



Associated
Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

DESIGN BASIS MEMORANDUM

Town of High Level

High Level WTP MIEX Upgrades



JANUARY 2025



Platinum
member

CONFIDENTIALITY AND © COPYRIGHT FOR THIS REPORT

This document is for the sole use of the addressee and Associated Engineering Alberta Ltd. The document contains proprietary and confidential information that shall not be reproduced in any manner or disclosed to or discussed with any other parties without the express written permission of Associated Engineering Alberta Ltd. Information in this document is to be considered the intellectual property of Associated Engineering Alberta Ltd. in accordance with Canadian copyright law.

This report was prepared by Associated Engineering Alberta Ltd. for the account of Town of High Level. The material in it reflects Associated Engineering Alberta Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering Alberta Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

EXECUTIVE SUMMARY

The Town of High Level's water treatment plant (WTP) experiences high organics loading in the source water, leading to high disinfection by-product (DBP) formation, significant coagulant use, and frequent granular activated carbon (GAC) replacement. In 2023, IXOM Watercare (IXOM) and Associated Engineering (Associated) conducted a pilot at the WTP to evaluate the ability of Magnetic Ion Exchange (MIEX®) to remove organics. The pilot found that MIEX reduced coagulant use, decreased the organics loading on the GAC filters, and reduced downstream DBP formation. Based on the favourable results of the pilot study, the Town elected to add MIEX to the WTP's process. This design basis memorandum (DBM) outlines the requirements for incorporating MIEX into the WTP.

Flow Requirements and Equipment Layout

The new MIEX process will be sized to match the existing capacity of the WTP: 75 L/s (6,480 m³/d). Records from 2021 - 2023 show an average day flow of 20.4 L/s (1,850 m³/d), with 95% of flows between 15 L/s and 27.5 L/s (1,296 and 2,376 m³/d). The supplier of the MIEX system has indicated that two MIEX vessels, each sized for 50% of the WTP flow rate, are required. Each contactor vessel can operate at a capacity as low as 25-30%.

Based on the size of the equipment, the dewatering building was selected as the only existing location within the WTP envelope where the equipment could be placed.

MIEX Process Description

Once MIEX is incorporated into the High Level WTP, raw water will be pumped to the potassium permanganate contact chamber and then flow by gravity to the new MIEX contactors. MIEX effluent will flow by gravity to a break tank and then will be pumped to the existing clarifiers. The equipment included in the MIEX installation includes:

- 2 x MIEX Contactor Vessels
- Resin Regeneration Equipment, including 2 x Regeneration Skids
- Salt Saturator Tank
- Brine Tank and Brine Skid
- Fresh Resin Pump Skid
- Resin Tote / IBC
- Virgin Resin Skid

Discipline Considerations

Process Considerations

Associated performed a hydraulic analysis that indicated there is sufficient head in the potassium permanganate tanks for water to flow to the MIEX contactor tanks by gravity then back to the break tank. However, additional pumping will be required from the break tank to the clarifier. The break tank will be a partitioned section of the existing potassium permanganate tank. Submersible pumps will deliver water to the clarifiers.

The MIEX system uses salt to regenerate the resin. Salt will be delivered by bulk salt tanker truck into the salt saturator. In general, approximately 150 kg of salt is required per million litres of treated water. At full plant capacity, the system will require 972 kg/day; at typical flows, the system will consume closer to 400 kg/day

The high-rate MIEX configuration periodically discharges waste brine at 1-1.5 L/s as the resin is regenerated. The system is expected to produce 1,875 L of waste brine per million litres of water treated. At the plant's rated capacity of 75 L/s, the waste generation would be 12,150 L/day.

The waste brine will also contain DOC. Based on the piloting results, approximately 50% of organics can be removed through the MIEX system. If the raw water contains 36 – 47 mg/L of DOC, then 18 mg/L to 23.5 mg/L of DOC will be in the waste brine.

The MIEX system waste will be sent to the existing backwash waste sump via the existing waste line within the dewatering building. The MIEX system includes pumps for waste brine which will pump the water to the existing waste line.

Electrical Considerations

The new equipment will contribute approximately 54 kVA of additional load. 386 kVA of electrical capacity is therefore required to support the new MIEX system. Sufficient electrical capacity is available to meet this requirement without additional upgrades.

The plant MCC has dedicated compartments for the centrifuges and related systems that can be reallocated to sub-feed the MIEX system and the two break tank pumps.

The MIEX supplier will provide a new Control Cabinet. This is a cabinet split into two sections: power and controls. The power section will house the motor protection equipment and motor controls for the MIEX system pumps and mixers. The controls section will house the Programmable Logic Controller (PLC), networking equipment, low-voltage terminal blocks and ancillary equipment. The PLC and other key equipment will have their electric power backed up by a 120 VAC Uninterruptible Power System (UPS) battery backup supplied by the Vendor in the MIEX Control Cabinet.

Controls Considerations

The MIEX system will operate on a vendor-supplied Allen-Bradley Micrologix Programmable Logic Controller (PLC) with an Allen-Bradley 15" OptixPanel. The OptixPanel comes complete with a web interface and remote screen-viewing software. The web interface or remote screen-viewing software will be used as the main form of control from the control room, instead of re-drawing the graphics in the existing control graphics system.

After the MIEX installation, when the WTP is started, first the break tank pump will start, achieving pressure on the clarifier inlets. Only after pressure has been achieved will the treatment units be permitted to open their valves. Once the level in the break tank descends below a setpoint, the raw water pumps will be started to restore level to the break tank. A level control loop based on the level in the break tank will control the flow-rate setpoint used by the raw water transfer pumps.

Structural Considerations

The MIEX system will be installed in the dewatering building. The floor space of the dewatering building is split between two elevations: a loading-bay slab that sits at-grade, and the elevated top of the abandoned concrete alum storage tank. To better use the area for the new MIEX system, most of the concrete storage tank structure will be demolished leaving the tank's base slab in place. The elevation of the tank's base slab is lower than the adjacent loading bay slab, so a concrete infill slab will be built over the tank base slab to the elevation of the adjacent loading bay floor. This will provide a level, uniform floor space in the dewatering building for the MIEX system. The elevated

walkway structure between the dewatering building and plant proper will be mostly maintained to not impact access between the two areas of the plant.

Opinion of Probable Costs

The opinion of probable cost for the inclusion of MIEX into the WTP is shown below.

Description	Estimate of Probable Costs
General Requirements (10% of all other costs)	\$415,000
Structural	\$610,000
Process Mechanical ¹	\$3,200,000
Building Mechanical	\$15,000
Electrical, Instrumentation, and Controls	\$200,000
<i>Subtotal, Construction</i>	<i>\$4,540,000</i>
Contingency (10%)	\$454,000
Engineering ²	\$720,000
Total, Construction	\$5,714,000

¹ IXOM has provided costs for the MIEX equipment in USD. Costs have been calculated based on an exchange rate of 1.38 CAD to 1 USD, but are subject to changes in USD conversion and possible tariffs.

² Engineering fees calculated from sum of DBM engineering fees + proposed design fees (issued December 2024) + 5% of construction subtotal for engineering during construction.

Construction Discussion

The Town has indicated a preference for construction not to take place in winter as travel can be compromised in the area. It is recommended that construction be staged to clear space in the fall of 2025 (demolition, building envelope modifications) and install the MIEX equipment in the spring of 2026.

Given the scale of the project, two project delivery methods were considered: Design-Bid-Build (DBB) and Construction Manager at Risk (CMAR). Given the remote location of High Level and the challenge with accurately estimating costs, the Town of High Level will proceed with CMAR.

TABLE OF CONTENTS

SECTION	PAGE NO.
Executive Summary	i
Table of Contents	iv
List of Tables	v
List of Figures	vi
1 Introduction	1-1
1.1 Purpose	1-1
1.2 Scope of Work	1-1
1.3 WTP Overview	1-1
2 Flow Requirements and Equipment Layout	2-1
3 MIEX Process Description	3-1
3.1 MIEX Contactors	3-1
3.2 Regeneration	3-1
3.3 Recycle Brine	3-2
3.4 Saturated Salt Systems	3-2
3.5 Virgin Resin Addition	3-2
4 Discipline Considerations	4-1
4.1 Process Considerations	4-1
4.2 Electrical Considerations	4-5
4.3 Controls Considerations	4-6
4.4 Structural Considerations	4-9
4.5 Building Mechanical Considerations	4-12
4.6 Operations and Maintenance Considerations	4-12
4.7 Additional Scope	4-12
5 Updated Opinion of Probable Costs	5-1
6 Construction Discussion	6-1
6.1 Construction Staging	6-1
6.2 Project Delivery Discussion	6-1
6.3 Regulatory Review	6-1
Closure 6-1	
Appendix A – MIEX P&ID	
Appendix B – MIEX Equipment Estimate	

LIST OF TABLES

	PAGE NO.
Table 4-1	Existing Potassium Permanganate Conditions
Table 4-2	New Potassium Permanganate Conditions
Table 4-3	Break Tank Parameters
Table 4-4	Salt Requirements for Various Flowrates
Table 4-5	Waste Generation for Various Flow Rates
Table 5-1	Opinion of Probable Capital Costs

LIST OF FIGURES

	PAGE NO.
Figure 1-1	Process Flow Diagram of the High Level WTP, including MIEX 1-3
Figure 2-1	Proposed MIEX Layout within the Dewatering Building 2-2
Figure 4-1	Partitioned Potassium Permanganate Tank 4-2
Figure 4-2	Existing Waste Line in Dewatering Building to be Reused for MIEX Waste 4-4
Figure 4-3	Control Loop Diagram 4-8
Figure 4-4	Dewatering Building Floor Plan – Demolition Mark-ups 4-10
Figure 4-5	Section through Dewatering Building – Demolition and New Floor Assembly Mark-ups 4-10
Figure 4-6	Partial Plan of Existing Potassium Permanganate Tank – New Concrete Wall to Form Break Tank 4-11
Figure 4-7	Centrifuge Inlet Piping to be Removed and Capped 4-13

1 INTRODUCTION

1.1 Purpose

The Town of High Level's (Town) water treatment plant (WTP) experiences high organics loading in the source water, leading to significant coagulant use, frequent granular activated carbon (GAC) replacement, and high disinfection by-product (DBP) formation that exceed the Guidelines for Canadian Drinking Water Quality. In 2023, IXOM and Associated Engineering (Associated) conducted a pilot at the WTP to evaluate the ability of Magnetic Ion Exchange (MIEX®) to remove organics.

MIEX is an ion exchange process that uses a magnetized resin specifically developed to target organics removal. MIEX is implemented as a pre-treatment process (i.e., upstream of the flocculation, clarification, and filtration processes) and uses anion exchange resin to reduce Dissolved Organic Carbon (DOC). The resin is regenerated using salt brine to desorb the ions and restore the ion exchange capacity, allowing it to be continuously reused.

The pilot study (*Evaluation of MIEX Pilot Chemical Review and Jar Testing*, Associated Engineering, November 2023) found that MIEX reduced coagulant use, decreased the organics loading on the GAC filters, and reduced downstream DBP formation. Based on the favourable results of the pilot study, the Town elected to add MIEX to the WTP process.

1.2 Scope of Work

This design basis memorandum (DBM) outlines the requirements for incorporating MIEX into the WTP. It will define the project scope, outline the technical basis for detailed engineering, and guide the detailed design process. The DBM includes the following information:

- Review of the flow requirements and proposed equipment layout with the WTP
- Description of the MIEX system
- Process, electrical, controls, and structural considerations for incorporating MIEX
- Updated opinion of probable costs
- Construction considerations, including staging, project delivery, and a regulatory review

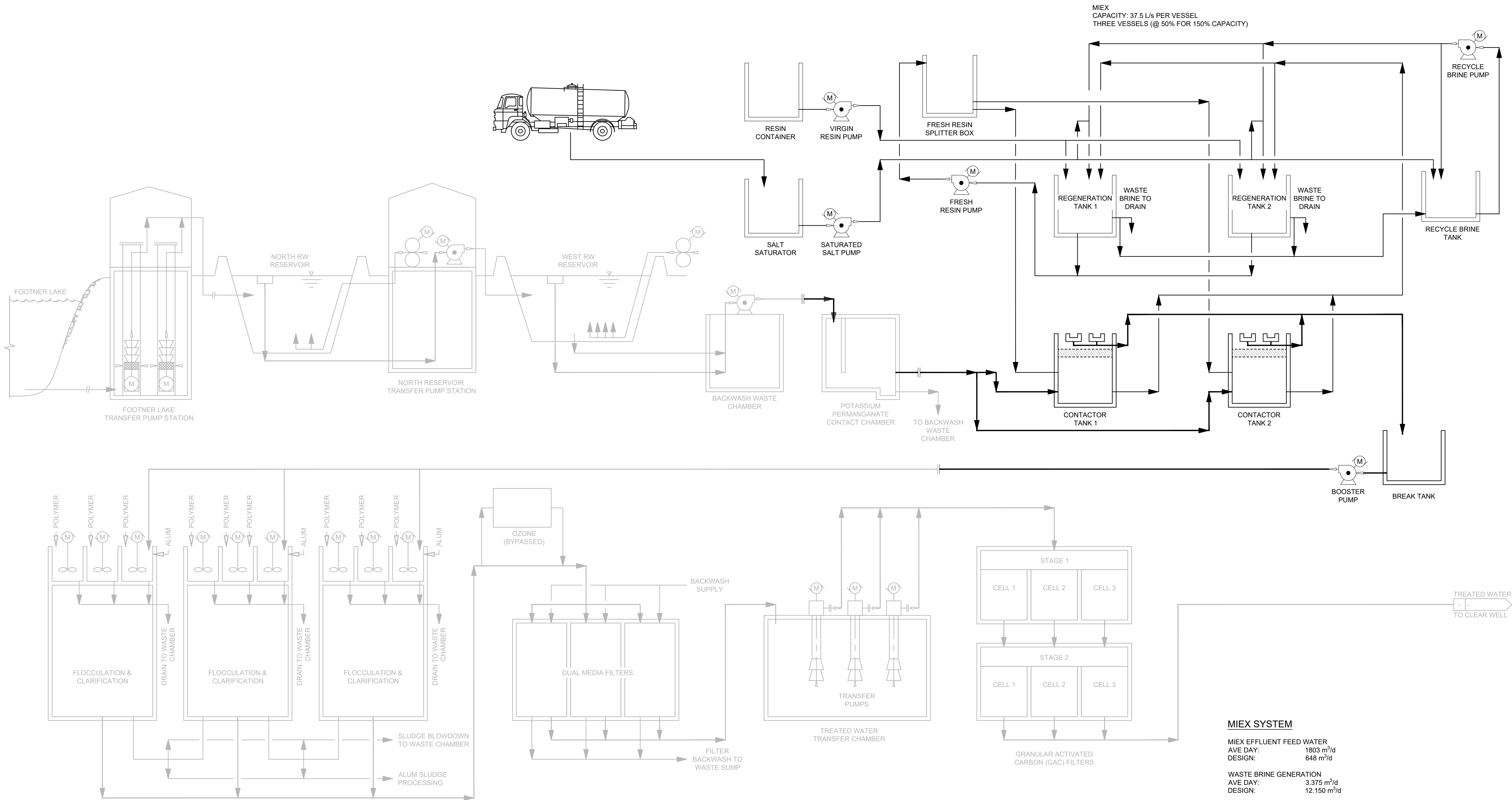
1.3 WTP Overview

The High Level WTP was constructed in 2002 and provides the Town with drinking water and bulk water needs. The facility draws water from Footner Lake and stores raw water in aerated storage ponds. Water is then pumped to the WTP, where it is treated as follows:

- Potassium permanganate dosing and contact tank to remove manganese.
- Package WTP, including coagulation, flocculation, and clarification
 - Alum is used as a coagulant and ClearFloc AP1065 is used as a polymer
- Ozone system, currently bypassed.
- Dual media sand and anthracite filters.
- Granular Activated Carbon (GAC) filtration.
- Disinfection by chlorine injection and contact time.

When installed, MIEX will be located between the potassium permanganate contact tank and the package WTP.

A simplified process schematic of the existing WTP including the new MIEX equipment is shown in **Figure 1-1**. The new equipment is shown in black.



MIEX SYSTEM

MIEX EFFLUENT FEED WATER
AVE DAY: 1803 m³/d
DESIGN: 648 m³/d

WASTE BRINE GENERATION
AVE DAY: 3.375 m³/d
DESIGN: 12.150 m³/d

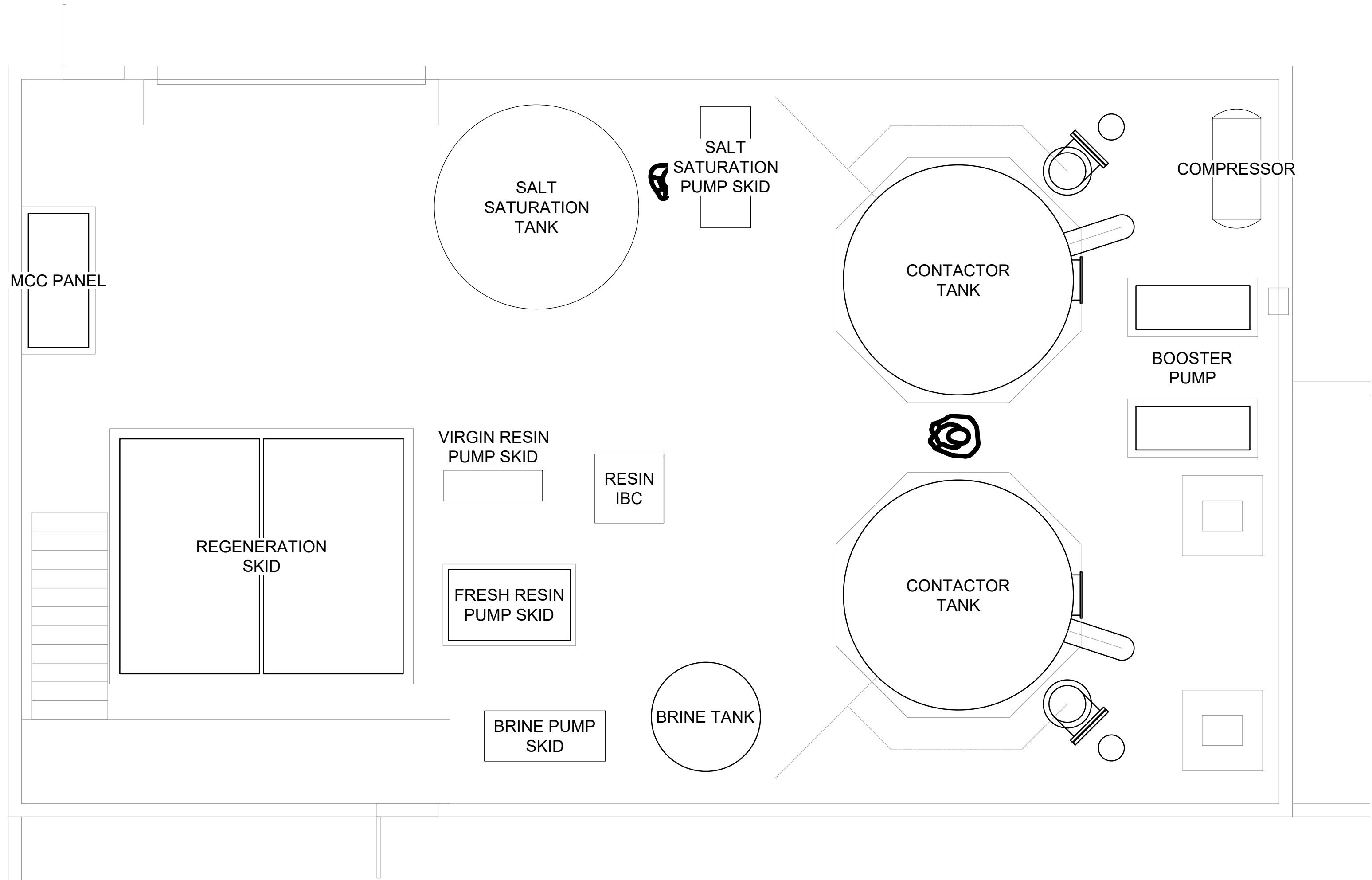
2 FLOW REQUIREMENTS AND EQUIPMENT LAYOUT

The MIEX process will be sized to match the existing capacity of the WTP, which has a raw water capacity of 75 L/s (6,480 m³/d). The system will include two MIEX contactors, each sized for 50% of the plant's total flow rate. Based on the 2023 pilot study, a bed volume of 400 was selected for the full-size MIEX system. Bed volume (BV) measures the ratio of treated water volume to resin volume; a BV of 400 means the system will treat 400 m³ of water for each 1 m³ of resin before the resin is regenerated. Based on the size of the MIEX equipment, the dewatering building was selected as the only existing location within the WTP envelope where the equipment could be located. The dewatering building does not have capacity for additional contactors beyond the two proposed, so the design does not include any redundancy. However, Operations have noted that the WTP is generally not operated at or near capacity. Records from 2021 - 2023 show an average day flow of 20.4 L/s (1,850 m³/d), with 95% of flows between 15 L/s and 27.5 L/s (1,296 and 2,376 m³/d).

Plant records supplied to Associated indicate that the distribution flows are typically between 13 to 35 L/s (1,120 – 3,030 m³/day).

