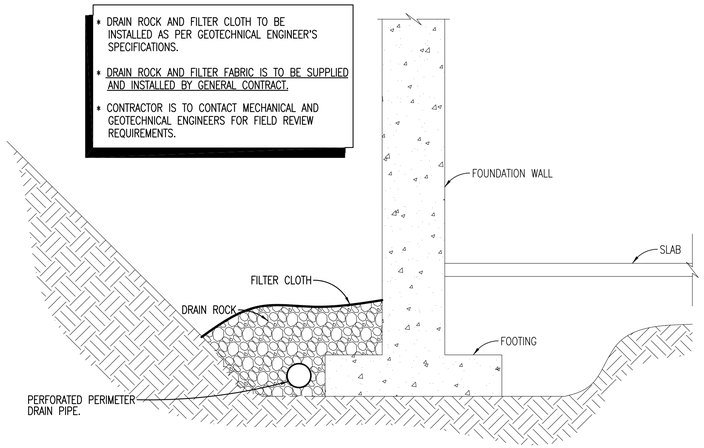


TEMPERING VALVE ARRANGEMENT
SCALE: NTS



CLEANOUT ARRANGEMENT
SCALE: NTS

- DRAIN ROCK AND FILTER CLOTH TO BE INSTALLED AS PER GEOTECHNICAL ENGINEER'S SPECIFICATIONS.
- DRAIN ROCK AND FILTER FABRIC IS TO BE SUPPLIED AND INSTALLED BY GENERAL CONTRACT.
- CONTRACTOR IS TO CONTACT MECHANICAL AND GEOTECHNICAL ENGINEERS FOR FIELD REVIEW REQUIREMENTS.



PERFORATED PIPE FOUNDATION DRAINAGE GENERAL ARRANGEMENT
SCALE: NTS

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Consultant's Project No.: 18159

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URBAN systems

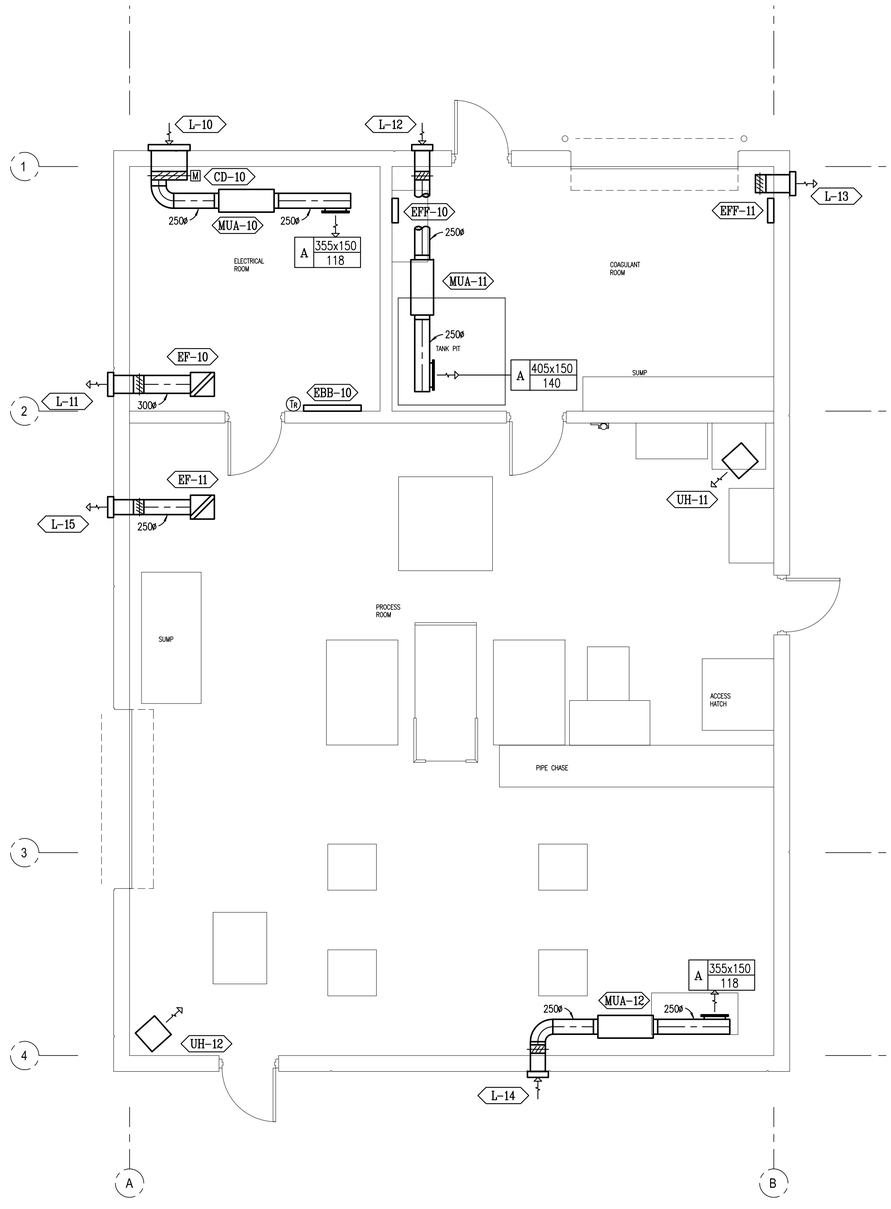
Scale

Quality Control by	DM
Designed by	GO
Drawn by	GO

CULTUS LAKE

GENERAL ARRANGEMENTS

Sheet Number		10 of 12
Project Number	Drawing Number	Revision
18159	M113	6



MAIN FLOOR HVAC PLAN
SCALE: 1:50

CONTROL DAMPER SCHEDULE					
TYPE	MANUFACTURER	MODEL	AREA SERVED	SIZE (WxH)	REMARKS
CD-10	GREENHECK	VCD-18	L-10	24x12 (600x300)	c/w 24 VOLT ACTUATOR