The supplier of the MIEX system has indicated that each contactor vessel can operate at a capacity as low as 25-30% by using recirculation pumps to maintain the fluidization of the resin. The system can operate using only one contactor at the lower plant flow rates; with one MIEX vessel, the system flow can be as low as 9.4 L/s.

The MIEX unit layout drawings for the Town are shown in **Figure 2-2**.



1 PLAN 1:50
D-101

PRELIMINARY/
FOR DISCUSSION
NOT FOR CONSTRUCTION
DRAFT

A	2024DEC07	S. LARLEE	R. MOLZAN	ISSUED FOR PRE-DESIGN
REV	DATE	DESIGN	DRAWN	DESCRIPTION

TOWN OF HIGH LEVEL
ALBERTA, CANADA
WATER TREATMENT PLANT
MIEX UPGRADES
2022-3031-00
SCALE: AS SHOWN



PROPOSED MIEX LAYOUT
WITHIN DEWATERING BUILDING

DRAWING	REVISION	SHEET
Figure 2-1	A	----

3 MIEX PROCESS DESCRIPTION

Following the upgrades, raw water will continue to be pumped to the potassium permanganate contact chamber and then flow by gravity to the new MIEX contactors. Effluent from the MIEX contactors will flow by gravity to a break tank and will then be pumped to the existing clarifiers. The new process flow diagram is shown in **Figure 3-1**.

The equipment included in the MIEX installation consists of:

- 2 x MIEX Contactor Vessels
- Resin Regeneration Equipment, including 2 x Regeneration Skids
- Salt Saturator Tank
- Brine Tank and Brine Skid
- Fresh Resin Pump Skid
- Resin Tote / IBC
- Virgin Resin Skid

The vendor process and instrumentation diagram (P&ID) is included in **Appendix A**. The process descriptions of this equipment are included below.

3.1 MIEX Contactors

Raw water is fed to the base of the contactor and mixed with MIEX resin. An agitator operates at low speeds to maintain a uniform resin and water suspension. During times of lower raw water flow, treated effluent will automatically recirculate to maintain a consistent flow through the vessels and level of resin fluidization. Above the resin bed are inclined tube settlers, which capture, settle, and return resin that escapes from the main bed. MIEX-treated effluent leaving the inclined tubes is directed to collection troughs and then flows out the top of the reactor vessel to the break tank.

Additional pumping will be required to transfer water from the break tank to the existing package water treatment equipment.

3.2 Regeneration

As resin is loaded with DOC, batches of resin are automatically removed from the contactors and regenerated with a salt solution in the regeneration tanks. Once regenerated, the fresh resin is returned to the contactor vessels via the fresh resin splitter tank. Regenerations occur once a specific volume of water is treated based on process setpoints. Once the specified volume of water is treated, a regeneration sequence is initiated automatically. Regeneration does not halt water treatment; the contractor continuously treats water.

Regeneration involves the following phases:

1. DOC-laden resin, mixed with water to form a slurry, flows by gravity to the regeneration tank.
2. The water is removed from the resin and returned to the treatment process.
3. Recycled brine is pumped into the regeneration tank and pumped through the resin bed.
4. A portion of the brine is directed to waste discharge, and the remainder is returned to the reuse brine tank.
5. Fresh (saturated) brine is transferred into the regeneration tank and pumped through the resin bed.
6. Process water is transferred into the regeneration tank and pumped through the resin bed to remove residual salt; depending on its conductivity, the rinse water drains to the reuse brine tank or waste.
7. Once rinsed, additional process water is added to the tank, and the resin is mixed/agitated into a slurry, then pumped back into the treatment process using the fresh resin transfer pump.

3.3 Recycle Brine

During a Regeneration Cycle, a pre-defined volume of brine is transferred from the Recycle Brine Tank to one of the Regeneration Tanks. The transfer pumps operate in a duty/standby configuration and normally switch after each use. Should a pump fail when in use, the system controls put it out of service, and the standby pump is promoted to duty.

Generally, the volume of brine transferred out at the start of a regeneration is equal to the volume of recycled brine/rinse water returned to the tank. The system measures the conductivity of the solution in the regeneration tank and adjusts the ratio of recycled brine and rinse water return as necessary.

3.4 Saturated Salt Systems

Granular salt is pneumatically blown into the salt saturator, which is dissolved to produce a saturated salt solution. Either service water or recovered permeate is used as liquid make-up to fill the salt saturator to its setpoint level.

During a Regeneration Cycle, a pre-defined volume of fresh brine is transferred from the Salt Saturator Tank to one of the Regeneration Tanks. The transfer pumps operate in a duty/standby configuration and normally switch after each use. Should a pump fail when in use, the system controls put it out of service, and the standby pump is promoted to duty.

The system adds make-up service water as required to maintain the Salt Tank liquid level setpoints.

3.5 Virgin Resin Addition

The virgin resin skid loads virgin (new) resin into the plant. MIEX resin is supplied in 1,000 L intermediate bulk containers (IBC). An eductor using service water draws resin slurry out of resin containers. Small amounts of virgin resin are added automatically to maintain a constant inventory, as resin is lost from the system at approximately 2 L/ML water treated.

The operator will be notified via an alarm when resin addition is required. This alarm is a notification only and does not stop or affect the operation of the MIEX system. Loading the virgin resin skid is a manual process whereby the operator connects the resin container via hoses and initiates service water flow to load the resin slurry. It is not imperative to immediately add resin when the notification message is raised; this can occur within the next 1-2 days.

The following is an example of how the alarm will be annunciated based on the manufacturer control philosophy:

Plant Flow:	= 75 L/sec (assume 24hr/day operating, =6,480,000 L/day treated)
Resin Loss Rate:	= 2.0 L resin/ML
Net Daily Addition Volume:	= 6.48 ML/day x 2.0 L resin/ML
	= 12.96 (~13) L resin/day

The control system will have two (2) set points as below, and a totalized raw water volume that is accumulated since the last resin addition.

Setpoint Resin Loss:	= 2.0 L/ML
Setpoint Resin Volume per Addition:	= 180 L
Calculated Treated Water Vol. per Addition:	= 180 L resin / 2.0 L resin per ML
	= 90.0 ML treated

4 DISCIPLINE CONSIDERATIONS

There are several factors that must be considered when incorporating MIEX into the existing WTP. The following sections divide the considerations by discipline.

4.1 Process Considerations

4.1.1 Process Hydraulics

Effluent from the potassium permanganate contactor tank will flow to the MIEX system. The hydraulic pressure head must be enough to overcome minor losses and allow water to flow by gravity to the MIEX contactor tanks. Associated has performed a hydraulic analysis that indicated there is sufficient head in the potassium permanganate tanks for water to flow to the MIEX contactor tanks without additional pumping. Note: Based on discussions with Operations, the potassium permanganate tank is operated at an elevation of 331.5 m.

Once the MIEX system has treated water, it will gravity drain to a break tank from which it will be pumped to the existing package water treatment plant. A break tank with pumping is required for two reasons: 1) insufficient head for the water to flow by gravity from the MIEX system to the existing package water treatment plant, and 2) a break tank will maintain steady flow to the existing package water treatment plant.

Changes are required to the potassium permanganate tank for the break tank.

4.1.2 Changes to Potassium Permanganate Tank

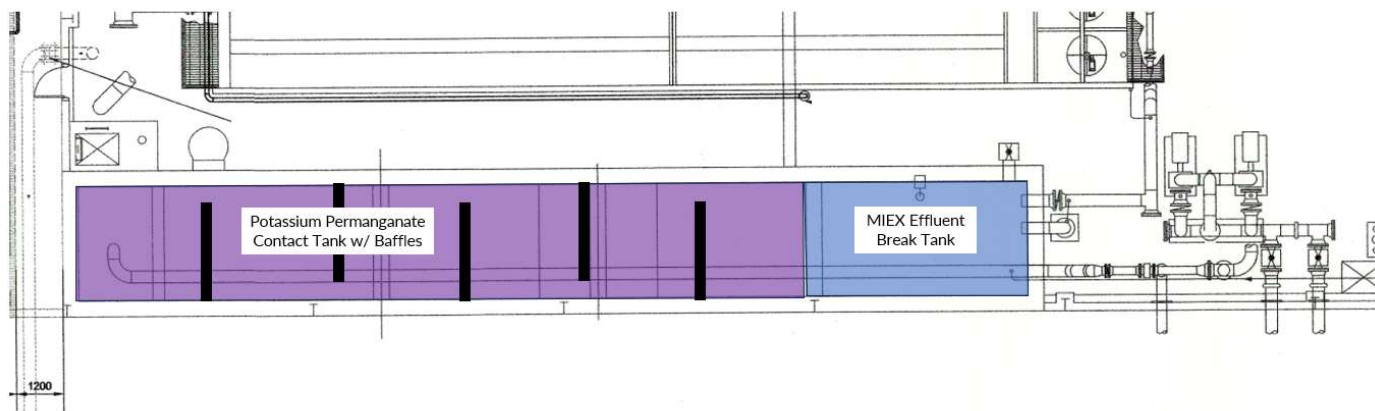
The current potassium permanganate contact tank has the following parameters:

Table 4-1 Existing Potassium Permanganate Conditions

Parameter	Value
Maximum Flow	75 L/s
Tank Area	70.2 m ² (2.9 m x 24.2 m)
Operating Level	7.3 m
Contact Time	1.9 hr
Baffling Factor	0.5 (single baffle, high length to width ratio)
Effective Contact Time	0.9 hr (57 min)

The existing potassium permanganate contact tank will be divided into two tanks: one for potassium permanganate contact time and another for a MIEX effluent break tank, as shown in [Figure 4-1](#). See Section 4.4 for structural details on the partitioning.

Figure 4-1 Partitioned Potassium Permanganate Tank



The new potassium permanganate tank will have the following parameters:

Table 4-2 New Potassium Permanganate Conditions

Parameter	Value
Maximum Flow	75 L/s
Tank Area	58.58 m ² (2.9 m x 20.0 m)
Operating Level	7.3 m
Contact Time	1.6 hr
Baffling Factor	0.7 (serpentine or perforated intra-basin baffles, high length to width ratio)
Effective Contact Time	1.1 hr (66 min)

The operating level within the package WTP is 330.8 m. A break tank is required to allow for the equalization of treated water before pumping the water to the package WTP. The break tank design criteria are as follows:

Table 4-3 Break Tank Parameters

Parameter	Value
Tank Area	11.2 m ² (2.9 m x 3.8 m)
Operating Level	5.25 m / 329.46 m (MIEX tank level minus headloss in piping)
Pump Type	Submersible well pumps
Pump Configuration	1 duty + 1 standby (+ provision for third pump)

Parameter	Value
Pump Duty Point	27.5 L/s
Motor Size	7.5 HP

Water will be pumped to the package WTP via a PRV to control pressure. Excess pressure will be discharged back to the break tank.

4.1.3 Waste Considerations

The MIEX system uses salt to regenerate the resin. Salt will be delivered by bulk salt tanker truck into the salt saturator. In general, approximately 150 kg of salt is required per million litres of treated water. At full plant capacity, the system will require 972 kg/day; at typical flows, the system will consume closer to 400 kg/day (see [Table 4-4](#)). The *Environmental Quality Guidelines for Alberta Surface Waters Surface Water Quality Guidelines for the Protection of Freshwater Aquatic Life* indicate a maximum wastewater limit of 120 mg/L. At a rate of 150 kg of salt per million litres of treated water, the estimated concentration going to the lagoon is 91 mg Cl/L of water.

Table 4-4 Salt Requirements for Various Flowrates

Flow Condition	Salt Use (kg/day)
Full Plant Capacity (75 L/s)	972
Typical High Flow (37.5 L/s)	486
Typical Low Flow (13 L/s)	168

The high-rate MIEX configuration periodically discharges waste brine at 1-1.5 L/s as the resin is regenerated. The system is expected to produce 1,875 L of waste brine per million litres of water treated as designed. At the plant's rated capacity of 75 L/s, the waste generation would be 12,150 L/day. The system would generate less waste at lower flow rates, as shown in [Table 4-5](#).

Table 4-5 Waste Generation for Various Flow Rates

Flow Condition	Waste Brine (L/day)
Full Plant Capacity (75 L/s)	12,150
Typical High Flow (37.5 L/s)	6,075
Typical Low Flow (13 L/s)	2,106

Two regeneration tanks may send waste at the same time, so the waste-receiving system design allows for flows up to 3 L/s. If the system cannot handle this higher flow, the MIEX system can be limited to only one regeneration tank discharging waste at a time.

The waste brine will also contain DOC. Based on the piloting results, approximately 50% of organics can be removed through the MIEX system. If the raw water contains 36 – 47 mg/L of DOC, then 18 mg/L to 23.5 mg/L of DOC will be in the waste brine.

The MIEX system waste will be sent to the existing backwash waste sump via the existing waste line within the dewatering building, as shown in **Figure 4-2**. The MIEX system includes pumps for waste brine which will pump the water to the existing waste line.

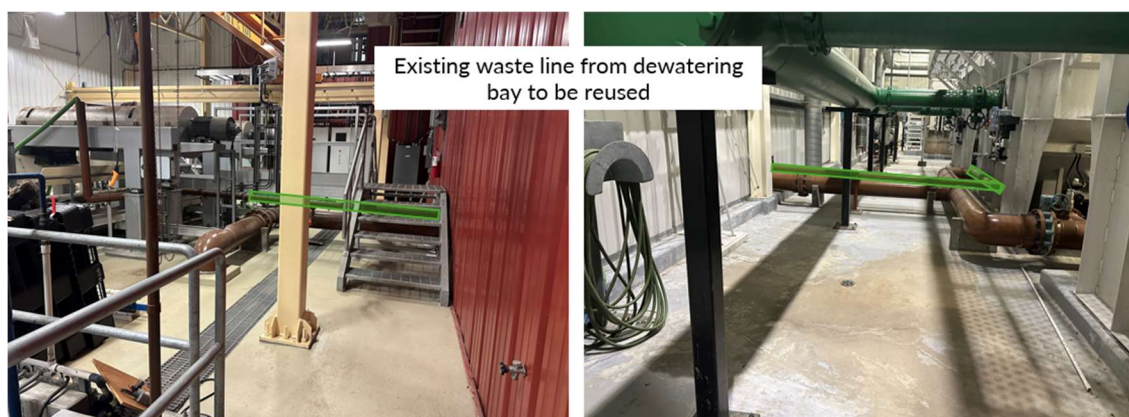


Figure 4-2 Existing Waste Line in Dewatering Building to be Reused for MIEX Waste

The existing floor trench in the dewatering bay will be extended the length of the bay at the new elevation of the floor.

4.1.4 Service Water

The MIEX system requires service water for the regeneration system, the resin tanks, the salt saturator tanks, the recycle brine tanks, the virgin resin skid, and the contactor sample sinks. All uses are intermittent, so a pressurized service water connection of 400-450 kPa with flows up to 3.75 L/s is required. Service water can be chlorinated water if the free chlorine concentration is below 2 ppm; based on annual reporting data, treated water at the plant typically has 1 ppm or less.

A 4-inch service water line branches off the distribution main. Operations have noted that the pressure on the 4-inch line is 430 kPa. The 4-inch main has numerous 2-inch service water lines that branch from it to provide service water throughout the WTP. There is a 2-inch service water line in the dewatering building for use. However, its pressure and flow are unknown. Operations must confirm the flow and pressure of the service water line before detailed design and a new, larger service water line may be required if it cannot meet the above noted requirements. Backflow preventers are required for service water lines.

4.1.5 Additional Process Considerations

All equipment will be NSF-certified for contact with potable water, and the MIEX resin has NSF-61 certification. The supplier does not have NSF approval for fully completed tanks or equipment skids, but the individual components in the MIEX system will have their own NSF certification, including contactor vessels, piping, valves, and standpipes. All associated piping will be Schedule 80 PVC. Connections in piping will be made to include some flexibility in case of building settlement.

4.2 Electrical Considerations

The WTP 600 Volt, 3-phase electrical utility supply is fed through a 500 kVA transformer, and a 500 kVA backup generator is connected through an automatic transfer switch. The electrical distribution system inside the plant is rated for 800 A or approximately 830 kVA at 600 VAC, allowing for future upgrades to the utility and backup generation capacity.

The WTP uses interval metering, which reports power usage in fifteen-minute periods. The power usage reported on the bill is based on the total energy consumed in a fifteen-minute period. Based on billing records, between November 2023 and November 2024, the WTP only consumed as much as 192 kVA in any fifteen-minute period. Associated has assumed that the high-flow pump, which is currently decommissioned, was never run and that only one 50 HP distribution pump was running at any one time during that timespan. Associated has assumed that all other electrical usage is typical and is not expected to increase significantly.

In an emergency, it is possible for the 100 HP high-flow pump to run at the same time as two 50 HP distribution pumps. The additional two pumps running impose an additional 140 kVA of load on the system, requiring a total base power allocation pre-upgrade of 332 kVA.

The new equipment will contribute approximately 54 kVA of additional load. 386 kVA of electrical capacity is therefore required to support the new MIEX system. Sufficient electrical capacity is available to meet this requirement without additional upgrades.

The plant MCC has dedicated compartments for the centrifuges and related systems that can be reallocated to sub-feed the MIEX system and the two break tank pumps.

The MIEX supplier will provide a new MIEX Control Cabinet. This is a cabinet split into two sections: power and controls. The power section will house the motor protection equipment and motor controls for the MIEX system pumps and mixers. The controls section will house the Programmable Logic Controller (PLC), networking equipment, low-voltage terminal blocks and ancillary equipment. The PLC and other key equipment will have their electric power backed up by a 120 VAC Uninterruptible Power System (UPS) battery backup supplied by the Vendor in the MIEX Control Cabinet. This will be installed in the dewatering building, near the entry doors (see [Figure 2-2](#)).

Two 7.5 HP VFDs will be provided for the break tank pumps. These will be installed separately from, but adjacent to, the MIEX Control Cabinet and controlled by the plant PLC over Ethernet.

Luminaires suspended from the roof assembly are currently present and provide adequate light for the facility. However, some of the luminaires may need to be relocated due to equipment installations.

Existing power distribution panel boards in the dewatering building room will be preserved and used to feed ancillary equipment.

Cable tray will be suspended from the roof assembly to provide a raceway between the MIEX control panel and the various skid-mounted equipment.

4.3 Controls Considerations

The MIEX system will operate on a vendor-supplied Allen-Bradley Micrologix Programmable Logic Controller (PLC) with an Allen-Bradley 15" OptixPanel. The OptixPanel comes complete with a web interface and remote screen-viewing software. The web interface or remote screen-viewing software will be used as the main form of control from the control room, instead of re-drawing the graphics in the existing control graphics system.

The existing graphical control software used at the High Level WTP is FactoryTalk View Studio version 10.00. This has a license for 100 unique display screens, of which 85 are currently used, leaving room for additional graphical displays.

This software can communicate natively with the new MIEX controller. To take advantage of the existing control graphics' historical logging capabilities, key process values and alarms will be polled by the software. These data will be shown on a Key Performance Indicators dashboard for the MIEX system on the main software. Alarms will be programmed to inform operations of specific issues from the MIEX system. Additionally, a trend page will be created for the analog values associated with the MIEX system. These graphical user interfaces on the main SCADA software will be strictly read-only: operators will manipulate the MIEX system using the touch panel in the dewatering building either in-person, using the Web interface, or using remote screen-viewing software.

Prior to the MIEX installation, the Raw Water Transfer Pumps draw from the West Raw Water Pond and deliver their flow to the potassium permanganate contact tank. This maintains a consistent level in the contact tank, which delivers consistent pressure to the inlets of the clarifiers.

After the MIEX installation, the consistent level in the potassium permanganate contact tank will deliver consistent pressure to the inlets of the MIEX contactors. These will flow by gravity to the break tank. The elevation of the contactor effluent is lower than the current elevation of the clarifiers, so pumping is required to deliver water to the clarifiers from the break tank. If at least one clarifier is running, the duty pumps will run and modulate their speed to maintain a pressure setpoint on the common header to the clarifiers. Refer to **Figure 4-3** below for a simplified illustration of the control loops involved. The three inlets to the three treatment units are currently provisioned with pneumatically actuated butterfly valves. To provide a more linear control and smoother operation, Associated recommends replacing these butterfly valves with v-port ball valves.

The plant is started and stopped either by clearwell level or manually. After the MIEX installation, when the WTP is started, first the break tank pump will start, achieving pressure on the clarifier inlets. Only after pressure has been achieved will the treatment units be permitted to open their valves. Once the level in the break tank descends below a setpoint, the raw water pumps will be started to restore level to the break tank. A level control loop based on the level in the break tank will control the flow-rate setpoint used by the raw water transfer pumps.

Before the MIEX installation, the filters operate while they see the raw water pumps running. After the MIEX installation, they will operate while they see the break tanks running.

An outdoor cabinet will be installed near the salt inlet port on the exterior wall to provide an indication of the level of the saturated salt tank to truck drivers delivering salt.

Existing plant ethernet connectivity is available to the dewatering building and will be re-used: A network switch installed in this location will provide connectivity to the Vendor's control cabinet and the two VFDs. Most equipment will be controlled from the Vendor control system. The VFDs for the Break Tank pumps will be controlled via Ethernet

to the VFDs. Other incidental equipment, such as the break tank discharge pressure transmitter, shall be monitored or controlled from the existing PLC taking advantage of existing spare capacity.

In general, instruments (Liquid Flow Meter, Radar Level Transmitter, Pressure Level Transmitter, Level Switch, Pressure Transmitter, Conductivity Sensor and Transmitter) shall be manufactured by Endress+Hauser. Small air-flow meters shall be manufactured by IFM. Small PVC electrically actuated valves shall be manufactured by Chemline with Chemline actuators. Solenoid Valves shall be manufactured by ASCO. All instruments touching liquids must be NSF-certified.

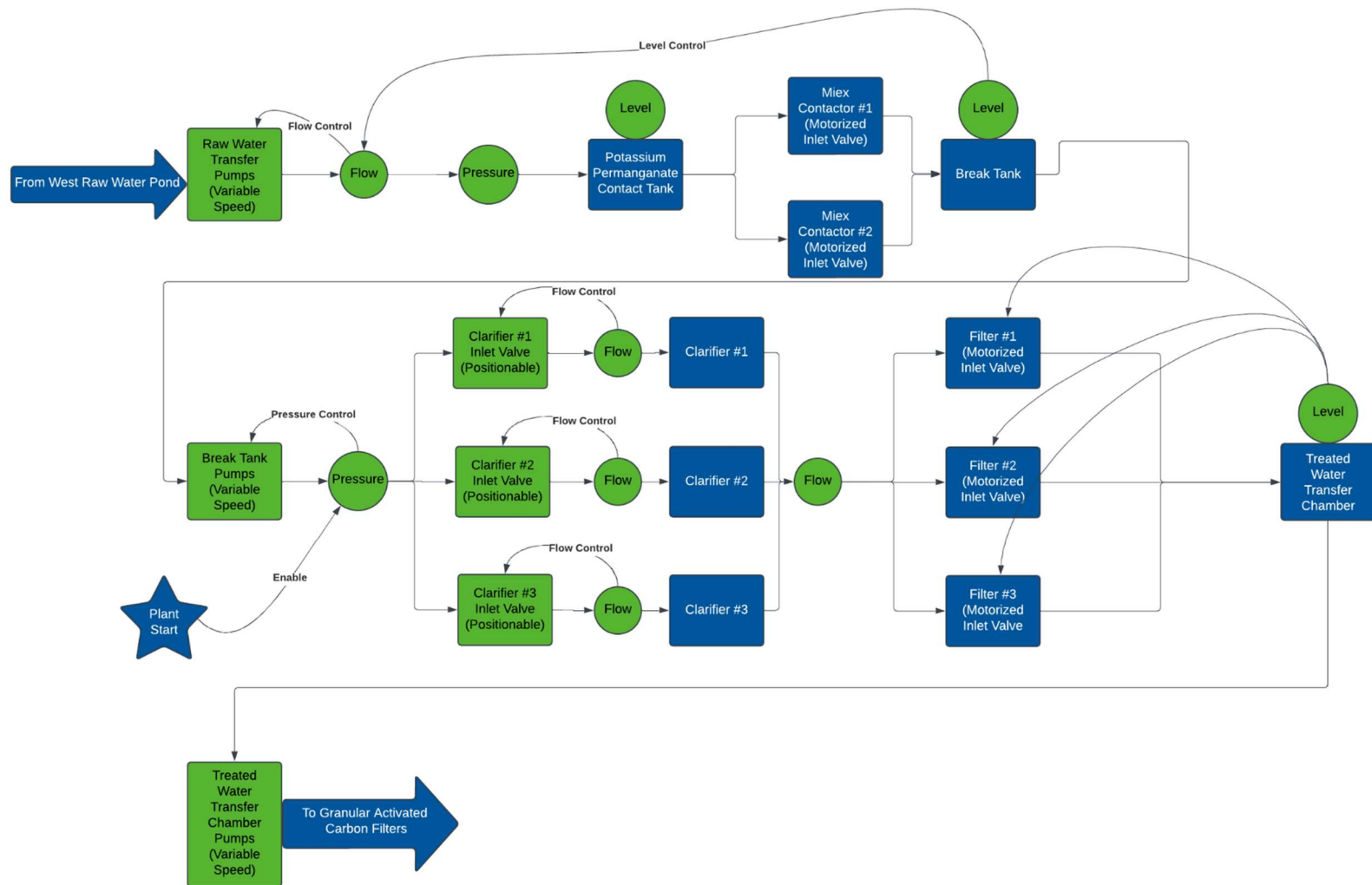


Figure 4-3 Control Loop Diagram

4.4 Structural Considerations

The MIEX system will be installed in the dewatering building. Approximately half of the area consists of a slab-on-grade with overhead door access that is currently being used as a loading bay. The rest of the area is comprised of the concrete storage tank that is no longer in use. To accommodate the footprint of the new MIEX system, and provide an even uniform floor area, the cap slab and interior load bearing concrete walls, of the alum tank storage structure will be demolished and a new concrete floor assembly installed over the abandoned storage tank area (**Figure 4-4** and **Figure 4-5**). There is an elevated concrete walkway along the south end of the dewatering building that provides access between the main floor of the water treatment plant structure and the top slab surface of the alum storage tank. A localized section of the elevated walkway slab will be maintained to not affect building access between the new MIEX system room and water treatment plant.

In summary, the scope of structural work briefly includes the following:

- Demolition of the suspended cap slab, the two interior east and west tank concrete walls, and column structure of the abandoned alum storage tank.
 - There is a section of backfill between the storage tank walls and ozone building foundation that will need to be partially removed.
- Consideration for the effect demolition of the cap slab structure will have on adjacent structures, such as perimeter foundation walls, and elevated walkway slab that is to remain in place.
- Assessment of the perimeter foundation wall during detailed design. The perimeter foundation walls support exterior earth materials, that apply some lateral pressure against the foundation. Removal of the cap slab may affect the integrity of the foundation walls, and thus, require supplemental buttress walls to account for the removal of the cap slab.
- Design of the new concrete floor assembly over the existing storage tank. The base slab of the storage tank is approximately 800 mm lower than the adjacent bay. To provide a uniform floor elevation across the area, the storage tank base slab will be filled with fillcrete, and a new concrete floor assembly built over the fillcrete. The top surface of the new floor assembly will be level with the adjacent bay.
- Buoyancy considerations for the new concrete floor assembly.
- Design of the new concrete floor assembly will also include housekeeping pads for the new MIEX equipment.
- Design of galvanized steel handrails, guardrails, stairs, walkways and platforms as required for safe access to the MIEX system equipment.
- Analysis of existing structures capacity to support new or revised pipe loads, as a result of the new MIEX system. This also includes new pipe penetrations through existing structures as part of the new MIEX system.
 - Based on existing structures capacity, and new load demands of the MIEX system, structural strengthening or support of existing structures may be required.
- Design of new concrete separation wall, in the existing potassium permanganate tank, to create a new MIEX effluent break tank as part of the treatment changes for the new MIEX system (**Figure 4-6**).
 - Detailing for application of a new NSF 61 certified waterproof assembly on the surfaces new effluent break tank.
- Concrete repair details to address localized areas of deterioration that may be present at the new effluent break tank due to previous exposure and service conditions.

Figure 4-4 Dewatering Building Floor Plan – Demolition Mark-ups

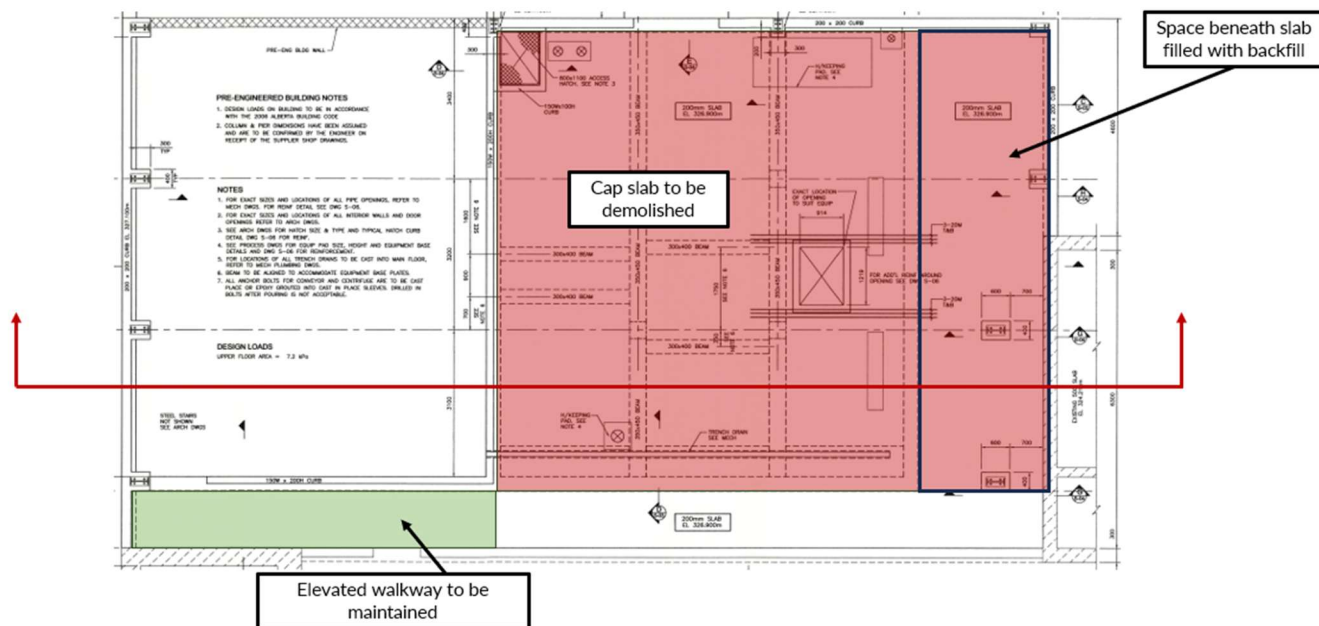


Figure 4-5 Section through Dewatering Building – Demolition and New Floor Assembly Mark-ups

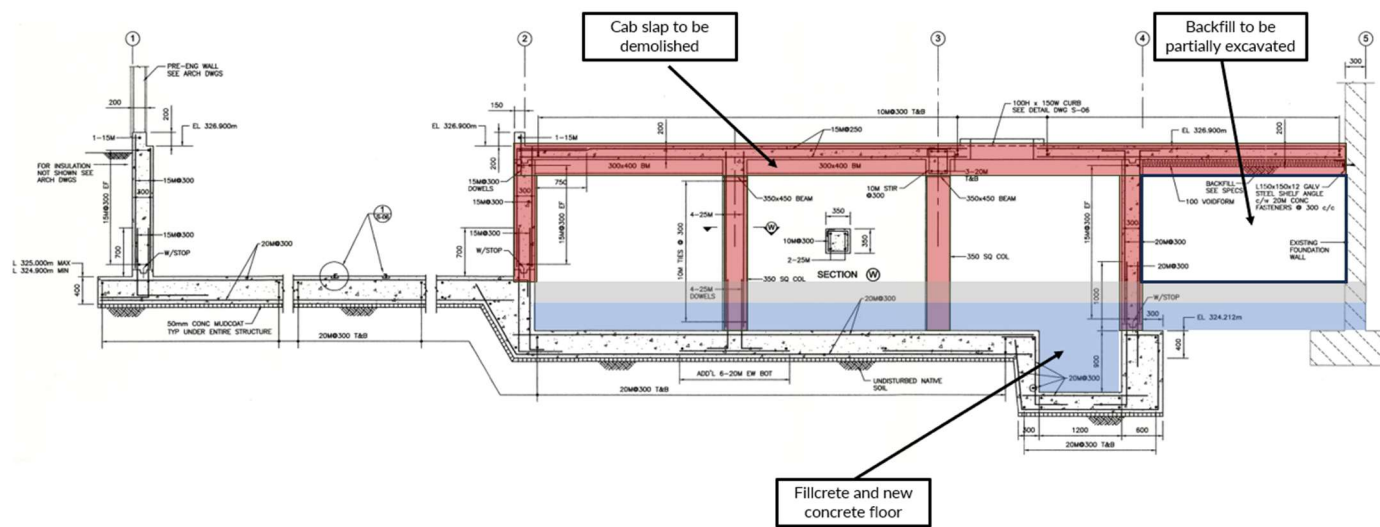
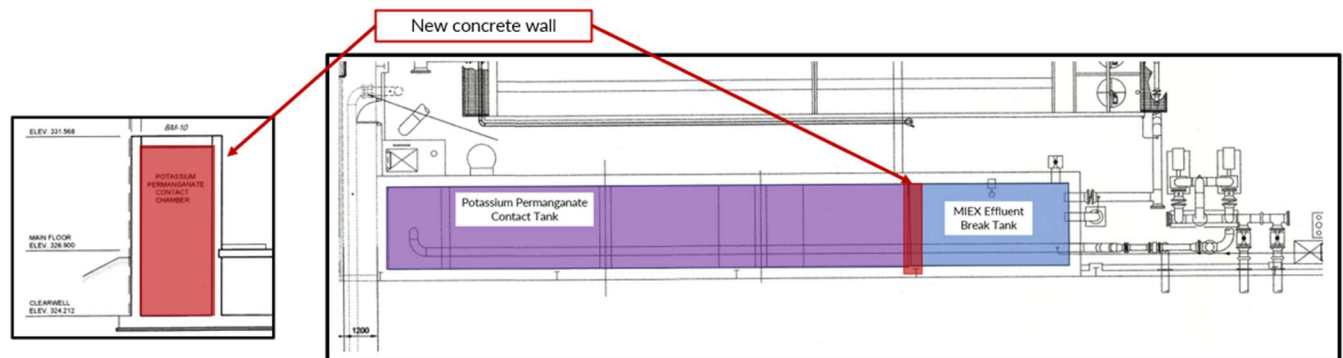


Figure 4-6 Partial Plan of Existing Potassium Permanganate Tank – New Concrete Wall to Form Break Tank



4.4.1 Available Historical Drawings

A limited set of drawings from original construction were available for our review. The structural design and analysis will include review of available existing drawings and specifications from original construction for the desludge room and water treatment plant. Associated has performed a preliminary visual review of the existing structure and did not identify any major concerns or discrepancies with the existing structures condition.

The following structural drawings for the desludge room and water treatment plant are available for our review during detailed design:

- Issued for Construction “Water Supply System Upgrading – Water Treatment Plant Upgrading” dated February 4, 2002 prepared by DCL Siemens Engineering Ltd.
- Issued for Tender “Water Treatment Plant Upgrading - Centrifuge Addition - Contract 1 – Structural and Building” dated August 4, 2010 prepared by DCL Siemens Engineering Ltd.

4.4.2 Codes, Standards, and Regulations

- National Building Code - 2023: Alberta Edition.
- CSA A23.1/ CSA A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- CSA A23.3, Design of Concrete Structures.
- CSA S16, Design of Steel Structures.

4.4.3 Construction Materials

Materials requirements for the construction of the new floor slab assembly and steel components will include:

- Cast-in-place concrete conforming to CSA A23.1/ A23.2, minimum compressive strengths of 35 MPa at 28 days for all concrete, exposure Class N.
- Reinforcing steel conforming to CAN/CSA-G30.18, grade 400 R/W.
- Structural steel conforming to CAN/CSA-G40.20/G40.21.
 - Grade 350W for W, channel and hollow structural sections.
 - Grade 300W for steel angle, and steel plate.

4.4.4 Geotechnical Considerations

A geotechnical investigation has not been performed as part of this project. The existing native soils are not expected to be disturbed by the works of this project. It is assumed that the existing grade materials were properly prepared or designed for during construction of the base buildings.

Based on our site reviews, and understanding of the building's performance to date, we have no reason to believe there to be any underlying issues with existing grade materials that support building foundations. Additionally, based on the age of the structure, we have assumed that the majority of long-term settlement has already occurred, and installation of the new MIEX system will not cause further settlement to occur.

4.5 Building Mechanical Considerations

The existing building mechanical system was reviewed, and no additional upgrades are required to accommodate the MIEX system. The existing dewatering building heaters are nearing the end of their lifespan, and will be replaced as part of this project (like-for-like replacement).

4.6 Operations and Maintenance Considerations

The MIEX resin must be topped up periodically, as approximately 2L of resin is lost per million litres of water treated. Resin is added in batches and can be delivered by IBC or in 200L drums. The resin is loaded from ground level to the virgin resin skid. The MIEX control panel will display a message when operators must add virgin resin.

As the MIEX system consumes a large quantity of salt during normal operations, salt will be delivered by tanker truck and blown into a salt tank through a port on the plant's exterior.

The MIEX system has a yearly routine maintenance requirement. The tube settlers must be washed twice per year, so stairs and walkways allow for access to the top of the contactors.

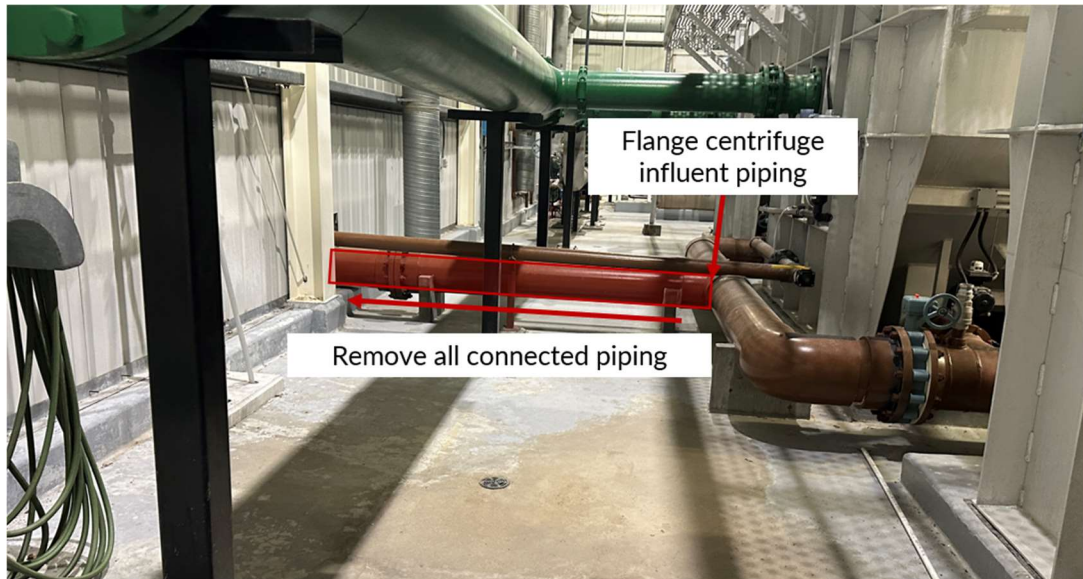
Replacement of valves, instruments, or fittings should not lead to unnecessary downtime for the MIEX system or the WTP as a whole. The upgrades will specify the use of parts purchased from manufacturers with a presence in northern Alberta.

4.7 Additional Scope

The centrifuge and all associated equipment will be removed to make space for the MIEX unit. The centrifuges, the access stairs to the centrifuge, the polymer system, the 5-ton lift, and centrifuge control panel will all be removed.

Centrifuge influent piping will be flanged and removed as shown in **Figure 4-7**.

Figure 4-7 Centrifuge Inlet Piping to be Removed and Capped



5 UPDATED OPINION OF PROBABLE COSTS

IXOM provided an updated cost estimate for the MIEX equipment, which is included in [Appendix B](#). An updated opinion of probable cost is included below.

IXOM has indicated that design submittals will take 8 – 10 weeks to be provided. Equipment is 20 – 24 weeks after submittal approvals.

Table 5-1 Opinion of Probable Capital Costs

Description	Estimate of Probable Costs
General Requirements (10% of all other costs)	\$415,000
Structural	\$610,000
Process Mechanical ¹	\$3,200,000
Building Mechanical	\$15,000
Electrical, Instrumentation, and Controls	\$200,000
<i>Subtotal, Construction</i>	<i>\$4,540,000</i>
Contingency (10%)	\$454,000
Engineering ²	\$720,000
Total, Construction	\$5,714,000

¹ IXOM has provided costs for the MIEX equipment in USD. Costs have been calculated based on an exchange rate of 1.38 CAD to 1 USD, but are subject to changes in USD conversion and possible tariffs.

² Engineering fees calculated from sum of DBM engineering fees + proposed design fees (issued December 2024) + 5% of construction subtotal for engineering during construction.

6 CONSTRUCTION DISCUSSION

6.1 Construction Staging

The demolition scope of work and MIEX equipment installation can occur without significantly impacting the existing WTP process. In addition, the potassium permanganate tank can be bypassed during tie-in.

It is recommended that piping tie-ins and MIEX system construction be delayed until late fall, when water demand is lower.

The Town has indicated a preference for construction not to take place in winter as travel can be compromised in the area. It is recommended that construction be staged to clear space in the fall of 2025 (demolition, building envelope modifications) and install the MIEX equipment in the spring of 2026.

All equipment that can be salvaged will be returned to the Town, including the centrifuges and the polymer system.

6.2 Project Delivery Discussion

The project delivery methods were discussed with the Town of High Level. Given the scale of the project, two project delivery methods were considered:

1. Design-Bid-Build (DBB)
2. Construction Manager at Risk (CMAR)

Given the remote location of High Level and the challenge with accurately estimating costs, the Town of High Level will proceed with CMAR.

6.3 Regulatory Review

With the addition of the MIEX equipment to the WTP, the existing Waterworks Approval (Approval No. 772-04) must be amended.