ELECTRIC BASE BOARD HEATER SCHEDULE							
ITEM	MANUFACTURER	MODEL	HEAT (W)	Volts	Ph	Hz	OPTIONS/REMARKS
EBB-10	OUELLET	RBH0758	750	208	1	60	c/w Remote Thermostat, by Electrical

ELECTRIC FORCE FLOW HEATER SCHEDULE							
ITEM	MANUFACTURER	MODEL	HEAT (W)	Volts	Ph	Hz	OPTIONS/REMARKS
EFF-10	OUELLET	OACU01500-T	1500	208	1	60	By Electrical
EFF-11	OUELLET	OACU01500-T	1500	208	1	60	By Electrical

DIFFUSER and REGISTER SCHEDULE			
TYPE	MANUFACTURER	MODEL	OPTIONS/REMARKS
A	PRICE	620/F/L/A/B12	c/w BALANCING DAMPER

MAKE-UP AIR UNIT SCHEDULE									
ITEM	MANUFACTURER	MODEL	HEAT INPUT (MBh)	CFM (L/s)	EXTERNAL S.P. ("w.c.)	Volts	Ph	Hz	OPTIONS
MUA-10	THERMOLEC	FER-10-3-208/3	3.0	250 (118)	0.3	208	3	60	ROOF CURB, END DISCHARGE, UP DISCHARGE PURGE, LOW LEAKAGE CONTROL DAMPERS, REMOTE PANEL, DISCHARGE AIR TEMPERATURE SENSOR, AIR PROVING SWITCH.
MUA-11	THERMOLEC	FER-10-3-208/3	3.0	295 (139)	0.3		3	60	
MUA-12	THERMOLEC	FER-10-3-208/3	3.0	250 (118)	0.3		3	60	

LOUVRE SCHEDULE						
TYPE	MANUFACTURER	MODEL	CFM (L/s)	LOCATION	SIZE (WxH)	OPTIONS
L-10	GREENHECK	EDD-401	250 (118)	ELECTRICAL	24x12 (600x300)	c/w CONTROL DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-11	GREENHECK	EDD-401	250 (118)	ELECTRICAL	12x12 (300x300)	c/w BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-12	GREENHECK	EDD-401	295 (139)	COAGULENT ROOM	12x12 (300x300)	c/w INTAKE BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-13	GREENHECK	EDD-401	295 (139)	COAGULENT ROOM	12x12 (300x300)	c/w BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-14	GREENHECK	EDD-401	250 (118)	PROCESS ROOM	12x12 (300x300)	c/w INTAKE BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING
L-15	GREENHECK	EDD-401	250 (118)	PROCESS ROOM	12x12 (300x300)	c/w BACKDRAFT DAMPER, BIRDSCREEN, CONFIRM COLOUR (SILVER) PRIOR TO ORDERING

EXHAUST FAN SCHEDULE														
ITEM	MANUFACTURER	MODEL	AREA OF SERVICE	AIRFLOW CFM (L/s)	S.P. ("w.c.)	AMPS	WATTS	HP	Volts	Ph	Hz	Rpm	OPTIONS / REMARKS	CONTROLS
EF-10	GREENHECK	–	ELECTRICAL ROOM	250 (118)	0.375	–	–	–	120	1	60	–		REVERSE ACTING THERMOSTAT
EF-11	GREENHECK	–	PROCESS ROOM	250 (118)	0.375	–	–	–	120	1	60	–		–

UNIT HEATER SCHEDULE										
ITEM	MANUFACTURER	MODEL	LOCATION	HEAT INPUT (MBH)	BLOWER HP	AMPS (115 Volt)	Volts	Ph	Hz	OPTIONS
UH-11	OULLET	OASU02008	PROCESS ROOM	2.0	1/30	–	208	1	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades
UH-12	OULLET	OASU02008	PROCESS ROOM	2.0	1/30	–	208	1	60	c/w Vertical Mount, Diffuser Cone, Disconnect, Epoxy Coated Fan Blades

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URBAN systems

Scale: AS SHOWN

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Designed by	GO
Drawn by	GO

CULTUS LAKE

FILTER BUILDING
HVAC PLAN

Sheet Number		11 of 12
Project Number	Drawing Number	Revision
18159	M300	6

- DRAIN ROCK AND FILTER CLOTH TO BE INSTALLED AS PER GEOTECHNICAL ENGINEER'S SPECIFICATIONS.
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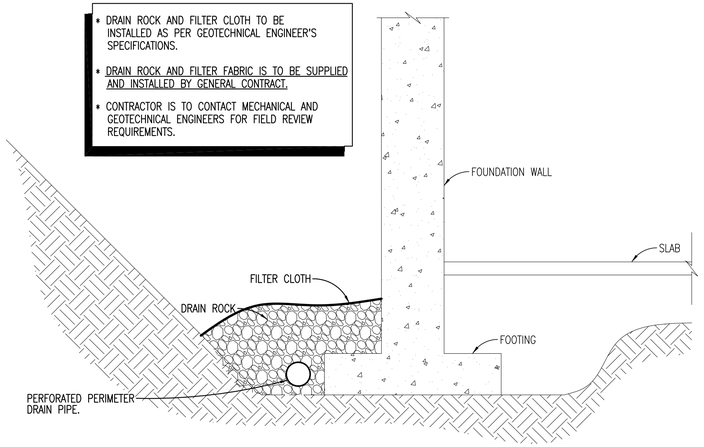
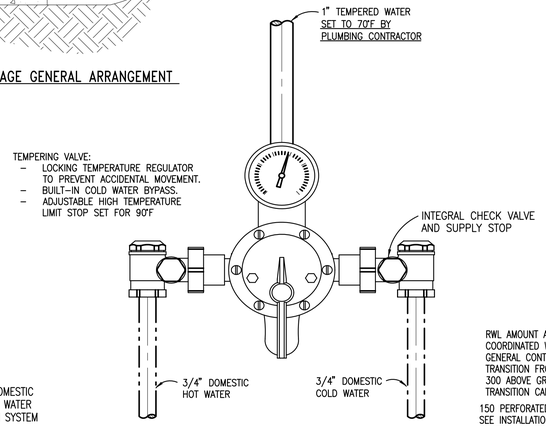
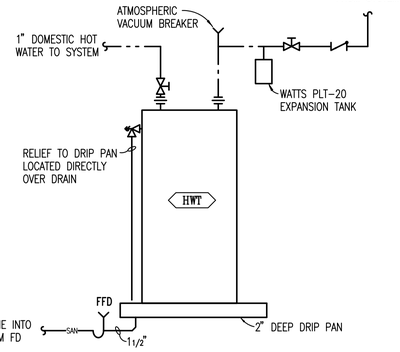


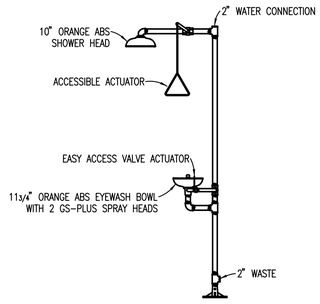
PERFORATED PIPE FOUNDATION DRAINAGE GENERAL ARRANGEMENT
SCALE: NTS



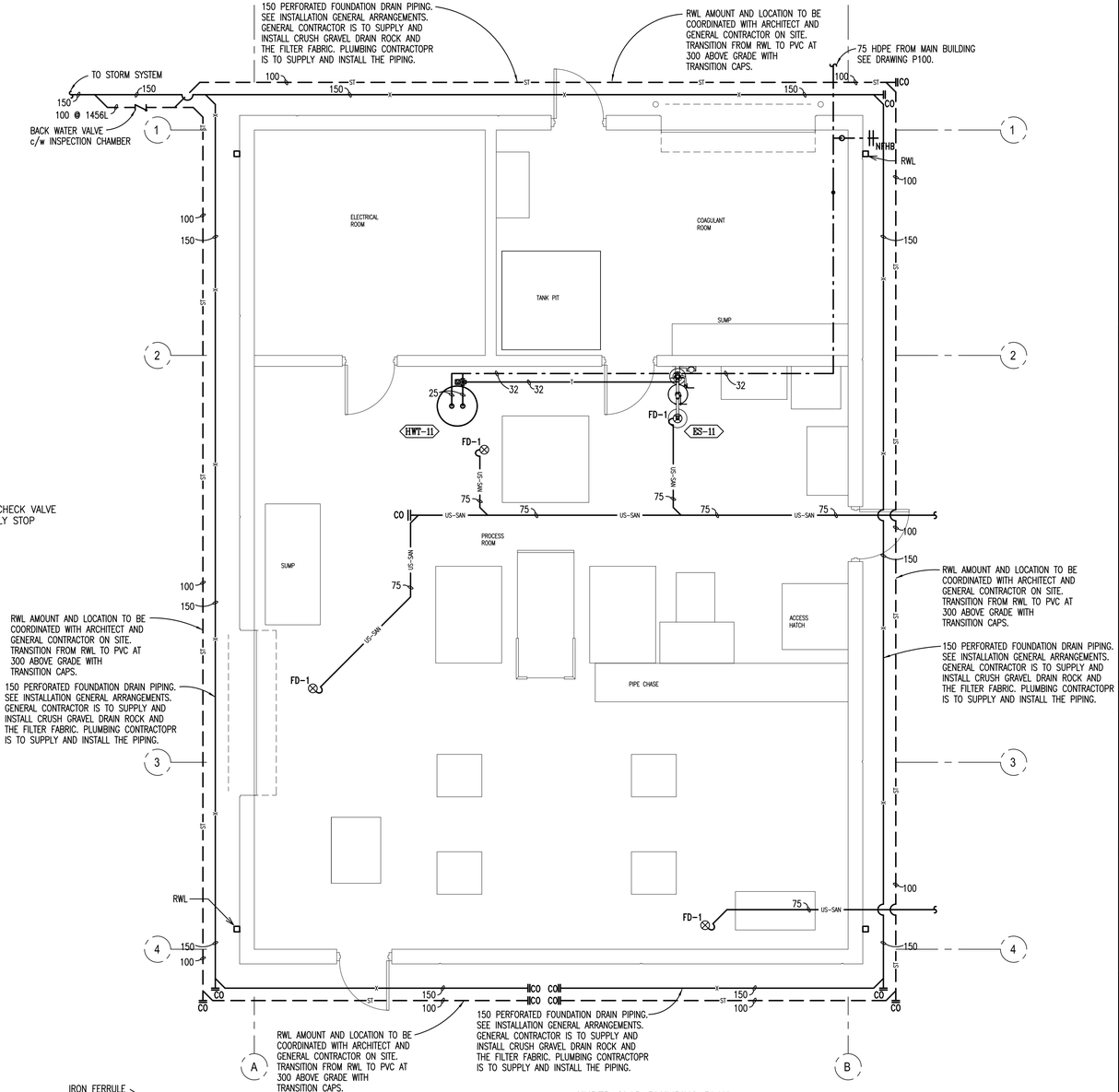
TEMPERING VALVE ARRANGEMENT
SCALE: NTS



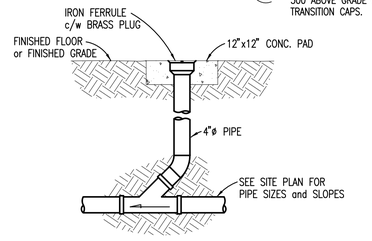
HOT WATER TANK GENERAL ARRANGEMENT
SCALE: N.T.S.



EMERGENCY STATION GENERAL ARRANGEMENT
SCALE: N.T.S.