It should be noted that the Approval expiry date is August 1, 2025, and the renewal should be submitted February 1, 2025, to meet the 6-month requirement for renewals. Associated Engineering will engage Alberta Environment and Protected Areas (AEPA) at the next design phase in early 2025 and begin discussions regarding approval renewal and amendments.

Updates to the Approval are required regardless of the MIEX addition, as the current document incorrectly indicates the use of ozone and biological filtration. The ozone system is not operational, and the granular activated carbon is not operated as a biological filtration system.

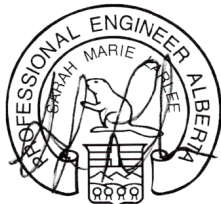
CLOSURE

This report was prepared for the Town of High Level to illustrate how MIEX will be incorporated into the existing process within the High Level WTP.

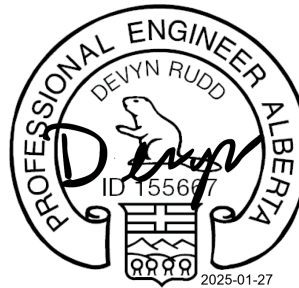
The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

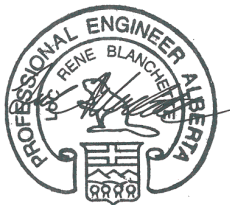
Associated Engineering Alberta Ltd.



Sarah Larlee, M.A.Sc., P.Eng.
Process Engineer, Associate Project Manager



Devyn Rudd, P.Eng.
Structural Engineer



Luc Blanchette, P.Eng.
EI&C Engineer

PERMIT TO PRACTICE	
ASSOCIATED ENGINEERING ALBERTA LTD.	
RM Signature	
	ID: 72405
2025-01-28	
PERMIT NUMBER: P 03979	
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)	

APPENDIX A – MIEX P&ID

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

8

7

6

5

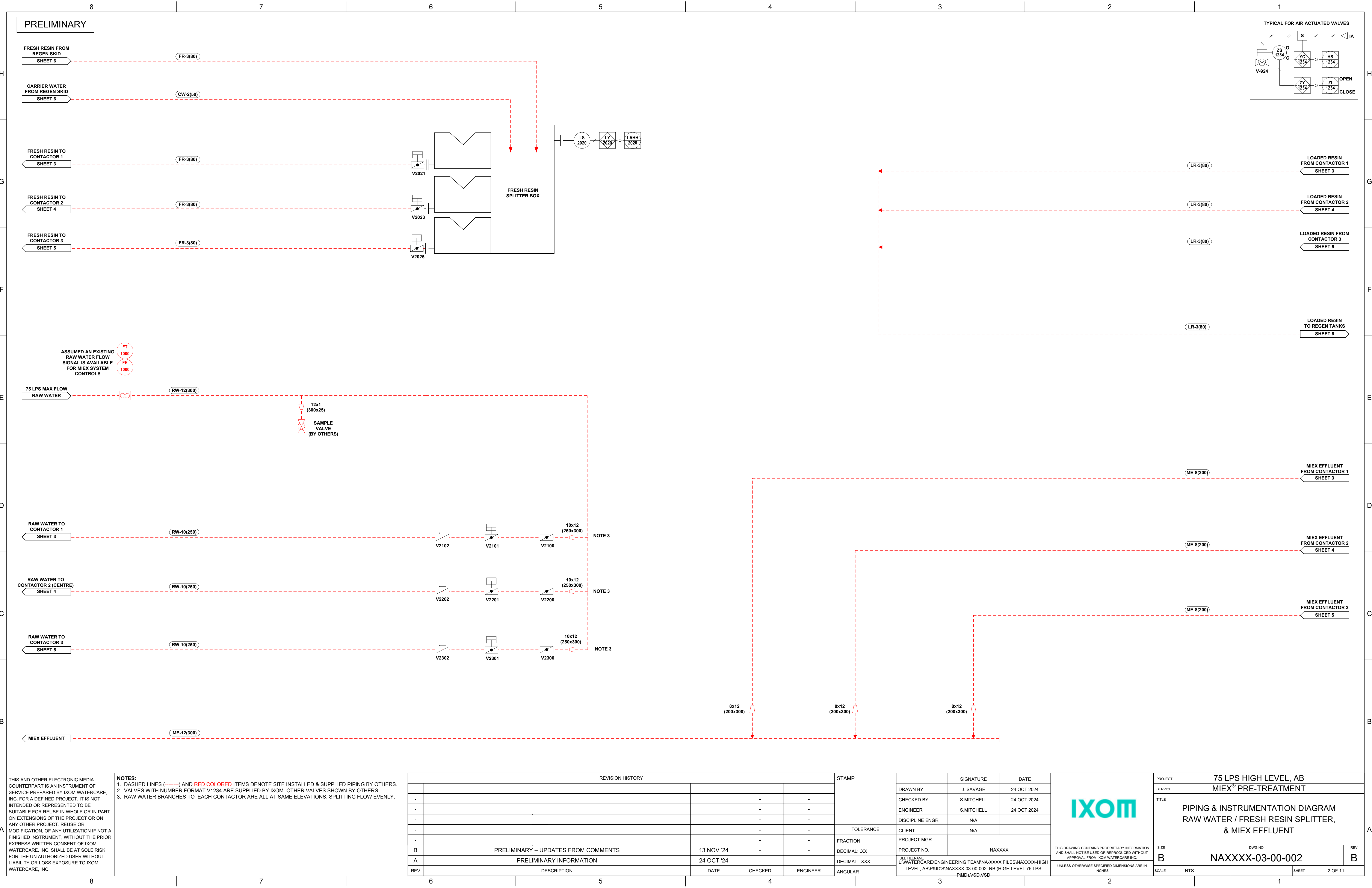
4

3

2

1

8

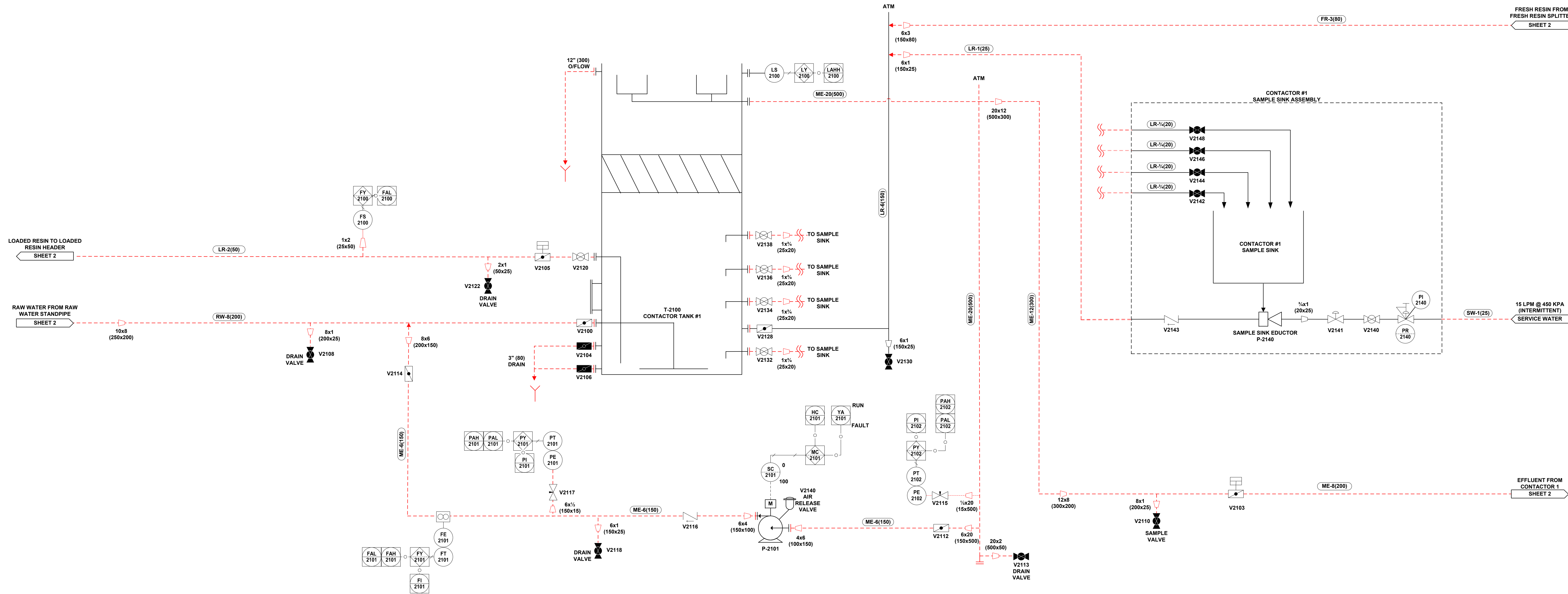
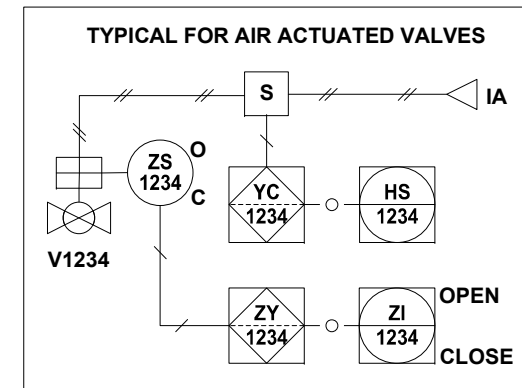


THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

- NOTES:**
- DASHED LINES (---) AND RED COLORED ITEMS DENOTE SITE INSTALLED & SUPPLIED PIPING BY OTHERS.
 - VALVES WITH NUMBER FORMAT V1234 ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS.
 - RAW WATER BRANCHES TO EACH CONTACTOR ARE ALL AT SAME ELEVATIONS, SPLITTING FLOW EVENLY.

REVISION HISTORY					STAMP		SIGNATURE		DATE			PROJECT	75 LPS HIGH LEVEL, AB				
-				-	-	DRAWN BY		J. SAVAGE	24 OCT 2024	SERVICE		MIEX® PRE-TREATMENT					
-				-	-	CHECKED BY		S.MITCHELL	24 OCT 2024	TITLE		PIPING & INSTRUMENTATION DIAGRAM RAW WATER / FRESH RESIN SPLITTER, & MIEX EFFLUENT					
-				-	-	ENGINEER		S.MITCHELL	24 OCT 2024								
-				-	-	DISCIPLINE ENGR		N/A									
-				-	-	CLIENT		N/A									
-				-	-	TOLERANCE					A						
B	PRELIMINARY – UPDATES FROM COMMENTS			13 NOV '24	-	-	FRACTION		PROJECT MGR								
A	PRELIMINARY INFORMATION			24 OCT '24	-	-	DECIMAL: .XX		PROJECT NO.	NAXXXX							
REV	DESCRIPTION			DATE	CHECKED	ENGINEER	ANGULAR	DECIMAL: .XXX	FULL FILENAME	THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC.							
											SIZE	DWG NO		REV			
											B	NAXXXX-03-00-002		B			
											SCALE	NTS		SHEET	2 OF 11		
											UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES						

PRELIMINARY

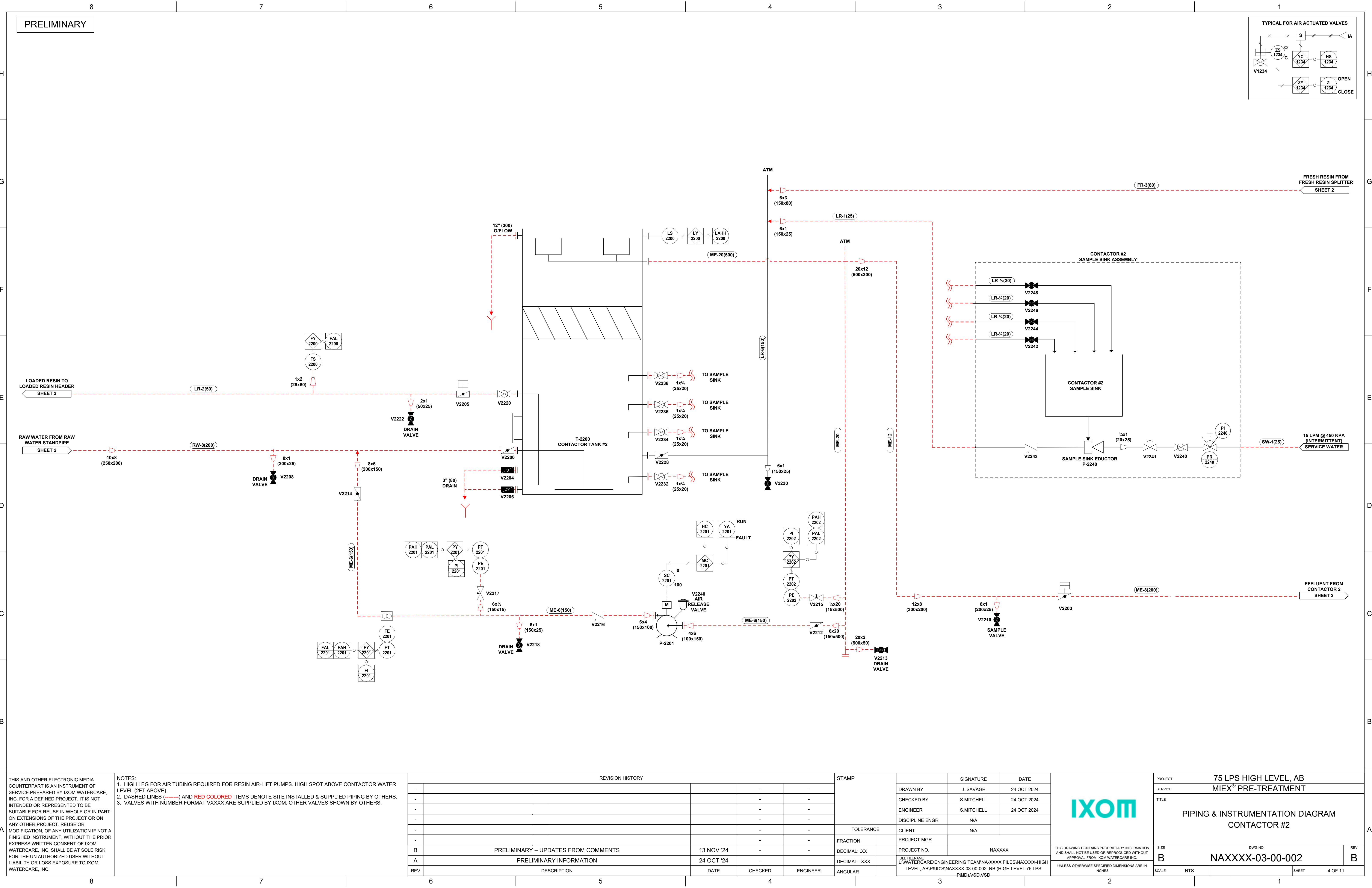


THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UNAUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

NOTES:

1. HIGH LEG FOR AIR TUBING REQUIRED FOR RESIN AIR-LIFT PUMPS. HIGH SPOT ABOVE CONTACTOR WATER LEVEL (2FT ABOVE).
2. DASHED LINES (-----) AND RED COLORED ITEMS DENOTE SITE INSTALLED & SUPPLIED PIPING BY OTHERS.
3. VALVES WITH NUMBER FORMAT VXXXX ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS.

REVISION HISTORY					STAMP		SIGNATURE		DATE		 THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	PROJECT75 LPS HIGH LEVEL, AB			
-			-	-			DRAWN BYJ. SAVAGE	24 OCT 2024	SERVICEMIEX® PRE-TREATMENT						
-			-	-			CHECKED BYS.MITCHELL	24 OCT 2024	TITLE PIPING & INSTRUMENTATION DIAGRAM CONTACTOR #1						
-			-	-			ENGINEERS.MITCHELL	24 OCT 2024							
-			-	-			DISCIPLINE ENGR	N/A							
-			-	-			CLIENT	N/A							
-			-	-			PROJECT MGR								
B	PRELIMINARY – UPDATES FROM COMMENTS		13 NOV '24	-	-	DECIMAL: .XX	PROJECT NO.	NAXXXX		SIZE	DWG NO		REV		
A	PRELIMINARY INFORMATION		24 OCT '24	-	-	DECIMAL: .XXX	FULL FILENAME L:\WATERCARE\ENGINEERING TEAM\NA-XXXX FILES\NAXXXX-HIGH LEVEL, AB\IP&I\NAXXXX-03-00-002_RB (HIGH LEVEL 75 LPS				B	NAXXXX-03-00-002			
REV	DESCRIPTION		DATE	CHECKED	ENGINEER	ANGULAR					SCALE	NTS		SHEET	3 OF 11



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

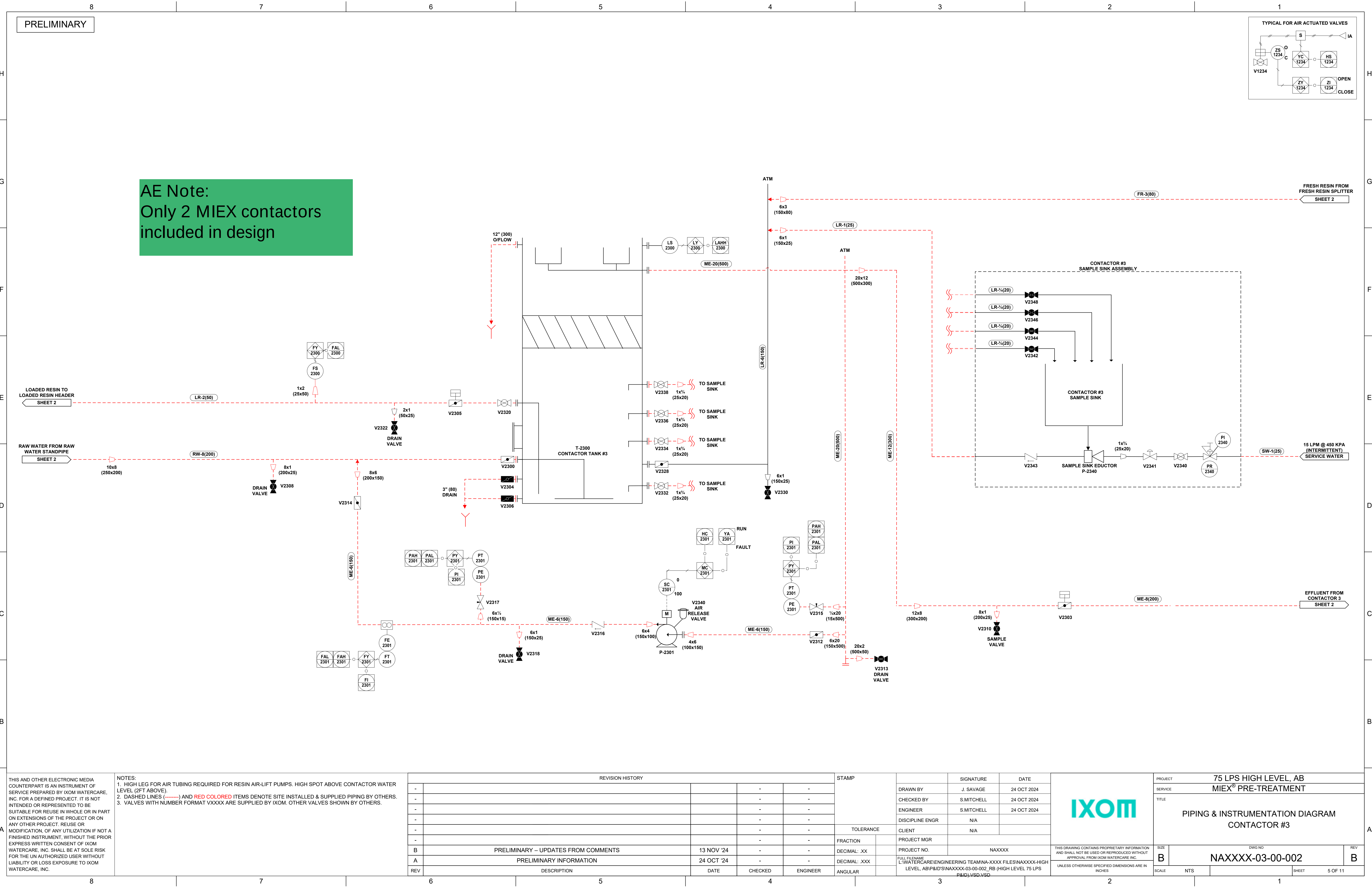
NOTES:
1. HIGH LEG FOR AIR TUBING REQUIRED FOR RESIN AIR-LIFT PUMPS. HIGH SPOT ABOVE CONTACTOR WATER LEVEL (2FT ABOVE).
2. DASHED LINES (---) AND RED COLORED ITEMS DENOTE SITE INSTALLED & SUPPLIED PIPING BY OTHERS.
3. VALVES WITH NUMBER FORMAT VXXXX ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS.