UNDER SLAB PLUMBING PLAN
SCALE: 1:50



CLEANOUT ARRANGEMENT
SCALE: NTS

COMBINATION SHOWER/EYEWASH SCHEDULE							
ITEM	MANUFACTURER	MODEL	LOCATION	FLOW (gpm)	INLET	WASTE	OPTIONS
ES–11	GAURDIAN	G1992	FILTER BUILDING	20	1¼"	–	c/w G3700 Tempering valve, AP275–200 Electric Alarm with Flashing Light & Horn

HOT WATER TANK SCHEDULE								
ITEM	MANUFACTURER	MODEL	AREA of SERVICE	ELECTRIC (input kW)	STORAGE (GAL)	EWT (°F)	LWT (°F)	OPTIONS/REMARKS
HWT–11	BRADFOR WHITE	E32–120R–3	DOMESTIC HOT WATER	6	119	40.0	140.0	c/w Drain pan

SYMBOL LEGEND			
DOMESTIC COLD WATER		SANITARY VENT	
DOMESTIC HOT WATER	HB	HOSE BIBB	
TEMPERED WATER	CO	CLEANOUT	
SANITARY, ABOVE GRADE		GATE VALVE	
SANITARY, BELOW GRADE		UNION	
STORM		CHECK VALVE	
PERIMETER DRAINAGE		THREEWAY VALVE (MOTORIZED)	

GENERAL PLUMBING NOTES:

1. WHERE DOMESTIC WATER PIPE SIZING IS NOT SHOWN TO FIXTURES, IT SHALL BE 13mm (1/2") UNLESS OTHERWISE NOTED.
2. ALL VENTING SHALL BE GATHERED AND TAKEN THROUGH ROOF IN ACCORDANCE WITH THE BC BUILDING CODE. PROVIDE A MINIMUM 75 VTR AND MAINTAIN A MINIMUM OF 10'–0" CLEARANCE FROM AIR INTAKES.
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4. WHERE DRAINAGE PIPING IS LOCATED IN AN OUTSIDE WALL, PROVIDE INSULATION AND VAPOUR BARRIER BEHIND PIPE TO 50mm (2") MINIMUM CLEAR.
5. VERIFY ALL INVERTS ON SITE PRIOR TO INSTALLATION OF SANITARY DRAINAGE PIPING.

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URBAN systems

Scale: AS SHOWN

Quality Control by	DM
Designed by	GO
Drawn by	GO

CULTUS LAKE

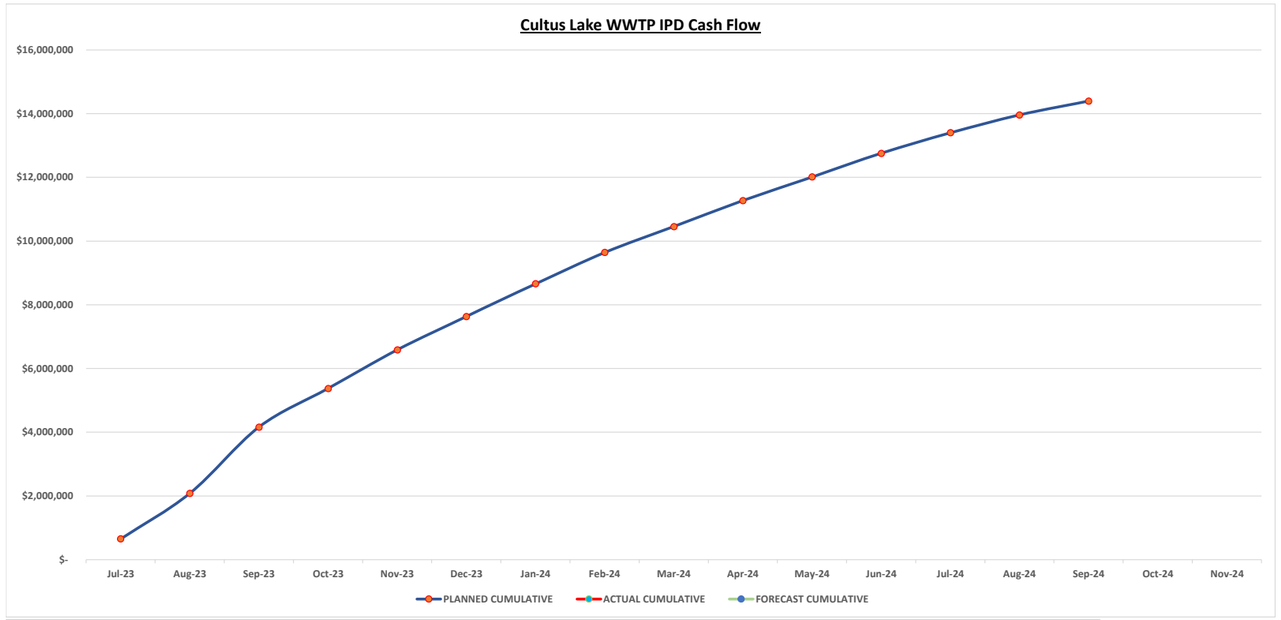
FILTER BUILDING PLUMBING PLAN

Sheet Number		12 of 12
Project Number	Drawing Number	Revision
18159	M310	6

Appendix G

Cash Flow Forecast

Cultus Lake WWTP IPD Project Cash Flow Sample



MONTH	PLANNED MONTHLY	PLANNED CUMULATIVE	ACTUAL MONTHLY	ACTUAL CUMULATIVE	FORECAST MONTHLY	FORECAST CUMULATIVE	PLANNED % COMPLETE	ACTUAL % COMPLETE	VARIANCE
Jul-23	$ 653,173	$ 653,173							
Aug-23	$ 1,431,206	$ 2,084,379							
Sep-23	$ 2,077,640	$ 4,162,019							
Oct-23	$ 1,214,116	$ 5,376,135							
Nov-23	$ 1,214,116	$ 6,590,251							
Dec-23	$ 1,047,345	$ 7,637,596							
Jan-24	$ 1,025,717	$ 8,663,313							
Feb-24	$ 981,960	$ 9,645,274							
Mar-24	$ 815,190	$ 10,460,463							
Apr-24	$ 815,190	$ 11,275,653							
May-24	$ 742,143	$ 12,017,796							
Jun-24	$ 742,143	$ 12,759,938							
Jul-24	$ 644,077	$ 13,404,015							
Aug-24	$ 560,807	$ 13,964,822							
Sep-24	$ 433,740	$ 14,398,562							
Oct-24	$ -								
Nov-24	$ -								
Total	$ 14,398,562		$ -	$ -	$ -				

	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24
rocurement and Contracting Requirements	$ 73,802	$ 73,802	$ 147,603	$ 147,603	$ 147,603	$ 147,603	$ 147,603	$ 73,802	$ 73,802	$ 73,802	$ 73,802	$ 73,802	$ 73,802	$ 73,802	$ 73,802
General Requirements	$ 77,373	$ 77,373	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 123,798	$ 77,373	$ 46,424	$ 30,949
Concrete	$ 129,427	$ 258,854	$ 388,281	$ 388,281	$ 388,281	$ 258,854	$ 258,854	$ 258,854	$ 129,427	$ 129,427	$ -	$ -	$ -	$ -	$ -
Metals	$ 25,709	$ 51,417	$ 77,126	$ 77,126	$ 77,126	$ 51,417	$ 51,417	$ 51,417	$ 25,709	$ 25,709	$ -	$ -	$ -	$ -	$ -
Wood, Thermal, Openings and Finishes	$ -	$ -	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ 58,213	$ -	$ -	$ -
Mechanical	$ 194,961	$ 584,882	$ 779,843	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961	$ 194,961
Electrical	$ 72,799	$ 218,396	$ 291,195	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799	$ 72,799
Earthwork	$ 33,533	$ 33,533	$ 33,533	$ 33,533	$ 33,533	$ 33,533	$ 13,413	$ 13,413	$ 13,413	$ 13,413	$ 100,598	$ 100,598	$ 114,011	$ 100,598	$ -
Misc/Risk	$ -	$ 33,098	$ 33,098	$ 33,098	$ 33,098	$ 33,098	$ 33,098	$ 66,196	$ 66,196	$ 66,196	$ 66,196	$ 66,196	$ 66,196	$ 33,098	$ 33,098
Total	$ 607,603	$ 1,331,355	$ 1,932,689	$ 1,129,410	$ 1,129,410	$ 974,275	$ 954,155	$ 913,452	$ 758,316	$ 758,316	$ 690,365	$ 690,365	$ 599,141	$ 521,681	$ 405,608
Chandos ICL/Overhead	$ 45,570.2	$ 99,851.6	$ 144,951.6	$ 84,705.8	$ 84,705.8	$ 73,070.6	$ 71,561.6	$ 68,508.9	$ 56,873.7	$ 56,873.7	$ 51,777.4	$ 51,777.4	$ 44,935.6	$ 39,126.1	$ 28,131.6
Total	$ 653,173	$ 1,431,206	$ 2,077,640	$ 1,214,116	$ 1,214,116	$ 1,047,345	$ 1,025,717	$ 981,960	$ 815,190	$ 815,190	$ 742,143	$ 742,143	$ 644,077	$ 560,807	$ 433,740

Appendix H

Pre-ordered Equipment Tracking Spreadsheet

PROCESS	Dwgs Tag	Purchased?			Delivered to site?		Status	Status Update Date (yyyy/mm/dd)	Comments
		Mech	Electrical Panel?	Instruments?	Yes	No			
Centrifuge Feed Systems	CP-6100 Feed Pump	x		x		x	TBD	2023-04-25	Validation Status: For budget purposes, the team has decided to re-tender the filtration and headworks equipment.
	CP-6110 Feed Pump	x		x		x			
Centrifuge	CE-6500 Centrifuge 1	x		x		x			
Dewatered Sludge Storage	CO-6500 - Conveyor	x		x		x			
Centrifuge Polymer	CT-6300 - Polymer Drum	x		x		x			
	MP-6300 - Polymer Feed Pump	x		x		x			
	MX-6300 - Polymer Mixer	x		x		x			
Odour Control	DM-7200 Mist Eliminator	x		x	x		Received on site per FVRD log/inventory	2023-04-25	
	BL-7210 Odour Control Fan 1	x		x	x				
	BL-7220 Odour Control Fan 2	x		x	x				
	AC-7400 - Granual Activated Carbon	x		x	x				
SBR Reactor#1	MX-2100 - Submersible Mixer	x		x	x		Received on site per FVRD log/inventory	2023-04-25	Received on site
	SP-2120 - Submersible Pump	x		x	x				
	DE-2130 - Decanter	x		x	x				
SBR Reactor#2	MX-2200 - Submersible Mixer	x		x	x				
	SP-2220 - Submersible Pump	x		x	x				
	DE-2230 - Decanter	x		x	x				
SBR Blower	BR-2510 - SBR Blower No.1	x		x	x		Received on site per FVRD log/inventory	2023-04-25	Received on site per FVRD log/inventory
	BR-2520 - SBR Blower No.2	x		x	x				
	BR-2520 - SBR Blower No.3	x		x	x				
Digester#1	MX-5130 - Mixer	x		x		x	Shop Drawings Review; Revise and Resubmit	2023-04-25	
	SP-5510 - Digested Decant Pump#1	x		x		x			
Digester#2	MX-5230 - Mixer	x		x		x	Shop Drawings Review; Revise and Resubmit	2023-04-25	
	SP-5210 - Digested Decant Pump#2	x		x		x			
Digester Blower	BR-5510 - Digester Blower#1	x		x		x	Shop Drawings Review; Revise and Resubmit	2023-04-25	
	BR#5520- Digester Blower#2	x		x		x			
Equalization Tank	SP-3120 - EQ Tank Pump 1	x		x		x	Shop Drawings Review; Revise and Resubmit	2023-04-25	Sent of Omni on November 22, 2019, returned on Dec 17/19. Sent to Lakeside Dec 18/19 - additional request to review sent Jan 13/20 - returned Jan 16/20. Returned to FVRD on Feb 19, 2020 - Revised and Resubmit
	SP-3130 - EQ Tank Pump 2	x		x		x	Shop Drawings Review; Revise and Resubmit		Sent of Omni on November 22, 2019, returned on Dec 17/19. Sent to Lakeside Dec 18/19 - additional request to review sent Jan 13/20 - returned Jan 16/20. Returned to FVRD on Feb 19, 2020 - Revised and Resubmit
	SP-3140 -EQ Tank Pump 3	x		x		x	Shop Drawings Review; Revise and Resubmit		Sent of Omni on November 22, 2019, returned on Dec 17/19. Sent to Lakeside Dec 18/19 - additional request to review sent Jan 13/20 - returned Jan 16/20. Returned to FVRD on Feb 19, 2020 - Revised and Resubmit
Filtration Chemical System	T-9700 Filter Media Cleaning Solution Day Tank	x		x		x	TBD	2023-04-25	Validation Status: For budget purposes, the team has decided to re-tender the filtration and headworks equipment.
	CP-9710 - Filter Media Cleaning Pump	x		x		x	TBD		
Flocculation	SM-33150 - Static Mixer 1	x		x	x		Received on site per FVRD log/inventory	2023-04-25	
UV	UV-4100 Channel #1	x		x	x		Received on site per FVRD log/inventory	2023-04-25	
	UV-4200 Channel #2	x		x	x				
Disinfected Effluent Wet Well and RW Pumping	SWP-8210 - Service Water Pumps	x			x		Purchased	2023-04-25	Purchased but not required; Wet effluent scope deleted.
	SWP-8220 - Service Water Pumps	x			x		Purchased	2023-04-25	Purchased but not required; Wet effluent scope deleted.