REVISION HISTORY				
-			-	-
-			-	-
-			-	-
-			-	-
-			-	-
-			-	-
B	PRELIMINARY – UPDATES FROM COMMENTS	13 NOV '24	-	-
A	PRELIMINARY INFORMATION	24 OCT '24	-	-
REV	DESCRIPTION	DATE	CHECKED	ENGINEER

STAMP		DRAWN BY	SIGNATURE	DATE
		J. SAVAGE		24 OCT 2024
		S.MITCHELL		24 OCT 2024
		S.MITCHELL		24 OCT 2024
		N/A		
		N/A		
		NAXXXX		
		FULL FILENAME L:\WATERCARE\ENGINEERING TEAM\NA-XXXX FILES\NAXXXX-HIGH LEVEL, AB\IP&D\S\NAXXXX-03-00-002_RB (HIGH LEVEL 75 LPS P&ID).VSD.VSD		

THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

PROJECT	75 LPS HIGH LEVEL, AB		
SERVICE	MIEX® PRE-TREATMENT		
TITLE	PIPING & INSTRUMENTATION DIAGRAM CONTACTOR #2		
SIZE	DWG NO		REV
B	NAXXXX-03-00-002		B
SCALE	NTS	SHEET	4 OF 11



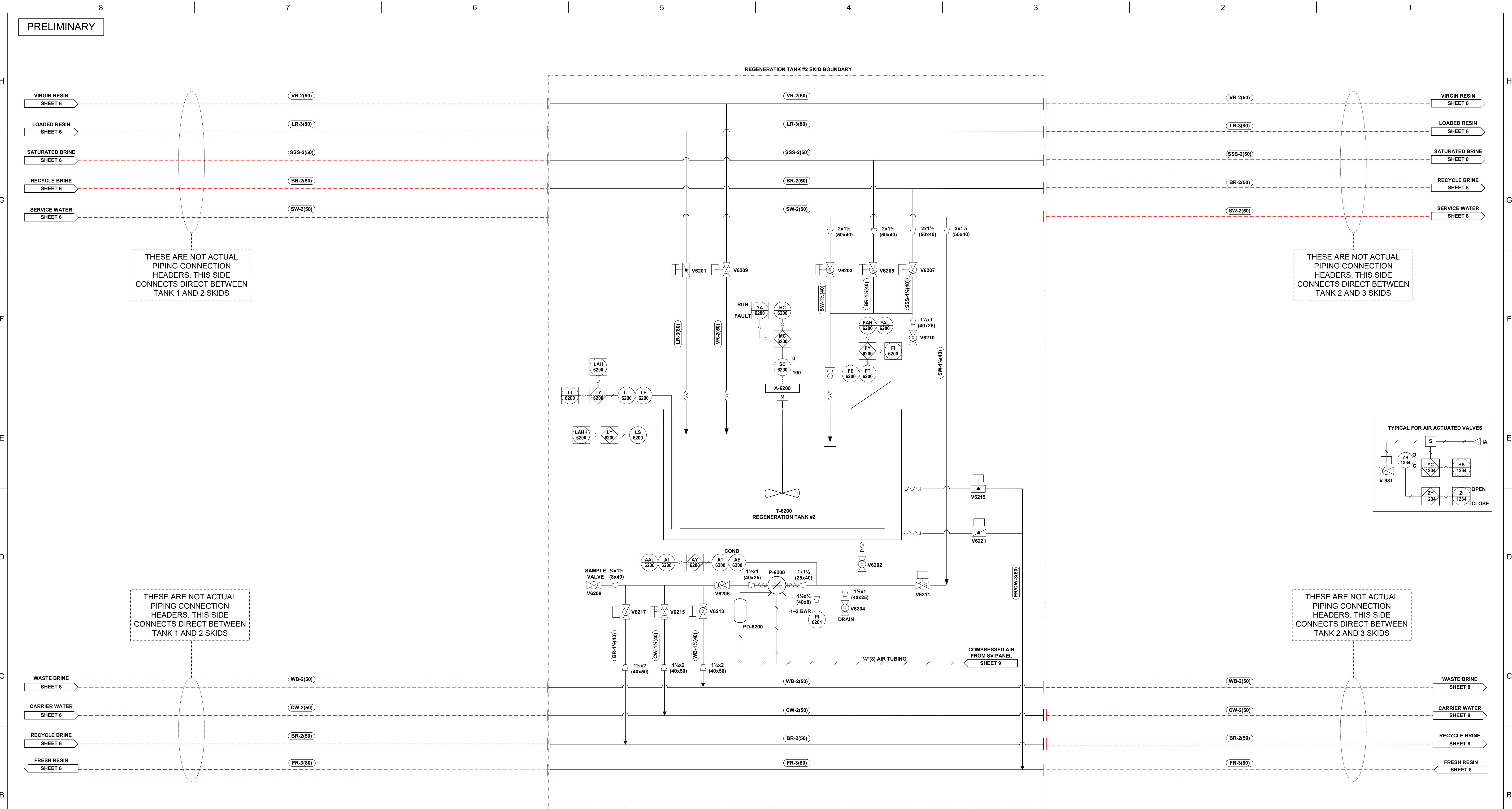
A	THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.	NOTES: 1. HIGH LEG FOR AIR TUBING REQUIRED FOR RESIN AIR-LIFT PUMPS. HIGH SPOT ABOVE CONTACTOR WATER LEVEL (2FT ABOVE). 2. DASHED LINES (-----) AND RED COLORED ITEMS DENOTE SITE INSTALLED & SUPPLIED PIPING BY OTHERS. 3. VALVES WITH NUMBER FORMAT VXXXX ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS.	REVISION HISTORY					STAMP		PROJECT		SIGNATURE		DATE		IXOM THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	PROJECT		75 LPS HIGH LEVEL, AB			
										DRAWN BY		J. SAVAGE		24 OCT 2024			SERVICE		MIEX® PRE-TREATMENT			
										CHECKED BY		S.MITCHELL		24 OCT 2024			TITLE		PIPING & INSTRUMENTATION DIAGRAM			
										ENGINEER		S.MITCHELL		24 OCT 2024					CONTACTOR #3			
										DISCIPLINE ENGR		N/A										
										CLIENT		N/A										
										PROJECT MGR												
										PROJECT NO.		NAXXXX										
										DECIMAL: .XX												
										DECIMAL: .XXX												
B			PRELIMINARY – UPDATES FROM COMMENTS					13 NOV '24		-		-				SIZE		DWG NO		REV		
A			PRELIMINARY INFORMATION					24 OCT '24		-		-				B		NAXXXX-03-00-002		B		
REV			DESCRIPTION				DATE		CHECKED		ENGINEER		ANGULAR				SCALE		NTS		SHEET 5 OF 11	

THESE ARE NOT ACTUAL
PIPING CONNECTION
HEADERS. THIS SIDE
CONNECTS DIRECT BETWEEN
TANK 1 AND 2 SKIDS

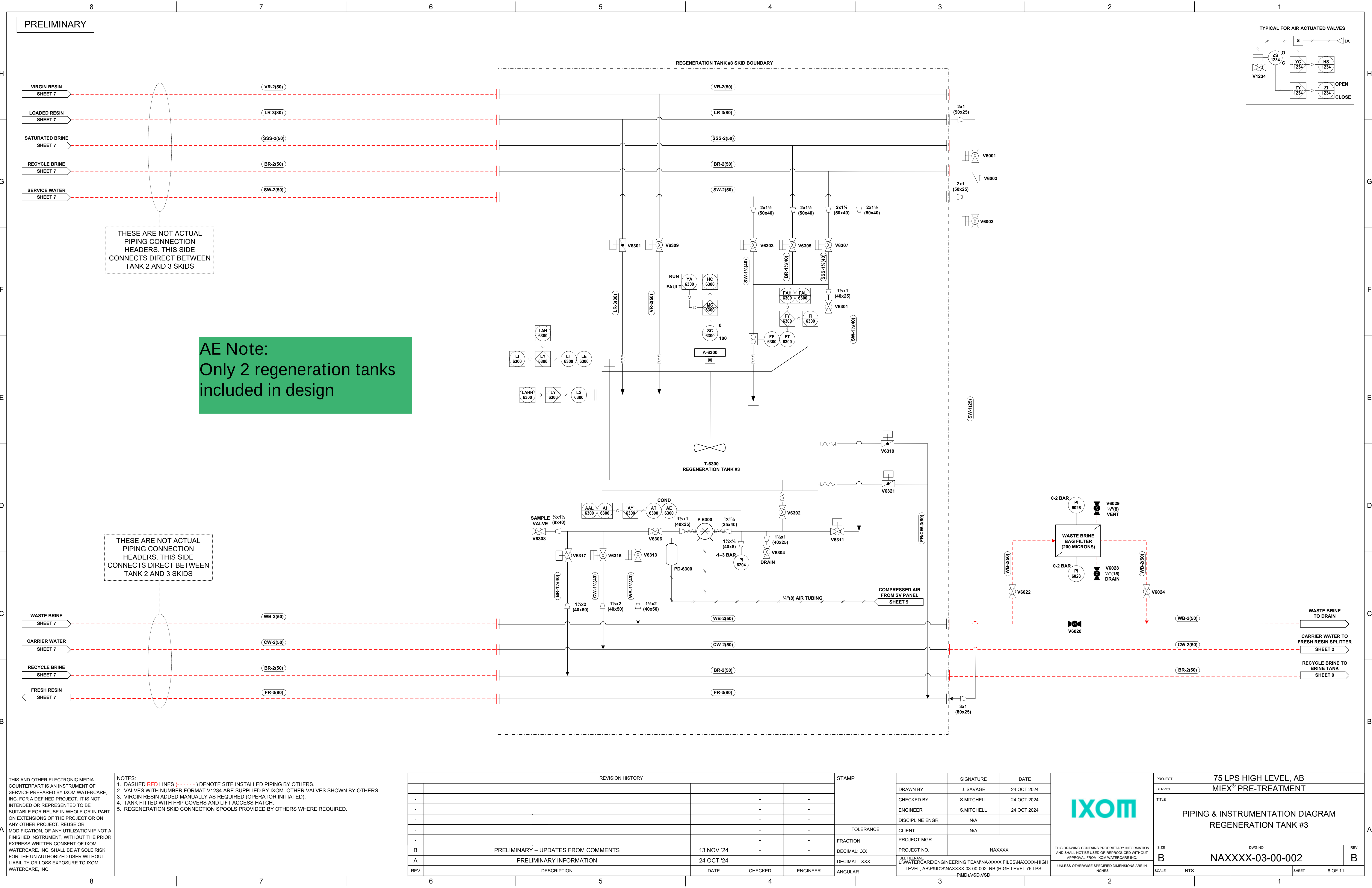


THIS DRAWING CONTAINS PROPRIETARY INFORMATION
AND SHALL NOT BE USED OR REPRODUCED WITHOUT
APPROVAL FROM IXOM WATERCARE INC.

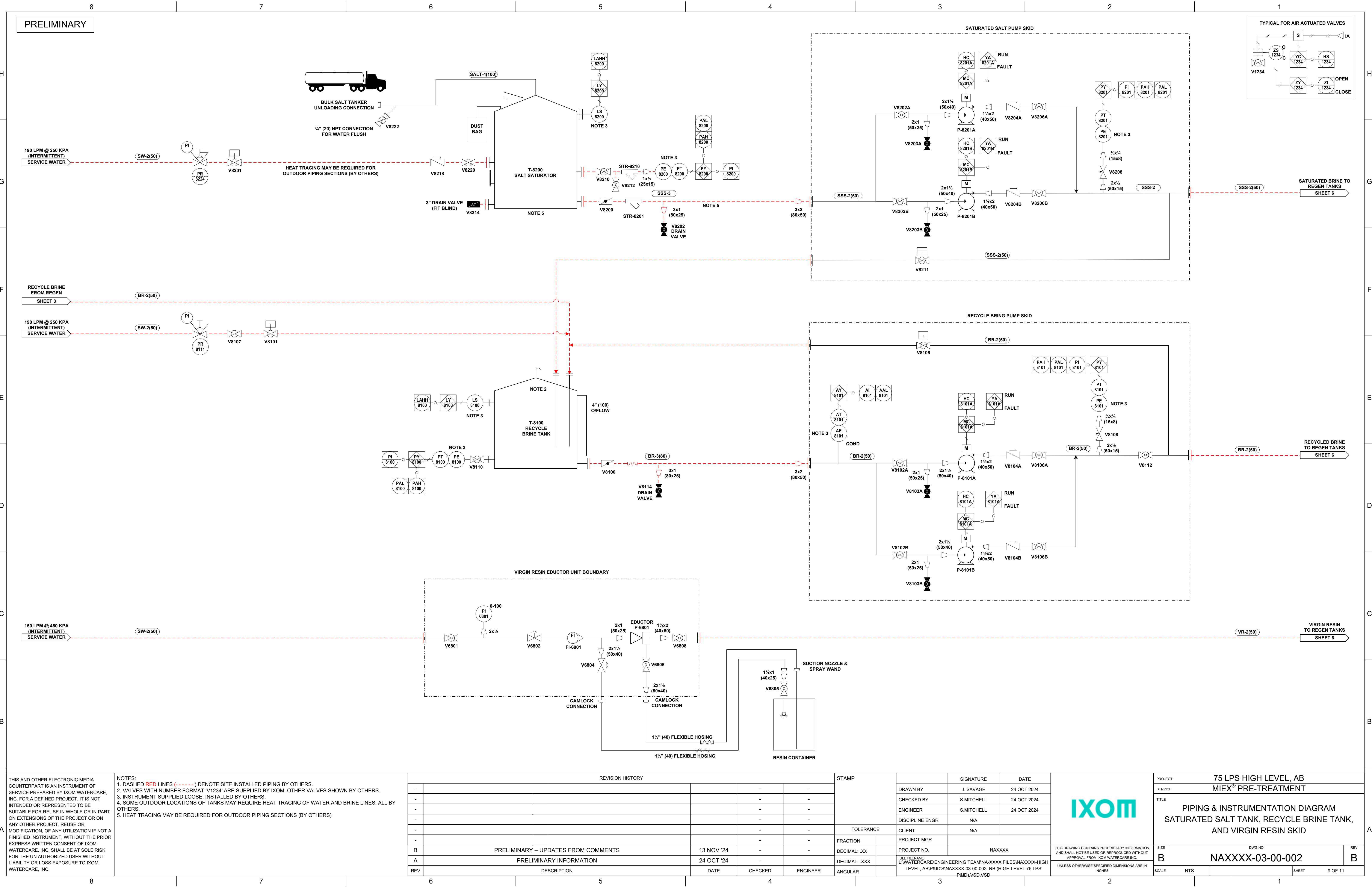
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.		REVISION HISTORY				STAMP		DRAWN BY J. SAVAGE 24 OCT 2024		SIGNATURE S. MITCHELL 24 OCT 2024		DATE 24 OCT 2024		PROJECT 75 LPS HIGH LEVEL, AB MIEX® PRE-TREATMENT		TITLE PIPING & INSTRUMENTATION DIAGRAM REGENERATION TANK #2		SIZE B		DWG NO NAXXXX-03-00-002		REV B	
NOTES: 1. DASHED RED LINES (---) DENOTE SITE INSTALLED PIPING BY OTHERS. 2. VALVES WITH NUMBER FORMAT V1234 ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS. 3. VIRGIN RESIN ADDED MANUALLY AS REQUIRED (OPERATOR INITIATED). 4. TANK FITTED WITH FRP COVERS AND LIFT ACCESS HATCH. 5. REGENERATION SKID CONNECTION SPOOLS PROVIDED BY OTHERS WHERE REQUIRED.		PRELIMINARY – UPDATES FROM COMMENTS				13 NOV '24		-		-		-		-		-		-		-		-	
PRELIMINARY INFORMATION		24 OCT '24				-		-		-		-		-		-		-		-		-	
DESCRIPTION		DATE				CHECKED		ENGINEER		ANGULAR		FRACTION		DECIMAL: .XX		DECIMAL: .XXX		ANGULAR		FRACTION		DECIMAL: .XX	
REV		DESCRIPTION				DATE		CHECKED		ENGINEER		ANGULAR		FRACTION		DECIMAL: .XX		ANGULAR		FRACTION		DECIMAL: .XX	
THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC.		FULL FILENAME L:\WATERCARE\ENGINEERING TEAM\NAXXXX-03-00-002_R6 (HIGH LEVEL 75 LPS P&ID).VSD.VSD				PROJECT MGR		PROJECT NO.		NAXXXX		DISCIPLINE ENGR		N/A		CLIENT		N/A		PROJECT MGR		PROJECT NO.	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		SCALE				NTS		SHEET		7 OF 11		SCALE		NTS		SHEET		7 OF 11		SCALE		NTS	



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.	NOTES: 1. DASHED RED LINES (-----) DENOTE SITE INSTALLED PIPING BY OTHERS. 2. VALVES WITH NUMBER FORMAT V1234 ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS. 3. VIRGIN RESIN ADDED MANUALLY AS REQUIRED (OPERATOR INITIATED). 4. TANK FITTED WITH FRP COVERS AND LIFT ACCESS HATCH. 5. REGENERATION SKID CONNECTION SPOOLS PROVIDED BY OTHERS WHERE REQUIRED.	REVISION HISTORY				STAMP		PROJECT		SIGNATURE		DATE		IXOM THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	PROJECT		75 LPS HIGH LEVEL, AB						
		-	-	-	-	-	-	-	-	DRAWN BY	J. SAVAGE	24 OCT 2024	SERVICE		MIEX® PRE-TREATMENT								
		-	-	-	-	-	-	-	-	CHECKED BY	S.MITCHELL	24 OCT 2024	TITLE		PIPING & INSTRUMENTATION DIAGRAM REGENERATION TANK #3								
		-	-	-	-	-	-	-	-	ENGINEER	S.MITCHELL	24 OCT 2024											
		-	-	-	-	-	-	-	-	DISCIPLINE ENGR	N/A												
		-	-	-	-	-	-	-	-	CLIENT	N/A		SIZE		DWG NO		REV						
		-	-	-	-	-	-	-	-	PROJECT MGR													
		-	-	-	-	-	-	-	-	PROJECT NO.	NAXXXX												
		B	PRELIMINARY – UPDATES FROM COMMENTS				13 NOV '24	-	-	DECIMAL: XX							B		NAXXXX-03-00-002		B		
		A	PRELIMINARY INFORMATION				24 OCT '24	-	-	DECIMAL: XXXX	FULL FILENAME L:\WATERCARE\ENGINEERING TEAM\NA-XXXX FILES\NAXXXX-HIGH LEVEL, AB\IP&D\S\NAXXXX-03-00-002_RB (HIGH LEVEL 75 LPS P&ID).VSD.VSD												
REV	DESCRIPTION				DATE	CHECKED	ENGINEER	ANGULAR							SCALE		NTS		SHEET		8 OF 11		



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

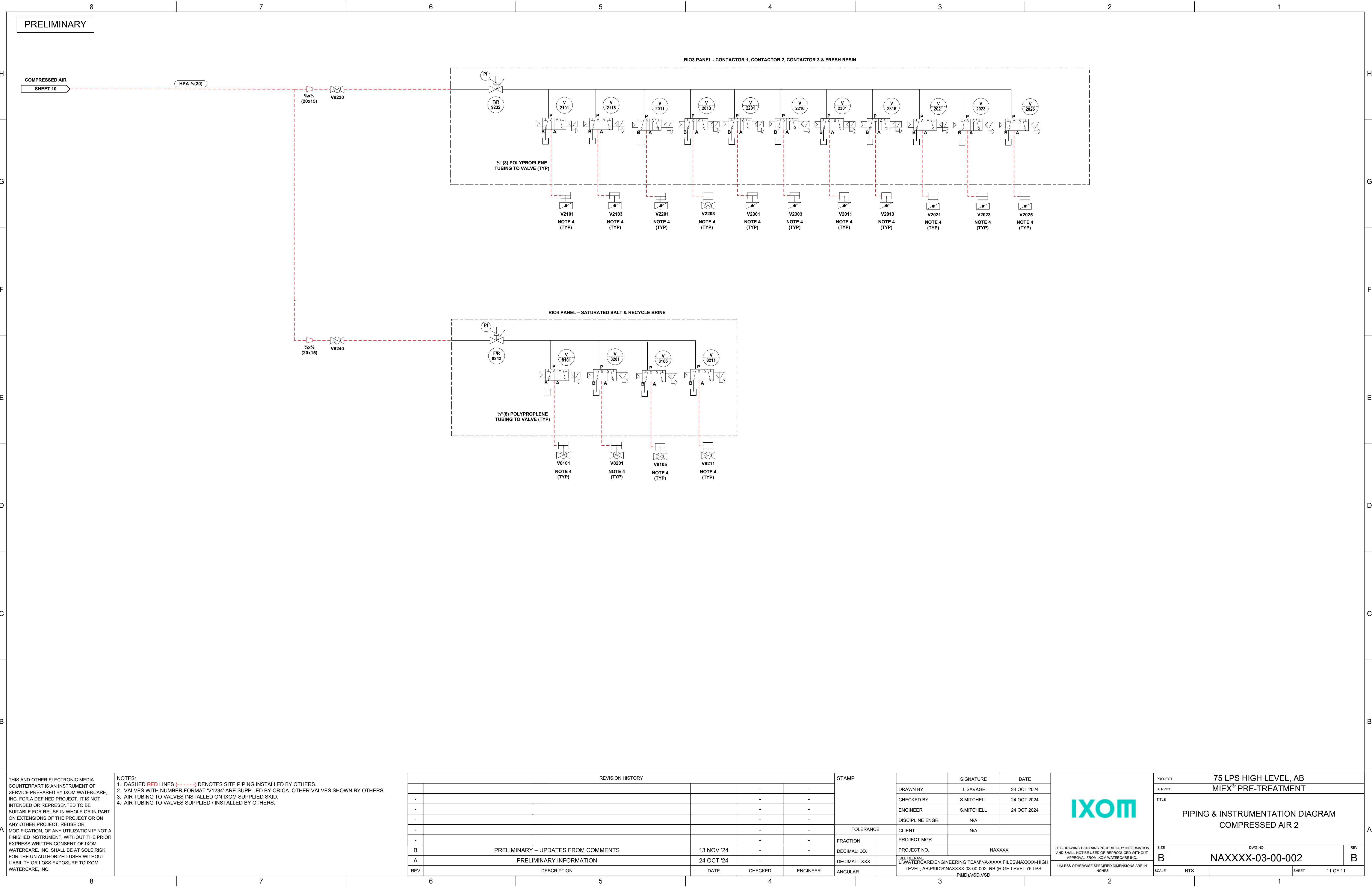
- NOTES:
- 1. DASHED RED LINES (---) DENOTE SITE INSTALLED PIPING BY OTHERS.
 - 2. VALVES WITH NUMBER FORMAT 'V1234' ARE SUPPLIED BY IXOM. OTHER VALVES SHOWN BY OTHERS.
 - 3. INSTRUMENT SUPPLIED LOOSE. INSTALLED BY OTHERS.
 - 4. SOME OUTDOOR LOCATIONS OF TANKS MAY REQUIRE HEAT TRACING OF WATER AND BRINE LINES. ALL BY OTHERS.
 - 5. HEAT TRACING MAY BE REQUIRED FOR OUTDOOR PIPING SECTIONS (BY OTHERS)