To be determined vendor to supply equipment
Shop drawing process; purchased not finalized
Purchased and received on site

NORTH CULTUS LAKE WASTE WATER TREATMENT PLANT INVENTORY

SBR equipment diffusers, decanters, stainless piping, pvc piping for diffusers, misc hardware and fittings

Ultra violet disinfection equipment

3- atlas copco blowers

Fibreglass tank

Screening materials

Vfd decanters

Meter als g20575 xylem

2- control panels

2- 2.2 hp pumps

2- 35 hp pumps sl 1 upgrade

Mixer times 2

Diffusers

2 inlet silencers

2 outlet silencers

2 pressure tanks

2- 15 hp motors submersible

2- sub wet 15 hp motor

Owner: Fraser Valley Regional District
Project: Cultus Lake North WWTP
Contractor: Fraser Valley Regional District
File: 0999.0069.03

Shop Drawing Status

Legend for Reviewing by Subconsultant

X	indicates reviewed by
X	indicates current location of shop drawings
	Outstanding Shop Drawings
	Outstanding O&M Manuals
X	Waiting on Resubmission from Contractor/Owner
	Completed

*** Status Legend:**
For Review
Reviewed
Reviewed As Modified - Proceed
Resubmit
No Exceptions Taken

Fraser Valley Regional District

SD #	FVRD #	Drawing or Title	Digital Copies	Reviewing Subconsultant								Status	Date Received (yyyy/mm/dd)	Date to Consultant (yyyy/mm/dd)	Date Returned (yyyy/mm/dd)	Date to FVRD (yyyy/mm/dd)	Spec. #	Comments
				USL	Omni	Lakeside	FVRD	Piteau	Novation	CWMM	HPF							
1	18-9433AC	Electrical Sumbittal Items for SBR Equipment	1	X	X	X	X					Revise and Resubmit	2019-02-19	2019-02-19	2019-03-21	2019-03-21		Received Reviewed SD back from Omni - Feb 28 - with USL/sent to Lakeshore on Mar 7 - Returned to FVRD Mar 21/19-Revise/Resubmit
1-R1	18-9433AC	Electrical Sumbittal Items for SBR Equipment	1	X	X	X	X					Reviewed	2019-05-03	2019-05-03	2019-06-21	2019-06-21		Returned by Omni - May 7/19 - Sent to Lakeside May 7/19 - Returned from Lakeside May 14 - with USL for Review; Returned to FVRD on June 21/19
2	18-9433AC	Mechanical Submittal Items for SBR Equipment	1	X	X	X	X					Revise and Resubmit	2019-02-19	2019-02-19	2019-03-21	2019-03-21		FVRD sent SD's to Omni for review on Feb 21, 2019, Returned on Mar 7 and sent on to Lakeshore - Returned to FVRD Mar 21/19-Revise/Resubmit
2-R1	18-9433AC	Mechanical Submittal Items for SBR Equipment	1	X	X	X	X					Revise and Resubmit	2019-05-03	2019-05-03	2019-06-21	2019-06-21		Returned by Omni - May 7/19 - Sent to Lakeside May 7/19, Returned from Lakeside May 14 - with USL for Review; Returned to FVRD June 21/19
3	18-9433AC	Blowers for SBR Submittal	1	X	X	X	X					Revise and Resubmit	2019-03-01	2019-03-01	2019-03-21	2019-03-21		Sent to Omni for Review March 6, 2019, returned on Mar 7 and sent to Lakeshore on Mar 7 - Returned to FVRD Mar 21/19-Revise/Resubmit
3-R1		Blowers for SBR Submittal - see SD 2-R1 Mechanical Resubmission- the Blower Resubmission is contained within this submittal										See SD 2-R1 for Blower Resubmission	2019-05-03	2019-05-03	2019-06-21	2019-06-21		See SD 2-R1 for Blower Resubmission; SD2-R1 returned to FVRD June 21/19-R&R
4	-	UV Submittal - Trojan UV3000 PTP	1	X	X	X	X					Reviewed as Modified	2019-03-21	2019-05-14	2019-08-28	2019-08-28		Review complete and returned to FVRD and posted on SharePoint 2019-08-28
5	-	Naoh Tank-4100 USG-7360000N	1	X			X					Revise and Resubmit	2019-06-26	2019-06-26	2019-07-09	2019-07-09		Sent back to FVRD - Revise and Resubmit. Revise and resubmit 2019-08-28.
5-R1		Naoh Tank-4100 USG-7360000N	1	X			X					Revise and Resubmit	2019-10-23	2019-10-23	2019-11-08	2019-11-08		Returned to FVRD on Nov 8, 2019 - Revise and Resubmit
5-R2		Naoh Tank-4100 USG-7360000N	1	X			X					Reviewed As Modified - Proceed	2020-01-06	2020-01-06	2020-01-21	2020-01-21		Returned to FVRD on Jan 21/20 - Reviewed as Modified - Proceed
6	-	Chemical Metering Pump SN1689A	1	X			X					Not Reviewed	2019-06-27	2019-06-27	2019-07-09	2019-07-09	46 33 42	Not complete - Need to be sent back to Manufacturer to provide a complete package.
7	-	Chemical Metering Pump SN1689B	1	X			X					Not Reviewed	2019-06-27	2019-06-27	2019-07-09	2019-07-09	46 33 42	Not complete - Need to be sent back to Manufacturer to provide a complete package.
8	-	Chemical Metering Pump SN1689C	1	X			X					Not Reviewed	2019-06-27	2019-06-27	2019-07-09	2019-07-09	46 33 42	Not complete - Need to be sent back to Manufacturer to provide a complete package.
6-7-8-R1-Combined	-	Chemical Metering Pumps-SN1689A-B-C - Combined Submission	1	X	X	X	X					Revise and Resubmit	2019-08-06	2019-08-06	2019-08-13	2019-08-28	46 33 42	SD 6, 7 and 8 combined for R1 review. Sent to Omni on Aug. 7, 2019 - Returned by Omni on Aug 13/19. Sent to Lakeside for review Aug 23, 2019. Returned from Lakeside 2019-08-28. Returned to FVRD 2019-08-28 Revise and Resubmit.
6-7-8-R2-Combined	-	Chemical Metering Pumps-SN1689A-B-C - Combined Submission	1	X								Revise and Resubmit	2019-09-23	2019-09-23	2019-10-01	2019-10-01		Returned to FVRD October 1, 2019 - Revise and Resubmit
6-7-8-R3-Combined	-	Chemical Metering Pumps-SN1689A-B-C - Combined Submission	1	X								Revise and Resubmit	2019-10-23	2019-10-24	-	-		Revised version sent Nov 1/19 which replaced Oct 23/19 version (Oct 23 version in ss folder). USL requested additional info from Client - revised Version sent Nov 21/19
6-7-8-R4-Combined	-	Chemical Metering Pumps-SN1689A-B-C - Combined Submission	1	X			X					Revise and Resubmit	2019-12-17	2019-12-17				Revised version sent Nov 21/19 after request from USL for additional information
6-7-8-R5-Combined	-	Chemical Metering Pumps-SN1689A-B-C - Combined Submission	1	X	X							For Review	2020-03-13	2020-03-13				Sent to Omni on 2020-05-21.
9	-	Headworks Screenings and Grit Systems Supply	1	X	X							Revise and Resubmit	2019-07-02	2019-07-03	2019-07-24	2019-07-24	46 05 00	Sent to FVRD to revise and resubmit. FVRD sent back to vendor on August 1, 2019 for revision and resubmission
9-R1	-	Headworks Screenings and Grit Systems Supply	1	X	X	X	X					Revise and Resubmit	2019-11-05	2019-11-06	2020-01-09	2020-01-13		Sent to Omni for reivew on Nov. 26, 2019. Returned from Omni and sent to Lakeside for review Dec 13, 2019. Returned from Lakeside Jan 9, 2020. Returned to FVRD Jan 13/20 - Revise and Resubmit
10	-	Drumfilters and Dosing Skids	1	X	X							Revise and Resubmit	2019-07-05	2019-07-08	2019-07-24	2019-07-24	46 05 00	Sent to FVRD to revise and resubmit
10-R1	-	Drumfilters and Dosing Skids	1	X	X	X	X					Revise and Resubmit	2019-09-13	2019-09-13	2019-10-16	2019-10-16		Sent to Omni Sept 20, 2019 for review, returned from Omni Oct 3. Returned to FVRD Revise and Resubmit - Oct 16, 2019.
11	-	Chamber Access Hatch	1	X								Reviewed	2019-07-10	2019-07-11	2019-07-29	2019-07-29		No exceptions taken, returned to FVRD
12	-	Check Valves	1	X								Reviewed	2019-07-10	2019-07-11	2019-07-29	2019-07-29		No exceptions taken, returned to FVRD
13	-	Drumfilters Automation - Electrical and Controls	1	X	X	X						No Exceptions Taken	2019-07-30	2019-07-30	2019-08-13	2019-09-17		Sent to Omni for Review - July 30, 2019 - Returned from Omni Aug 13, 2019 and sent on to Lakeside for review on the same day. Sept 17, 2019 - sent back to FVRD no excpetions taken
14	-	Aerobic Digester Mixing	1	X			X					Revise and Resubmit	2019-07-30	2019-08-07	2019-08-13	2019-08-21		Sent to Omni for Review - August 7, 2019 - Returned from Omni Aug 13, 2019. Returned to FVRD on Aug 21, 2019 - revise and resubmit.
14-R1	-	Aerobic Digester Mixing	1	X								Reviewed As Modified - Proceed	2019-08-28	2019-08-28	2019-10-01	2019-10-01		Revised submission received 2019-08-28; Returned to FVRD October 1, 2019- Reviewed As Modified - Proceed
15	-	Sludge Dewatering Centrifuge	1	X	X	X	X					Revise and Resubmit	2019-08-21	2019-08-27	2019-09-17	2019-09-18		Sent to Omni 2019-08-27; Sent to Lakeside for Review 2019-09-12; Sent back to FVRD Sept 18, 2019 - Revise and Resubmit
15.a		Sludge Dewatering Centrifuge Automation	1	X	X							Revise and Resubmit				2020-01-21		was not originally included in this spreadsheet. Was added as a shop drawing package was found on the server. Omni provided feedback on Dec 16, 2019. Urban reviewed and indicated revise and resubmit on Jan 21, 2020.
16	-	Flygt Pumps for 4 Stations (Equalization, Return Lift Station, Digested Sludge and Sanitary)	1	X	X	X	X					Revise and Resubmit	2019-09-04	2019-09-04	2019-10-16	2019-10-16		Sent to Omni for Review on Sept 20, 2019. Sent to Lakeside for review October 1, 2019. Returned to FVRD Revise and Resubmit - Oct 16, 2019.