REVISION HISTORY					
-				-	-
-				-	-
-				-	-
-				-	-
-				-	-
-				-	-
B	PRELIMINARY – UPDATES FROM COMMENTS		13 NOV '24	-	-
A	PRELIMINARY INFORMATION		24 OCT '24	-	-
REV	DESCRIPTION		DATE	CHECKED	ENGINEER

STAMP		DRAWN BY	SIGNATURE	DATE
TOLERANCE		J. SAVAGE		24 OCT 2024
		S.MITCHELL		24 OCT 2024
		S.MITCHELL		24 OCT 2024
		N/A		
FRACTION		N/A		
DECIMAL: .XX		N/A		
DECIMAL: .XXX		N/A		
ANGULAR		N/A		

THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

PROJECT		75 LPS HIGH LEVEL, AB	
SERVICE		MIEX® PRE-TREATMENT	
TITLE		PIPING & INSTRUMENTATION DIAGRAM SATURATED SALT TANK, RECYCLE BRINE TANK, AND VIRGIN RESIN SKID	
SIZE	DWG NO	REV	
B	NAXXXX-03-00-002	B	
SCALE	NTS	SHEET	9 OF 11



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UN AUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

NOTES:
1. DASHED RED LINES (-.-.-.-) DENOTES SITE PIPING INSTALLED BY OTHERS.
2. VALVES WITH NUMBER FORMAT 'V1234' ARE SUPPLIED BY ORICA. OTHER VALVES SHOWN BY OTHERS.
3. AIR TUBING TO VALVES INSTALLED ON IXOM SUPPLIED SKID.
4. AIR TUBING TO VALVES SUPPLIED / INSTALLED BY OTHERS.

REVISION HISTORY				
REV	DESCRIPTION	DATE	CHECKED	ENGINEER
-			-	-
-			-	-
-			-	-
-			-	-
-			-	-
-			-	-
B	PRELIMINARY - UPDATES FROM COMMENTS	13 NOV '24	-	-
A	PRELIMINARY INFORMATION	24 OCT '24	-	-

STAMP

FRACTION

DECIMAL: .XX

DECIMAL: .XXX

ANGULAR

PROJECT MGR

PROJECT NO.

FULL FILENAME
L:\WATERCARE\ENGINEERING TEAM\NA-XXXX FILES\NAXXXX-HIGH LEVEL, AB\IP&D\S\NAXXXX-03-00-002_RB (HIGH LEVEL 75 LPS P&ID).VSD.VSD

IXOM

THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

PROJECT		75 LPS HIGH LEVEL, AB MIEX® PRE-TREATMENT	
SERVICE		NAXXXX-03-00-002	
TITLE		PIPING & INSTRUMENTATION DIAGRAM COMPRESSED AIR 2	
SIZE	DWG NO	REV	
B	NAXXXX-03-00-002	B	
SCALE	NTS	SHEET	11 OF 11

APPENDIX B – MEX EQUIPMENT ESTIMATE

**BUDGET EQUIPMENT SUPPLY
AND COMMERCIAL PROPOSAL**

**1.71-MGD MIEX® TREATMENT SYSTEM
FOR
TOWN OF HIGH LEVEL, AB**



DATE: 9 Sept 2024
IXOM DOCUMENT No.: PR-2024-016
REVISION: B

PRESENTED BY:
Mequipco Ltd.
#101, 5126- 126 Ave SE
Calgary, AB T2Z 0H2
Contact: Gareth Wright
(Ph: 587-327-4052)

Rev History

Rev	Status	Date	Prepared	Checked	Approved
A	For Internal Review	3 Sept 2024	GS		
B	Budgetary Proposal Issued	9 Sept 2024	GS	SM	RJS

TABLE OF CONTENTS

SECTION 1: BACKGROUND.....	4
1.1 General	4
1.2 About IXOM Watercare.....	4
1.3 MIEX Resin.....	5
SECTION 2: TECHNICAL SUMMARY.....	7
2.1 Design Parameters and Preliminary Design.....	7
2.2 Feed Water Envelope and Treatment Performance.....	7
SECTION 3: SCOPE OF SUPPLY	8
3.1 Engineering: Process and Equipment Design Documentation	8
3.2 Equipment: High Rate Basins and Associated Equipment.....	9
3.3 Resin Regeneration Equipment.....	10
3.4 Recycle Brine Tanks and Components.....	11
3.5 Salt Saturator Tank and Components.....	12
3.6 MIEX Resin Addition Skid	13
3.7 Package Air Compressors.....	13
3.8 Electrical Panels.....	13
3.9 MIEX Resin and Regeneration Salt.....	14
3.10 Site Support Services	14
3.11 Other Items.....	15
3.12 General Equipment Comments / Clarifications	15
SECTION 4: EXCLUSIONS AND SCOPE OF WORKS BY OTHERS.....	16
4.1 General	16
4.2 Ixom Equipment Unloading / Site Setting	16
4.3 Contactor Vessels.....	16
4.4 Raw Water and MIEX Treatment Effluent.....	16
4.5 Loaded Resin Tank Equipment	17
4.6 Resin Regeneration Equipment.....	17
4.7 Electrical and Instrumentation.....	17
4.8 SCADA / HMI Control System	18
4.9 General Items.....	18
SECTION 5: COMMERCIAL PROPOSAL	19
5.1 IXOM Scope of Supply	19
5.2 Site Installation.....	19
5.3 Professional Services Allowances	19
5.4 Training	19

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.

Title: 1.71 MGD MIEX System Budgetary Proposal

DOC ID: PR-2024-016

Location: High Level, AB

Rev: B

IXOM Watercare, Inc.

Date: 9 September, 2024

Page 2 of 22

5.5	Documentation	19
5.6	Equipment Warranty	19
5.7	Spares	19
5.8	Equipment Delivery and Storage	19
5.9	Price Offering	20
5.10	Schedule (Preliminary)	21
SECTION 6:	ATTACHMENTS.....	22

SECTION 1: BACKGROUND

1.1 General

IXOM presents our budgetary proposal for the detailed design, supply of equipment and support services for a 1.71 MGD MIEX Treatment System for High Level, AB. Benefits of utilizing a MIEX system include a reduction in coagulation chemical demand, a significant residual sludge reduction, a decrease treated water organics and disinfection by-products, and potentially a more stable free chlorine residual in the distribution system. The plant design (max) flow evaluated in this proposal is 1.71-MGD and an assumed regeneration bed volume (BV) treatment rates of 400 BV which is based on preliminary results from pilot testing.

As outlined in the following sections of this proposal, it details IXOMS scope of supply being offered, namely the following items:

1. Necessary detailed design for MIEX System and Equipment.
2. Generation of detailed design documents, drawings, specifications for the MIEX System.
3. Procurement and fabrication of 1.71 MGD MIEX System equipment components.
4. Delivery of equipment to site only.
5. Onsite professional services to review installation requirements of supplied MIEX System equipment, and provide guidance to equipment installers (sub-contractors to or others).
6. Onsite professional services to support for start-up and commissioning of the MIEX System
7. Onsite professional services for operator training, overview of initial operation and performance verification.
8. Provide project documentation, OM Manuals, as built equipment drawings etc.

1.2 About IXOM Watercare

IXOM Watercare operates as a unit of Ixom Pty, Ltd doing business throughout the North America, and corporate headquarters based in Melbourne, Australia. Ixom is a market leader in water treatment and chemical distribution in Australia and New Zealand, with an expanding presence in Europe/UK, Asia, Latin America, and North America. We supply a wide range of products across a diverse range of industries including Water Treatment, Pulp & Paper, Mining, Energy, Industrial, Building & Construction, Plastics, Food & Beverage, Personal Care, Health, Hygiene and Agriculture.

We provide our customers with end-to-end solutions, supported by unique industry and technical expertise, across our full portfolio of products and services. With a focus on growth and innovation, Ixom will ensure we are providing the best possible products and services to our customers, in a bold, decisive, and results-focused manner. We will work every day to help your business succeed by providing end-to-end solutions to solve your challenges.

Ixom has supplied equipment and systems for over 70+ Ion Exchange systems worldwide ranging in capacity from 0.3 MLD up 124 MLD capacity, treating ~1.1 billion liters per day. Another 10 plants are currently in design or construction for through 2024.

Systems have been operating for 20 years treating targeting containments such as:

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.		
Title: 1.71 MGD MIEX System Budgetary Proposal		DOC ID: PR-2024-016
Location: High Level, AB		Rev: B
IXOM Watercare, Inc.	Date: 9 September, 2024	Page 4 of 22

- Dissolved organic carbon
- Nitrate
- Softening
- Colour (reduction)
- Bromide
- Hydrogen sulphide
- Taste and odour
- Other targeted containments



1.3 MIEX Resin

The name "MIEX[®]" comes from **M**agnetic **I**on **E**xchange due to the ion exchange resin beads contain a magnetized component within the bead structure. This feature allows the resin beads to act as weak individual magnets and increases the settling rate in the fluidized bed process. Our small resin bead size of around 180-200µm provides a high surface area enabling the resin to bind up a larger amount of Dissolved Organic Carbon (DOC) than compared to larger resin beads.

MIEX Resin has been specifically designed for the removal of DOC from drinking water sources. Negatively charged DOC ions exchange slots with a chloride ion on the resin surface. In this process we exchange a significant removal of DOC for a small increase in the treated water chloride level. Over the time the exchange sites on the MIEX resin become laden with DOC and will require regeneration for continued treatment operations. To accomplish regeneration the resin loaded with DOC undergoes a reversed ion exchange reaction where the resin substitutes chloride ions for DOC when exposed to a saturated brine solution. We have provided a general flow schematic of the overall process for your review on the next page.

MIEX Resin is a strong base anion exchange resins with methacrylate, macroporous matrices. Our resin products are certified to NSF61 standard and all MIEX Resin is produced in ISO 9001 registered manufacturing facilities Ixom Watercare manufactures several products used specifically for fluidized ion exchange processes. MIEX DOC and MIEX[®] Gold both products

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.		
Title: 1.71 MGD MIEX System Budgetary Proposal		DOC ID: PR-2024-016
Location: High Level, AB		Rev: B
IXOM Watercare, Inc.	Date: 9 September, 2024	Page 5 of 22

display excellent resistance to organic fouling, but with separate affinities to varying molecular weight fractions which occur in many water sources around the world.

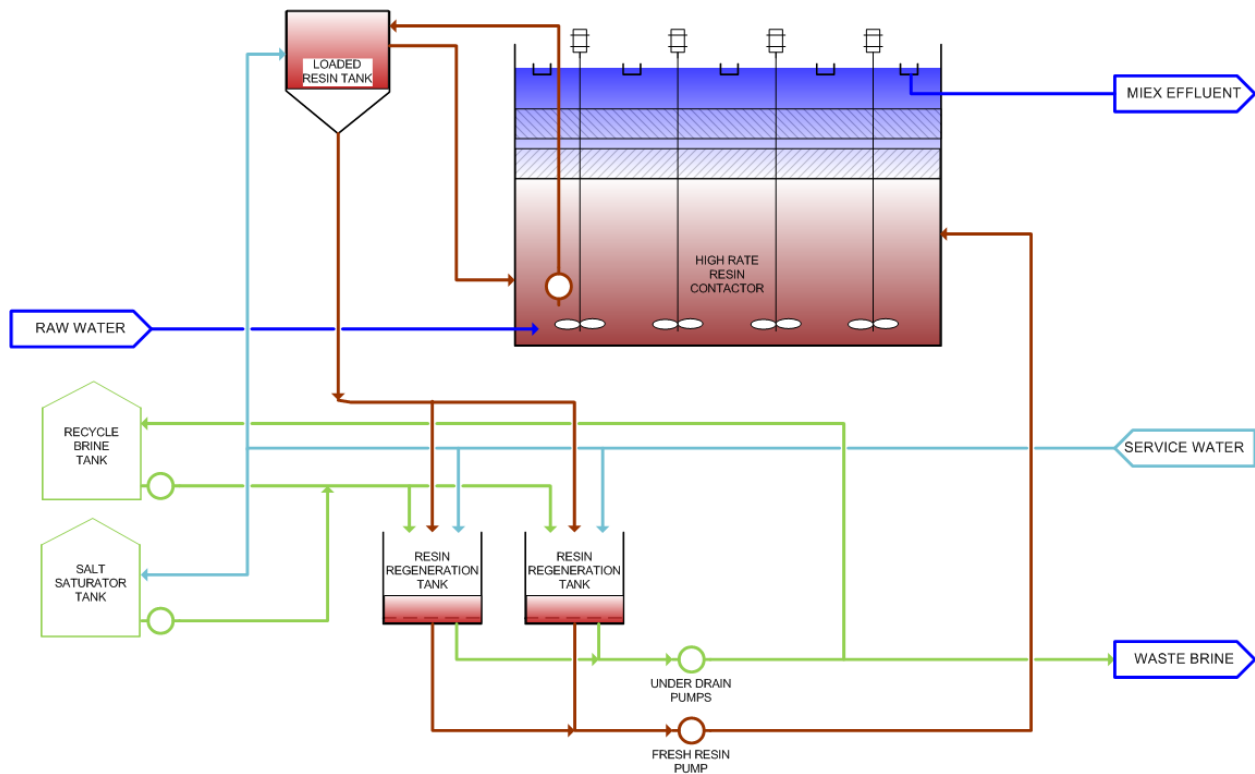


Figure 1: Typical MIEX Process Schematic

SECTION 2: TECHNICAL SUMMARY

2.1 Design Parameters and Preliminary Design

The proposed MIEX System main design parameters are summarized in the table below. MIEX Pilot testing has been carried out by Ixom in the summer of 2023. This preliminary proposal, as previously stated, is subject to change based on additional water quality sample testing. We assume the design shall use regeneration treatment rate of 400 bed volumes (BV) for this preliminary proposal.

Preliminary MIEX® Plant Design Parameters

Plant Variable	Value	Unit	Notes
Max. Daily Water Volume Treated	1.71	MGD	75.0 LPS
No. High-Rate Contactor Vessels	3	Qty	2 Duty / 1 standby. 0.86-MGD capacity each
Contactor Vessel (Circular)	11.0 x 19.5	ft (ID) x ft (H)	FRP Vessels, Circular
Maximum Treatment Rate	400	BVTR	
Number of Regeneration Tanks	3	Qty	6'-0" (ID) x 9' 9" (OAH) 2 duty / 1 standby
Resin Volume Regenerated	4,280	gal/day	
Recycle Brine Tanks – Quantity	1	ea	
Recycle Brine Tanks – Capacity	1,000	gal	
Salt Saturator Tanks – Quantity	1	ea	
Salt Saturator Tanks – Capacity	30	Tons	~30 days storage @ 1.7MGD

2.2 Feed Water Envelope and Treatment Performance

The feed water quality data used to develop this proposal comes from the preliminary information supplied to Ixom out of the 2023 piloting effort. As part of commissioning, a performance testing period will be carried out to verify the effluent water quality target(s) and the operational metrics are achieved. As previously stated, the MIEX will be subject to change depending on the design envelope for the feed water. For this BUDGET proposal, all design parameters presented in this document shall not be used for or assumed to be for final design purposes.

SECTION 3: SCOPE OF SUPPLY

This section outlines Ixom's typical scope of supply for a 1.71-MGD System at 400-BV Treatment Rate design.

3.1 Engineering: Process and Equipment Design Documentation

The following types of standard design documentation will be provided in Ixom standard supply formats for the MIEX System:

1 Lot Specification Documents:

1. Specification – Process Description, Design Basis and Scope
2. Specification – Responsibilities Matrix
3. Specification – Control System Functional Description & Sample HMI Screens
4. Specification – Performance Verification
5. Specification – Start-up / Process Commissioning Plan
6. Equipment Data sheets (Ixom forms)

1 Lot Schedule Documents:

1. Schedule – Ixom Equipment Summary
2. Schedule – Ixom Valve Summary
3. Schedule – Ixom Instrument Summary
4. Schedule – Ixom Drive Load Summary
5. Schedule – Ixom I/O List

1 Lot Drawings:

1. Process Flowsheet Mass Balance
2. Process & Instrumentation Drawings (w/ scope breaks)
3. Hydraulic Profile Schematic (Line Type)
4. Tanks/Vessel drawings and arrangements views
5. Equipment skids arrangement views
6. Overall Site Layout and Equipment Arrangement Views
7. Overall Site Interconnecting Piping (Schematic Lines)
8. Electrical panels layout, BoM and wiring

1 Lot Design PM / Review

1. Overall design project management
2. Site visits for design and overall review meetings with Client / Engineer
3. Supporting and providing input for general contractor bid documents generation (by Engineering)
4. Design / HAZOP review studies, if necessary

3.2 Equipment: High Rate Basins and Associated Equipment

Supply of internal equipment for Contactor Basins (installed by others). Each basin supplied with the following internal equipment (all site installed equipment by others):

3 of Contactor Vessels and Equipment:

Supply of three (3) 0.86 MGD High Rate Contactor Vessels constructed from fiberglass reinforced plastic (FRP) operation in 2-duty / 1-standby configuration. Each Vessel is supplied with:

1. Necessary influent, effluent, resin sample, drain nozzles (flanged or threaded) fitted to vessel.
2. Influent Distributor: One (1) internal bottom installed influent distributor constructed from PP piping.
3. Tube Settlers: Layer of plastic constructed tube settlers, overall 36-48" m thick
4. Effluent Troughs: One (1) set effluent collectors, all constructed from fiberglass
5. High Level Switch: One (1) high level switch (installed to side wall nozzle by the contractor)
6. Loaded Resin Collector: One (1) set of components for transferring resin from the contactor vessel to regeneration tank

Miscellaneous associated items with each Contactor Vessel equipment (supplied as loose items):

1. One (1) raw water influent standpipe constructed from stainless steel piping / fittings.
2. One (1) raw water influent standpipe high level switch.
3. One (1) MIEX treated effluent standpipe constructed from stainless steel piping / fitting.
4. One (1) MIEX treated effluent standpipe level (pressure) transmitter.
5. Contactor Recirculation Pumps: Two (2) vertical multistage centrifugal circulation pumps (duty / stand-by). Pump body constructed from ductile iron, with 304 stainless wetted internals.
6. Flowmeter: One (1) recirculation loop mag flowmeter, with local transmitter display
7. Pump Pressure Switches: One (1) set of suction and discharge pressure switches and gauges for each pump.
8. Resin Concentration Sampling (Manual) Equipment: One (1) sample sink system, with all necessary parts.
9. Actuated Process Valves: A set of air operated actuated valves with position feedback; valves constructed from PVC / EPDM.
10. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.

1 Lot Loaded Resin Tanks and Equipment:

One (1) Loaded Resin Tank constructed from glass reinforced plastic (GRP) and associated equipment:

1. Tank: One (1) 1,000-gal (approx.) HDPE conical bottom tank to be installed. Tank supplied with aluminum or painted carbon steel support stand. NOTE: Any access / platform for tank supplied BY OTHERS.

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.

Title: 1.71 MGD MIEX System Budgetary Proposal

DOC ID: PR-2024-016

Location: High Level, AB

Rev: B

IXOM Watercare, Inc.

Date: 9 September, 2024

Page 9 of 22

2. Loaded Resin Air-lift Pumps: Three (3) shop fabricated loaded resin air-lift pumps, made from PVC Sch 80 piping / fittings.
3. High Level Switch: One (1) high level switch.
4. Actuated Process Valves: A set of pneumatically operated actuated valves with position feedback; valves constructed from PVC / EPDM.
5. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.

All tank and associated equipment site installation shall be performed BY OTHERS.

1 Lot Fresh Resin Distribution Tanks and Equipment:

One (1) 200-gal (approx.) fresh resin tank would be required. Tank of stainless or fiberglass construction and supplied by Ixom, each tank will also include:

1. Tank high level switch. One (1) per tank.
2. Air Actuated Process Valves: A set of air operated actuated valves for each resin vessel; valves constructed from PVC / EPDM.
3. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.

All tank and associated equipment site installation shall be by OTHERS. Tanks or valves/piping are not skidded supply by Ixom.

3.3 Resin Regeneration Equipment

The following equipment will be part of the packaged regeneration systems supplied by Ixom. Site installation of skid modules shall be BY OTHERS

3 of Regeneration Tanks:

For a 400 BV treatment rate at 1.71-MGD, three (3) regeneration tanks that are connected as a system (2 duty / 1 standby configuration). Each individual regeneration tank consists of the following:

1. Resin Regeneration Vessel: One (1) regeneration vessels of approximate dimensions 6'-0" (ID) x 9'-9" (OAH) constructed from FRP.
2. Vessel Agitator: One (1) regeneration vessel agitator units (with standard TEFC motor, gearbox, stainless steel shaft and impeller).
3. Underdrain Pump: One (1) air-operated, non-metallic diaphragm underdrain pump used for separating resin / liquid, constructed from plastic.
4. Level Transmitter: One (1) vessel radar level transmitter.
5. Conductivity Probe: One (1) conductivity probes and transmitters for the vessel underdrain system.
6. Air Actuated Process Valves: A set of air operated actuated valves for each resin vessel; valves constructed from PVC / EPDM.
7. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.
8. Skid Frame: One (1) aluminum constructed skid frame for mounting vessels, mixers, instruments, valves, pumps, associated piping and controls. Regeneration skid may be fitted with access stairs and platform with handrails, kick plates, etc. for viewing into regeneration tanks.

9. Resin Process Piping: One (1) set of piping for resin duties on the regeneration skid to distribute resin to and from the regeneration vessels. Piping and fittings constructed from Sch 80 PVC.
10. Brine Process Piping: One (1) set of piping for brine duties on the regeneration skid to distribute brine to and from the regeneration vessels. Piping and fittings constructed from Sch 80 PVC.
11. Service Water Piping: One (1) set of piping for service water duties on the regeneration skid to distribute service water to and from the regeneration vessels. (NOTE: Service water connection supplied BY OTHERS).
12. Service Air Piping: One (1) set of piping/tubing for service air duties on the regeneration skid to distribute compressed air to applicable skid/vessel services. Pipe/tube and fittings constructed from stainless steel and poly tubing.

1 ea. Fresh Resin Pump Skid

One (1) fresh resin pump skid is required, skid consists of:

1. Two (2) low shear pumps (duty/standby configuration) for transferring fresh resin from the regeneration vessels back to the contactor vessels (via the fresh resin splitter tank). (NOTE: This is a common pump skid for all tanks).
2. Pump Pressure: One (1) common pump discharge pressure transmitter.
3. Discharge Conductivity: One (1) common pump discharge conductivity probe and transmitter.
4. Air Actuated Process Valves: A set of air operated actuated valves for each resin vessel; valves constructed from PVC / EPDM.
5. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.
6. Skid Frame: One (1) aluminum constructed skid frame for mounting pump, valves, instrument and associated piping.

1 Lots Access and Walkway Platform

System is supplied with one (1) common access stairs and walkway platform (that sits to the side of the Regeneration Tanks):

1. One (1) fabricated set of access stairs constructed from structural aluminum members, aluminum handrail components and GRP grid stair treads.
2. One (1) common tank walkway / access platform constructed from structural aluminum members, aluminum handrail components and FRP grid walkway grating.

3.4 Recycle Brine Tanks and Components

The following equipment will be part of the packaged regeneration systems supplied by Ixom. Site setting and installation of skid modules BY OTHERS

1 Lot One (1) recycle brine tank is supplied.

1. One (1) ~1,400-gal (approx.) recycle brine tank with all required nozzles constructed from HDPE.
2. One (1) brine tank pressure level transmitter.
3. One (1) brine tank high level switch.

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.		
Title: 1.71 MGD MEX System Budgetary Proposal		DOC ID: PR-2024-016
Location: High Level, AB		Rev: B
IXOM Watercare, Inc.	Date: 9 September, 2024	Page 11 of 22

4. One (1) set of air operated actuated valves with position feedback for associated recycle brine tank piping; valves constructed from PVC / EPDM.
5. One (1) set of manual valves for associated brine tank piping; valves constructed from PVC / EPDM.

One (1) recycle brine pump skid is supplied:

1. One (1) aluminum constructed skid frame for mounting pump, valves, instrument and associated piping.
2. Two (2) magnetic drive centrifugal pumps (duty/standby configuration) for transferring recycle brine to the resin regeneration module.
3. Pump Pressure: One (1) common pump discharge pressure transmitter.
4. One (1) recycle brine tank/piping conductivity sensor and transmitter.
5. Actuated Process Valves: A set of pneumatically operated actuated valves with position feedback; valves constructed from PVC / EPDM.
6. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.

Tank to be installed on concrete foundation BY OTHERS. Pump skid and interconnecting piping with and associated piping/valves will be supplied loose for site installation BY OTHERS.

3.5 Salt Saturator Tank and Components

- 1 Lot One (1) saturated salt tank and transfer pump(s) are supplied. Tank to be installed on concrete foundation BY OTHERS. Transfer pump(s) and associated piping/valves will be supplied loose for site installation BY OTHERS. Each saturator tank system will consist of:

1. One (1) 30 Ton salt saturator vessel with all required nozzles constructed from FRP. Vessel of flat bottom and domed top design; with access ladder; necessary internal components; translucent strip; anchor chairs or tie downs; lifting lugs; dust collection bag.
2. One (1) magnetic drive centrifugal pumps for transferring saturated brine to the resin regeneration module and Recycle Brine Tank.
3. One (1) pressure level transmitter for controlling water flow to saturator.
4. One (1) vessel high level switch.
5. One (1) set of air operated actuated valves with position feedback for the brine vessel skid; valves constructed from PVC / EPDM.
6. One (1) set of manual valves for the brine vessel skid; valves constructed from PVC / EPDM.

One (1) saturated salt pump skid is supplied:

1. One (1) aluminum constructed skid frame for mounting pump, valves, instrument and associated piping.
2. Two (2) magnetic drive centrifugal pumps (duty/standby configuration) for transferring recycle brine to the resin regeneration module
3. Pump Pressure: One (1) common pump discharge pressure transmitter.
4. One (1) saturated salt tank/piping conductivity sensor and transmitter.

5. Actuated Process Valves: A set of pneumatically operated actuated valves with position feedback; valves constructed from PVC / EPDM.
6. Manual Process Valves: A set of manual operated valves; valves constructed from PVC / EPDM.

Tank to be installed on concrete foundation BY OTHERS. Pump skid and interconnecting piping with and associated piping/valves will be supplied loose for site installation BY OTHERS.

3.6 MIEX Resin Addition Skid

- 1 Lot One (1) MIEX resin handling system. MIEX resin pump and associated piping/valves will be supplied on an aluminum or stainless steel support frame:
1. One (1) resin container interface device with slurry attachment.
 2. One (1) virgin resin educator for transferring from the tank to the resin regeneration module.
 3. One (1) set of manual valves; valves constructed from PVC / EPDM.

3.7 Package Air Compressors

- 1 Lot For 1.71-MGD / 400 BV System: Two (2) 15-HP package air compressor units (duty / standby configuration). All supplied as loose items for site installation (by a general contractor). Each compressor unit will be comprised of:
1. One (1) package rotary screw air compressor and air receiver tank.
 2. One (1) low sound enclosure.
 3. One (1) coalescing pre-filter unit (prior to drying).
 4. One (1) refrigerated air drier.
 5. One (1) pressure transmitter to monitor supplied air pressure (common for all).
 6. Other features; safety relief valve; high temperature shutdown, motor starter
 7. One (1) set of manual piping and manual valves for compressor equipment. Valves constructed from stainless steel / EPDM.
 8. Air compressors are supplied with internal motor starter and controls (only require a power feeds).

3.8 Electrical Panels

- 1 Lot Motor Control Center (MCC)
Motor controls center (MCC) for supplied drives are included in scope of supply by Ixom. Preliminary required motor control loads are listed above in previous section. MCC's Panels supplied with:
1. Motor drives, VFD's and controls as needed.
 2. Panel from VFD keypads with HOA type features.
- 1 ea. Programmable Logic Control Panel
Supply of one (1) stand-alone Programmable Logic Controller (PLC) control panel which will house necessary PLC controls for the MIEX System alone. Supplied with:
1. Power (120 VAC) supply / circuits.
 2. One (1) PLC processor, power supply and necessary communication cards.

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.		
Title: 1.71 MGD MIEX System Budgetary Proposal		DOC ID: PR-2024-016
Location: High Level, AB		Rev: B
IXOM Watercare, Inc.	Date: 9 September, 2024	Page 13 of 22

3. Necessary relays, terminals and other wiring devices.
4. Ethernet switch for communications to motors/drives

Panel supplied as a loose items (not skid installed) for site setting BY OTHERS. Wiring and communications to remote I/O panels, drive VSD, and other plant connections all BY OTHERS

4 ea. Remote I/O Panels

Supply of necessary remote I/O panels for regeneration tank skids, recycle brine and salt saturator equipment, and resin contactor equipment. Panels contain:

1. Power (120V VAC) supply / circuits for associated field equipment devices.
2. I/O cards (analog, discrete) for necessary field equipment devices control signals.
3. Necessary relays, terminals and other wiring devices.
4. Pneumatic controls for field air actuated valves.
5. Ethernet switch for communications.

The regeneration I/O panels are skid mounted with shop installed skid wiring. Other I/O panels are supplied a loose items for site installation and all field wiring to devices in BY OTHERS.

Remote I/O Panels for and Located:

- Contactor Vessels 1 / 2 / 3 (1 of overall)
- Regeneration Tanks 1 / 2 / 3 (1 of per tank)
- Recycle Brine Tanks / Salt Saturator Area (1 of overall)

3.9 MIEX Resin and Regeneration Salt

1 Lot MIEX Resin

Total MIEX Resin initial inventory requirements (for full plant capacities). MIEX Resin is supplied for the initial resin inventory sufficient for system start-up / commissioning, and currently in 1,000 L totes (with 900 L resin each).

1. Additional ongoing operating make-up resin is NOT INCLUDED.
2. Site unloading, storage and handling of resin BY OTHERS.

N/A Regeneration Salt

Salt for resin regeneration is NOT INCLUDED. Any and all initial / ongoing salt supply is BY OTHERS.

3.10 Site Support Services

1 Lot Site Support and Services: Equipment Installation

Onsite support for 2 trips (3 days each) visits during various phases of equipment installation to support the general contractor. Visit is for technical support only (no actual install works included).

1 Lot Site Support and Services: Commissioning, Testing

Onsite support for 20 days for all start-up, testing and commissioning of the MIEX System, initial testing and operator training.

1 Lot Site Support and Services: Post-Commissioning Follow-up Visits

Onsite support for 3 trips (3 days each) visits for MIEX System Operation check, additional training, further process optimization, support, any warranty items etc. over the first 12 months of plant operation.

3.11 Other Items

1 Lot Operation and Maintenance Manuals

System delivered with a full Operations and Maintenance Manual including P&ID's, Plant arrangement drawings, electrical schematics and panel layouts, process equipment cut-sheets and operation/maintenance manuals (to supplier weblinks), and other system information. Electronic copy (PDF files) will be provided.

1 Lot Optional: MIEX Equipment Spares

None included. A list of recommend spare can developed as the project progresses.

1 of Optional: MIEX Water Quality Monitoring

None included (i.e. online UVA).

3.12 General Equipment Comments / Clarifications

Skid/Frame Structure: Equipment skids are constructed from Aluminum unless otherwise specified. Some equipment and pipe supports on equipment skids may be constructed from 304 stainless steel when applicable.

Process Piping: Process piping and fittings that is prefabricated on equipment skids shall be constructed from:

- Sch 80 PVC for MIEX resin duties
- Sch 80 PVC for brine duties
- Sch 80 PVC for service water duties
- Stainless steel 304 sch 10 pipe/fittings for compressed air (for main header line); and nylon or PP tubing for individual lines to equipment items (e.g. from electric solenoid valve to underdrain pump)

Coatings: Scope of supply is based on standard coatings/finishes provided by equipment suppliers (pumps, motors, instruments, etc.).

Anchors: All equipment skids and tanks are designed with footing pads and hold-down features. ALL anchors/hold down bolts, washers, nuts and grout for leveling equipment shall be BY OTHERS unless otherwise noted.

Electrical Assembly of Equipment Skids: Any equipment skids will be pre-wired in the shop as much as practical. Field wiring to equipment skids will be terminated in junction boxes / panels installed on the equipment skids.

SECTION 4: EXCLUSIONS AND SCOPE OF WORKS BY OTHERS

4.1 General

All the items listed in this Section and other Sections where scope has been identified as BY OTHERS or BY BUYER/CONTACTOR are equipment, items, scope, works etc. that are fully carried out by others in terms of supply necessary equipment, materials, consumables and labor to perform the required tasks.

4.2 Ixom Equipment Unloading / Site Setting

The following items or works have NOT BEEN INCLUDED:

1. The unloading, storage and handling of process equipment and resin items supplied by Ixom shall be BY OTHERS.
2. All labor, materials, consumables, construction facilities, site setting and installation of process equipment items supplied by Ixom shall be BY OTHERS.

4.3 Contactor Vessels

The following items or works have NOT BEEN INCLUDED:

1. The design and construction of any concrete foundations (for tanks) or other services required shall be BY OTHERS.
2. Installation of all Ixom supplied internal components shall be BY OTHERS
3. The design and construction of any buildings or structures to house the equipment supplied by Ixom shall be BY OTHERS.
4. The design, supply and installation of any covers, unless specifically noted shall be BY OTHERS.
5. The design, supply and installation of any equipment/component supports, unless specifically noted shall be BY OTHERS.
6. The supply and installation of any general equipment for general power outlets, visual lighting, electrical ground wiring and lightning conductors, etc. around the equipment and access stairs / walkways shall be BY OTHERS.
7. The supply and installation of any protective coatings on concrete foundation/structures that are installed by others shall be BY OTHERS.
8. Dissolved / entrained gas in the raw water feed shall be removed prior to entry into the MIEX System. Provision for gas removal (if required) shall be BY OTHERS.
9. Provisions for raw water grit or other foreign solid material removal (if required) shall be BY OTHERS.

4.4 Raw Water and MIEX Treatment Effluent

The following items or works have NOT BEEN INCLUDED:

1. The supply and installation of any piping, fittings and controls to and from the MIEX Plant boundary; or to and from any upstream or downstream process equipment shall be BY OTHERS.

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.

Title: 1.71 MGD MIEX System Budgetary Proposal

DOC ID: PR-2024-016

Location: High Level, AB

Rev: B

IXOM Watercare, Inc.

Date: 9 September, 2024

Page 16 of 22

2. The supply and installation of any transfer pumps, flow measuring devices, automated controls, instruments, electrical equipment, civil structures, buildings, etc. shall be BY OTHERS.
3. The supply of any standalone or online water quality instruments or devices (such as to measure but not limited to TOC, DOC, UVA, Color, Turbidity) shall be BY OTHERS.

4.5 Loaded Resin Tank Equipment

The following items or works have NOT BEEN INCLUDED:

1. Site setting of supplied equipment associated with the tank.
2. Supplying and installation of loaded resin piping from tank outlet to regeneration system shall be BY OTHERS.

4.6 Resin Regeneration Equipment

The following items or works have NOT BEEN INCLUDED:

1. The design and construction of concrete foundations or structures shall be BY OTHERS.
2. The design and construction of any buildings or structures to house regeneration equipment supplied by Ixom shall be BY OTHERS.
3. The supply and installation of any protective coatings on concrete structures shall be BY OTHERS.
4. Supply and installation of resin transfer piping for interconnecting between Ixom supplied equipment items/skids shall be BY OTHERS.
5. Supply and installation of brine transfer piping for interconnecting between Ixom supplied equipment items/skids shall be BY OTHERS.
6. Supply and installation of service water piping for interconnecting between Ixom supplied equipment items/skids shall be BY OTHERS.
7. Supply and installation of compressed air piping for interconnecting between Ixom supplied equipment items/skids shall be BY OTHERS.
- Supply and installation of a service water supply and controls for the MIEX Treatment System shall be BY OTHERS.
8. Supply and installation of residual brine piping from the resin regeneration module to a residual brine storage tank or other location shall be BY OTHERS.
9. Supply provisions for and application of all piping labeling BY OTHERS
10. The supply and installation of a forklift, pallet jack, crane or other lifting/handling device for handling MIEX Resin bulk containers shall be BY OTHERS.

4.7 Electrical and Instrumentation

The following items or works have NOT BEEN INCLUDED:

1. The installation of Ixom supplied Motor Control Center for Ixom supplied pump and agitators.
2. The supply and installation of power supply cabling / equipment to the MIEX Plant location shall be BY OTHERS.
3. The supply and installation of any additional equipment required for a Motor Control Center (MCC) room; building or structures shall be BY OTHERS.

4. Field installation, conduit, cable trays, wiring terminations, etc. of Ixom supplied electrical equipment (e.g. motors, disconnects, instruments, electrical panels, etc.) and associated interconnections shall be BY OTHERS.
5. Any components, wiring, software required for integrating an existing PLC / SCADA control system with the MIEIX control system shall be BY OTHERS.

4.8 SCADA / HMI Control System

It is assumed that water treatment plant has an existing SCADA control and operator interface system. This MIEIX system and related components, software and programming are assumed to be integrated into the existing customer SCADA system BY OTHERS. Ixom would provide an overall specification document which outlines recommended SCADA/HMI features required for a MIEIX System. The SCADA/HMI system integrator will use this to develop the necessary MIEIX system sections.

4.9 General Items

The following items or works have NOT BEEN INCLUDED:

1. Necessary permits and/or governmental agency approval shall be BY OTHERS.
2. The supply and installation of a potable water supply, valves and controls to the MIEIX Plant location shall be BY OTHERS. Potable (service) water max pressure: 3-4 bar.
3. The supply and installation of a services (compressed air, water) piping, and other valves shall be BY OTHERS.
4. The supply and installation of floor drains, any storm water or other underground drainage shall be BY OTHERS.
5. The supply and installation of any general operator amenities, office equipment, laboratory equipment, etc. shall be BY OTHERS.

SECTION 5: COMMERCIAL PROPOSAL

5.1 IXOM Scope of Supply

Section 3 provides an overall scope of supply summary in terms of process equipment items and services being supplied by IXOM. Only explicit items listed in the Scope of Supply are included by IXOM. Items that maybe shown in preliminary design drawings/documents generated by IXOM that are not explicitly listed in Section 3 are not included in IXOM scope of supply (i.e. walkway platforms, concrete basins, etc.).

5.2 Site Installation

All site installation of IXOM supplied equipment is BY OTHERS. Some site visits during equipment installation are included in the scope of supply as outlined in Section 3. These are professional type visits providing guidance. No physical work is carried out or included.

5.3 Professional Services Allowances

As detailed in Section 3, IXOM has allowed for the set number of days for the activities listed. Days beyond those listed will be charged in addition at standard daily rates.

5.4 Training

Scope is based on all training performed by IXOM occurring at the works and during commissioning and testing phases. No other special trips or training occurring at other locations have been allowed for. Assumed all necessary operations and WTW staff will be available all at the same time for scheduled training classes / segments.

5.5 Documentation

System will be delivered with a full Operations and Maintenance Manual including P&ID's, Plant arrangement drawings, electrical schematics, panel layouts, process equipment cut-sheets, operation/maintenance manuals, and other system information for IXOM scope of supply.

5.6 Equipment Warranty

A warranty period of 12 months (from completion date) has been allowed for. Equipment warranty offered covers supply of parts only (delivered too site). Site labor requirements for change out / replacement of parts is not included. Specific timeframes upon which defects are to be corrected (based on defect classification/levels) have not been factored in. NOTE: IXOM does not store any parts; replacement parts are ordered from suppliers.

5.7 Spares

Currently no equipment spares are included. As the project develops, a recommended list can be supplied.

5.8 Equipment Delivery and Storage

Delivery to site included in IXOM budget estimate. Which is based on:

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.		
Title: 1.71 MGD MEX System Budgetary Proposal		DOC ID: PR-2024-016
Location: High Level, AB		Rev: B
IXOM Watercare, Inc.	Date: 9 September, 2024	Page 19 of 22

1. All equipment shipped to site.
2. All year round road access is possible (i.e. no ice roads accounted for)
3. A General contractor will off-load all the equipment and supply all necessary equipment and labour.
4. No temporary off-site equipment storage has been allowed for (i.e. if there was delay in site being able to accept equipment).
5. Resin may be shipped separately closer to the time when needed during commissioning.
6. Any general equipment packaging of the likes but not limited to wooden crates, plastic / shrink wrapping, cardboard boxes etc. Its assumed there will be an overall mechanism to dispose of onsite that's part of the larger project available, and specific removal of packaging materials will not be required.

5.9 Price Offering

In summary, IXOM scope of supply includes:

- Completion of detailed design documentation
- Procurement of process equipment components
- Procurement and fabrication of contactor vessels and equipment
- Procurement and fabrication of regenerations equipment skid and
- Procurement and fabrication of brine tanks and equipment skids
- Procurement and fabrication of miscellaneous equipment skids equipment
- Shop / FAT testing and inspection of equipment
- Delivery of all equipment to site / initial resin inventory
- Onsite support for start-up and commissioning
- Onsite support for operation of performance testing
- Onsite operator training
- Project documentations, as built drawings, OM manuals etc.