~~17~~	~~-~~	~~Reclaimed Water Pumping Equipment~~	~~1~~	~~X~~	~~X~~	~~X~~	~~X~~					~~Revise and Resubmit~~	~~2019-09-09~~	~~2019-09-09~~	~~2019-10-16~~	~~2019-10-16~~		~~Sent to Omni for further review on Sept 13, 2019. Sent to Lakeside for review October 1, 2019. Returned to FVRD Revise and Resubmit - Oct 16, 2019.~~
~~17-R1~~		~~Reclaimed Water Pumping Equipment~~	~~1~~	~~X~~	~~X~~	~~X~~	~~X~~					~~Approved - No Exceptions Taken~~	~~2019-10-23~~	~~2019-10-23~~	~~2020-01-09~~	~~2020-01-13~~		~~Sent to Omni for reivew on November 12, 2019. Returned from Omni and sent to Lakeside for review on Dec 13, 2019. Returned from Lakeside Jan 9, 2020. Returned to FVRD Jan 13/20 - Approved - No Exceptions~~
18	-	Engineering Submittal - Odour Control	1	X	X	X	X					Revise and Resubmit	2019-09-16	2019-09-17	2019-10-23	2019-10-23	46 05 00	Sent to Omni for review Sept 17, 2019, returned from Omni Oct 3. Returned to FVRD revise and resubmit
18-R1	-	Engineering Submittal - Odour Control	1	X	X		X					Revise and Resubmit	2020-01-23	2020-01-23		2020-06-04	46 05 00	Received from FVRD for review Jan 23/20. Sent to Omni for 2020-05-04 with followup on 2020-05-20. Omni returned 2020-06-04. Shop drawing uploaded to FVRD SharePoint mail box 2020-06-04 and email sent to DR and SC.
18-R2	-	Engineering Submittal - Odour Control	1	X	X							For Review	2020-07-07					Received by email from Dave Robillin 2020-07-07. Urban reviewed (postponed for updated drawings) and sent to Omni for review 2020-09-10.
19	-	Headworks-Rotarc-Mectan-Grit Pump-Sam-Automation - Electrical and Controls	1	X	X	X	X					Revise and Resubmit	2019-09-23	2019-09-23	2019-10-16	2019-10-16		Sent to Omni for review Sept 24, 2019. Sent to Lakeside for review October 1, 2019. Returned to FVRD Revise and Resubmit - Oct 16, 2019.
19-R1	-	Headworks-Rotarc-Mectan-Grit Pump-Sam-Automation - Electrical and Controls	1	X	X	X	X					Revise and Resubmit	2019-11-22	2019-11-22	2020-01-16	2020-02-19		Sent of Omni on November 22, 2019, returned on Dec 17/19. Sent to Lakeside Dec 18/19 - additional request to review sent Jan 13/20 - returned Jan 16/20. Returned to FVRD on Feb 19, 2020 - Revised and Resubmit
20	-	Aldec 30-Decanter plus Control-Electrical Dwg Pkg	1	X	X	X	X					Revise and Resubmit	2019-10-11	2019-10-11	2020-01-16	2020.03.06		Sent to Omni for review Nov 5, 2019, returned on Dec 17/19. Sent to Lakeside Dec 18/19 -additional request to review sent Jan 13/20 - returned on Jan 16/20. Returned to FVRD on March 6, 2020.
21	-	Atara Shaftless Screw Conveyor	1	X	X	X	X			X		Revise and Resubmit	2019-11-07	2019-11-07	2020-01-09	2020-01-13		Sent to CWMM for review on Nov 26/19 - Returned Nov 26/19. Sent to Omni for Review Nov 27/19. Returned from Omni and sent to Lakeside for review Dec 13, 2019. Returned from Lakeside on Jan 9, 2020. Returned to FVRD Jan 13/2020 - Revise and Resubmit
22	-	Flexible Membrane Disc Diffuser Aeration Systems	1	X			X					Revise and Resubmit	2019-12-03	2019-12-03	2019-12-20	2019-12-20		Returned to FCR December 20, 2019 revise and resubmit
22-R1	-	Flexible Membrane Disc Diffuser Aeration Systems	1	X			X					Revise and Resubmit	2020-02-19	2020-02-19	2020-04-23		46 51 33	Returned to FVRD via email, revise and resubmit, 2020-04-23.
22-R2	-	Flexible Membrane Disc Diffuser Aeration Systems	1	X			X					Revise and Resubmit	2020-06-09	2020-06-07		2020-07-22		Received from FVRD 2020-06-09. Returned to FVRD 2020-07-22 to D Roblin via email.
22-R3	-	Flexible Membrane Disc Diffuser Aeration Systems	1	X	X		X					Reviewed As Modified - Proceed	2020-08-20	2020-08-20	2020-11-05	2020-11-05		Received by email from Dave Roblin 2020-08-20. Review by Urban complete and sent to Omni for review 2020-09-11. Received from Omni 2020-10-20. Returned to FVRD 2020-11-05
23	-	Canco Crane Shop Drawings	1	X			X			X		Revise and Resubmit	2020-03-06	2020-03-06	2020-04-08			Returned to Dave via email revise and resubmit 2020-04-08. Email comments from CWMM incorporated into drawing, but thorough review not complete due to missing substantial information.
23-R1	-	Canco Crane Shop Drawings	1	X			X					Revise and resubmit	2020-04-27	2020-04-27		2020-06-04		Returned to FVRD 2020-06-04 by email.