Removed two regeneration systems (reduce price by 2 x 222,000 USD)
Conversion of 1.38 CAD = 1 USD

Assume removal of one contactor will be approx \$400,000

Scope of Supply items	Budget Price (USD)
The Total Lump Sum Costs for, Equipment Procurement and Fabrication, Delivery, Onsite Services During Installation, Start-up, Commissioning and Performance Verification, Initial Resin Inventory, Operator Training, Documentation.	\$ 2,556,000

Price Validity: Not applicable, indicative budgetary pricing provided. Inflationary market environment should be accounted for in the project timeline.

Additional Field Service: Additional field service beyond the services indicated in the Proposal is available at USD \$1,250 per day on site per person plus travel and living expenses at cost plus 15%

COVID-19: IXOM will agree to follow all provincial / regional health and safety regulations in effect at the time the IXOM site services are requested, and as provided to IXOM at the time; however, these cannot be anticipated at the time of bid. Any additional requirements regarding quarantine (i.e. entering Canada or regional requirements), testing,

	confinement, etc. are not included in the site services quoted in this proposal and any delays that may result.
Equipment Shipment:	The price includes delivery of all equipment to site. All equipment and labor for off-loading equipment is provide all BY OTHERS.
IXOM Standard	20% with Issuance of Purchase Order
Payment Terms:	10% with Issuance of all Submittals
	50% with Delivery of Equipment and Resin Inventory, partial and/or staged shipments allowed
	10% Upon Completion of Equipment Installation
	10% Upon Successful Commissioning and Testing
Taxes:	The Price excludes sales tax, HST, GST or other imposed taxes/duties by law
Terms & Conditions	Scope and price offering are based only on IXOM standard terms and conditions of sale, see Attachments. No allowance for liquidated damages have been included in the Ixom scope of supply and pricing. Ixom has described it's equipment warranty (12 months) and terms and conditions (see attachments).

5.10 Schedule (Preliminary)

Shop Drawings:	8-10 weeks after full acceptance of a purchase order
Equipment Fabrication	30-34 weeks after approval of all Final Submittals / Shop Drawings

NOTES:

1. These are tentative timeframes for MIEX System of this size / capacity. All durations and schedules subject to final conformation.
2. Based on Ixom standard equipment design. Changes from standard design / components can alter timeframes.
3. Staggered shipments based on overall construction schedule (TDB) by a general contractor shall be allowed.

SECTION 6: ATTACHMENTS

Following attachments are included:

1. Preliminary Equipment Footprint
2. IXOM Standard Terms and Conditions
3. Equipment Warranty

END OF DOCUMENT

© IXOM Watercare. All Rights Reserved. This document contains information confidential & proprietary to Ixom Watercare, Inc. It is submitted in confidence & is to be used solely for the purpose for which it is furnished and returned upon request. This document and such information is not to be reproduced, transmitted, disclosed or used otherwise in whole or in part without the written authorization of Ixom.

Title: 1.71 MGD MIEX System Budgetary Proposal

DOC ID: PR-2024-016

Location: High Level, AB

Rev: B

IXOM Watercare, Inc.

Date: 9 September, 2024

Page 22 of 22

PRELIMINARY

NOT TO BE USED FOR BUILDING DESIGN OR SCOPE DETERMINATION

30 TON SALT SATURATOR TANK
Ø 10'-0" x 12'-0" SWH

SALT SATURATOR PUMP SKID

BRINE TANK

BRINE PUMP SKID

FRESH RESIN
PUMP SKID

3X REGENERATION SKID
O.A.H 12'-3 1/4"

VIRGIN RESIN SKID

RESIN IBC

AIR COMPRESSORS

3X Ø 48" X 9'-6" TALL
REGENERATION TANK

REGENERATION SKID
ACCESS STAIRS AND WALKWAY

LOADED RESIN TANK

CONTACTOR TANK
ACCESS STAIRS AND WALKWAY

3X Ø 11' CONTACTOR TANK
18'-6" O.A.H

Ø 12" EFFLUENT OUTLET

Ø 10" RAW WATER PIPE

RAW WATER STANDPIPE

12" RAW WATER INLET

NOTES:

1. ALL DIMENSIONS APPROXIMATE
2. ALL DIMENSIONS ARE IN FEET & INCHES
3. EQUIPMENT LOCATIONS SUBJECT TO SITE CONSIDERATION AND NOT GIVEN FOR ANY PARTICULAR ARRANGEMENT

AE Note:
Only 2 MIEX contactors included
in design
Only 2 regeneration tanks
included in design
Raw water standpipe and loaded
resin tank will be removed

THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UNAUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

A	PRELIMINARY - FOR REVIEW	08-30-24			
REV	REVISION DESCRIPTION	DATE	CHANGED	CHECKED	ENGINEER
REVISIONS					

STAMP

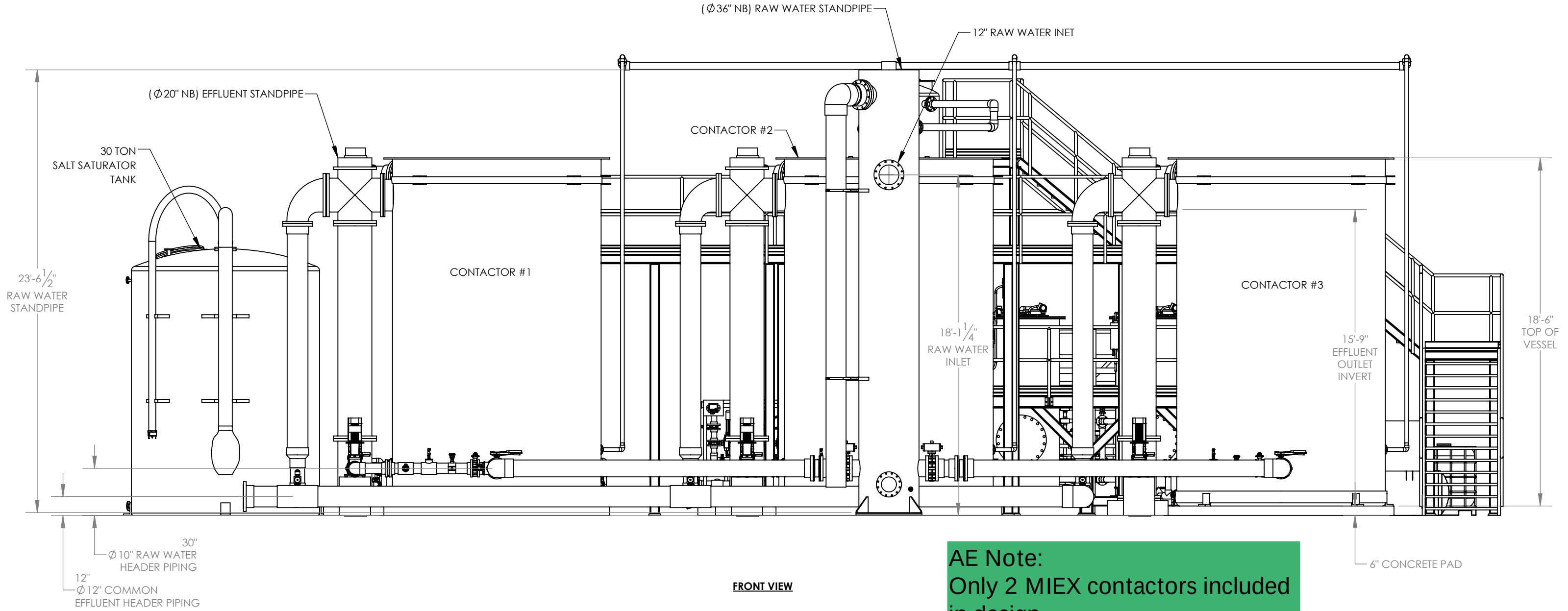
TOLERANCE
FRACTION: ± 1/8
DECIMAL: ± 0.03
ANGULAR: ± 1°

DRAWN BY	S. PADIAS	SIGNATURE	DATE
CHECKED BY			08/30/24
ENGINEER			
DISCIPLINE ENGR			
CLIENT			
PROJECT NO.	NAXXXX-HIGH LEVEL, AB		
PROJECT MGR			
FILENAME	NAXXXX-05-00-001		

IXOM
WATERCARE
8150 S. AKRON ST. SUITE 401
CENTENNIAL, CO 80112

THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE, INC.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

PROJECT	NAXXXX-HIGH LEVEL, AB		
SERVICE	MIEX® PRE-TREATMENT		
TITLE	MIEX® SYSTEM GENERAL ARRANGEMENT 1.71 MGD SITE LAYOUT		
SIZE	B	DWG NO.	NAXXXX-05-00-001
SCALE	1:75	SHEET	1 OF 3

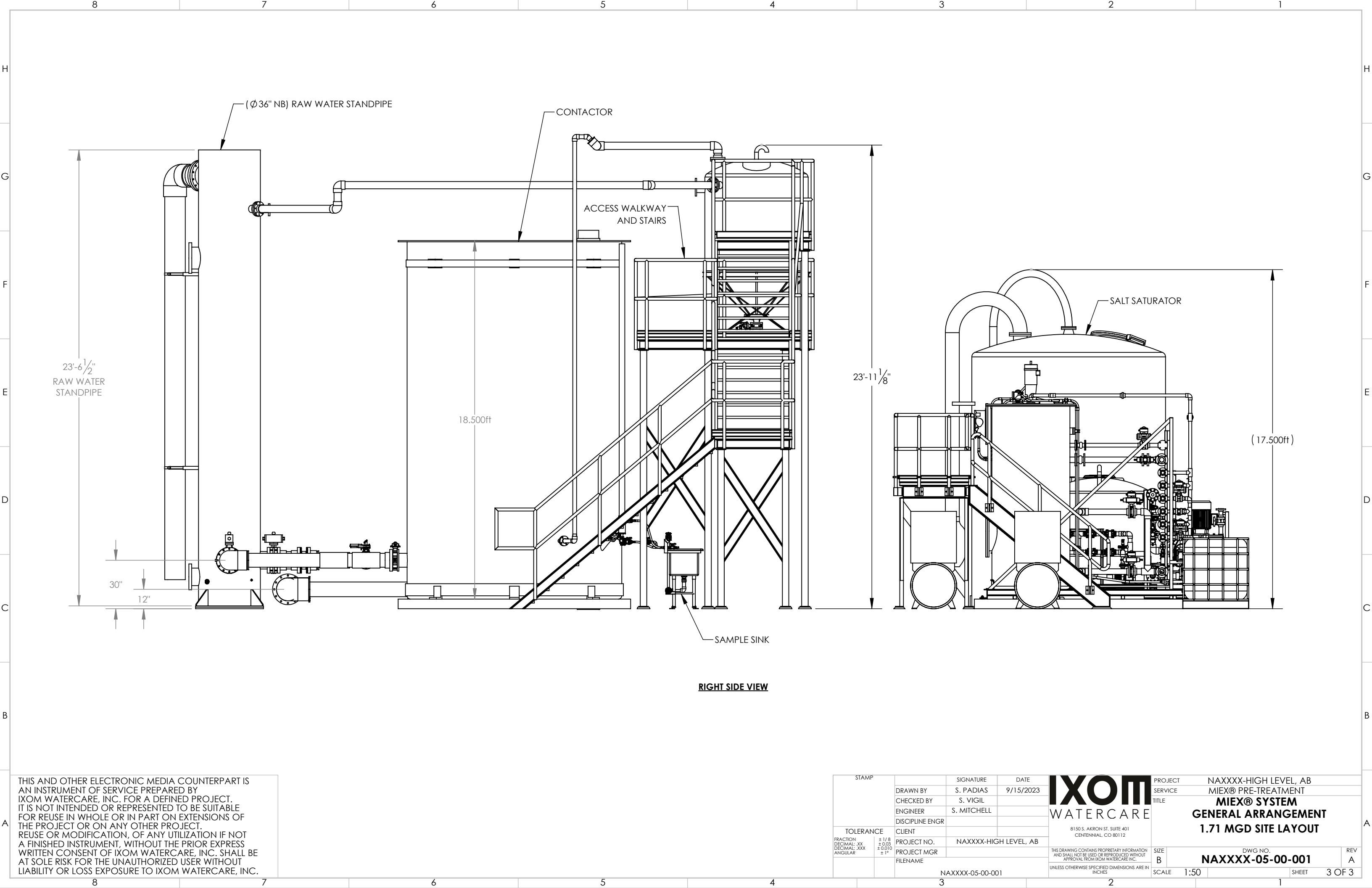


FRONT VIEW

AE Note:
Only 2 MIEX contactors included
in design
Only 2 regeneration tanks
included in design
Raw water standpipe and loaded
resin tank will be removed

THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UNAUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

STAMP	DRAWN BY	S. PADIAS	SIGNATURE	DATE	PROJECT SERVICE TITLE	NAXXXX-HIGH LEVEL, AB MIEX® PRE-TREATMENT MIEX® SYSTEM GENERAL ARRANGEMENT 1.71 MGD SITE LAYOUT		
	CHECKED BY	S. VIGIL						
	ENGINEER	S. MITCHELL						
	DISCIPLINE ENGR							
TOLERANCE FRACTION: ± 1/8 DECIMAL: ± 0.03 ANGULAR: ± 0.010 ± 1°	CLIENT				PROJECT NO. PROJECT MGR FILENAME	NAXXXX-HIGH LEVEL, AB		
IXOM WATERCARE 8150 S. AKRON ST. SUITE 401 CENTENNIAL, CO 80112					SIZE B	DWG NO. NAXXXX-05-00-001	REV A	
THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE, INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES					SCALE 1:60	SHEET 2 OF 3		



THIS AND OTHER ELECTRONIC MEDIA COUNTERPART IS AN INSTRUMENT OF SERVICE PREPARED BY IXOM WATERCARE, INC. FOR A DEFINED PROJECT. IT IS NOT INTENDED OR REPRESENTED TO BE SUITABLE FOR REUSE IN WHOLE OR IN PART ON EXTENSIONS OF THE PROJECT OR ON ANY OTHER PROJECT. REUSE OR MODIFICATION, OF ANY UTILIZATION IF NOT A FINISHED INSTRUMENT, WITHOUT THE PRIOR EXPRESS WRITTEN CONSENT OF IXOM WATERCARE, INC. SHALL BE AT SOLE RISK FOR THE UNAUTHORIZED USER WITHOUT LIABILITY OR LOSS EXPOSURE TO IXOM WATERCARE, INC.

STAMP			SIGNATURE	DATE	IXOM WATERCARE 8150 S. AKRON ST. SUITE 401 CENTENNIAL, CO 80112	PROJECT		NAXXXX-HIGH LEVEL, AB	
		DRAWN BY	S. PADIAS	9/15/2023		SERVICE		MIEX® PRE-TREATMENT	
		CHECKED BY	S. VIGIL			TITLE		MIEX® SYSTEM	
		ENGINEER	S. MITCHELL					GENERAL ARRANGEMENT	
		DISCIPLINE ENGR						1.71 MGD SITE LAYOUT	
TOLERANCE		CLIENT			THIS DRAWING CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED WITHOUT APPROVAL FROM IXOM WATERCARE INC. UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	SIZE		DWG NO.	REV
FRACTION: ± 1/8 DECIMAL: ± 0.03 ANGULAR: ± 0.010 ± 1°		PROJECT NO.	NAXXXX-HIGH LEVEL, AB			B		NAXXXX-05-00-001	A
		PROJECT MGR				SCALE		1:50	SHEET
		FILENAME	NAXXXX-05-00-001						3 OF 3



GENERAL TERMS AND CONDITIONS OF SALE

These terms and conditions (collectively, “Terms and Conditions”) govern all sales of products, equipment and services (collectively, “Goods”) agreed to be supplied by IXOM Watercare Inc (“Seller”) to any person to whom any quotation is made or who is offering to contract with the Seller (“Buyer”). The Terms and Conditions are incorporated into any order, offer, arrangement or understanding between the Seller and the Buyer (including pursuant to a quotation or letter of offer accepted by the Buyer) as well as any quotation or invoice or any other document to which they are attached (individually and collectively “Order”). All purchases by Buyer are expressly limited and conditioned upon acceptance of the Terms and Conditions and without limiting any other mode of acceptance, Buyer’s acceptance of the Goods manifests Buyer’s assent to the Terms and Conditions and the credit terms offered by Seller. Seller objects to and rejects any provision additional to or different from the Terms and Conditions that may appear in Buyer’s purchase order, acknowledgement, confirmation, writing or in any prior or later communication from Buyer to Seller, unless Seller expressly agrees to such provision in a written amendment signed by Seller. An Order together with these Terms and Conditions are herein referred to as “Contract”.

1. PRICES; TAXES; PAYMENT TERMS; DEFAULT.

(a) Prices for Goods and any adjustments to such prices shall be determined in accordance with Seller’s final pricing letter or offer forming part of the Contract which has been accepted by Buyer (“Price”).

(b) Prices do not include any sales, use, excise, privilege, or other taxes or assessments imposed on the Goods sold hereunder and unless Buyer provides proof of exemption satisfactory to Seller, such may be added to the price of the Goods.

(c) Subject to Section 1(e) and unless otherwise agreed in writing, payment terms are net 30 days from date of invoice. Payments not received when due shall incur service charges at the rate of 1½% per month (18% per annum) until paid, compounded on a daily basis.

(d) If any of the events set out in this Section 1(d)(i) through (v) below occur, Seller reserves the right, among other remedies, to delay or suspend further shipments or require full or partial cash payment in advance until all sums due have been paid. Buyer shall be liable for all costs and expenses incurred by Seller in collecting any overdue amounts, including without limitation reasonable attorneys’ fees..

(i) Buyer defaults in any payments or is unable or states that it is unable to pay its debts as and when they fall due.

(ii) Buyer commits an act of bankruptcy, files a voluntary petition in bankruptcy or has filed against it an involuntary petition in bankruptcy or has a trustee, receiver, liquidator, custodian, conservator, manager, controller or voluntary administrator appointed in respect of Buyer’s estate or any part of Buyer’s property or assets.

(iii) Buyer passes a resolution for its winding up or enters into liquidation or has an application for winding up filed against it.

(iv) Buyer makes an assignment for the benefit of its creditors.

(v) Buyer experiences any analogous event having substantially similar effect to any of the events listed above.

(e) Notwithstanding Section 1(a), Seller may at any time in its sole and unfettered discretion and without being under any duty or obligation to assign reasons, review, alter or terminate Buyer’s credit limit or payment terms without notice. Without limiting the generality of the foregoing, the decision of Seller shall be final and Seller accepts no liability or responsibility for any loss, howsoever arising, incurred by Buyer due to the operation of this condition.

2. SHIPMENT; DELIVERY AND RESPONSIBILITY TO PURCHASE.

(a) Unless agreed otherwise in writing, all shipments are F.C.A. Seller’s or its sub-contractor’s warehouse. Shipping dates are estimates only and are subject to Seller’s lead time policy. Seller shall make all reasonable efforts to have Goods delivered to Buyer on or about the date or within the time frame of the Order but Seller shall not be liable for any failure or delay in delivery for any reason. Buyer is responsible for disposing of all non-returnable containers and shipping materials

(b) Purchase orders issued by Buyer and placed with Seller are irrevocable and Buyer is contractually obliged to take delivery and pay for all Goods ordered and supplied or made available by Seller pursuant to such purchase order. If Seller does not receive forwarding instructions sufficient to enable it to dispatch Goods within fourteen (14) days after notice to Buyer that such Goods are ready, Buyer shall be deemed to have taken delivery from such date and shall be obliged to pay reasonable storage charges payable on demand. Unless otherwise agreed upon by the parties in writing, if Buyer does not accept delivery or collect Goods from Seller when made available at the agreed delivery point in accordance with the Contract, Buyer also will pay Seller for SLC-7548174-2

storage costs and reimburse Seller for any demurrage, transport or futile delivery costs incurred by Seller.

3. TITLE; RISK OF LOSS OR DAMAGE.

Title to and risk of loss of the Goods shall pass to Buyer upon delivery to the carrier at point of shipment.

4. INSPECTION; ACCEPTANCE.

Buyer shall promptly examine the Goods for any damage or shortage or failure of the Goods to comply with the Seller’s standard sales specifications or the specifications contained in or referenced in the Contract. All claims for damage or shortage of Goods shall be deemed waived unless made in writing and received by Seller within 30 days of delivery of the Goods. If Buyer finds that any of the Goods do not comply with the specifications, Buyer may, at its option, reject that portion of the Goods that fail to comply by providing Seller with a notice made in writing and received by the Seller within 30 days of delivery of the Goods. Failure to timely deliver written notice of any such claim or rejection of the Goods within the warranty period specified in this clause 4 shall be deemed an absolute and unconditional waiver of such claim for damage or shortage or a right to reject such Goods and all claims related thereto and shall constitute an unqualified acceptance of such Goods, irrespective of whether the facts giving rise to such claim shall have then been discovered or of whether use or application of the Goods shall have then taken place.

5. RETURNS.

Returned Goods shall not be accepted unless Buyer obtains prior written approval and transportation instructions from Seller. All Goods returned to Seller must be in full containers or cases, unopened and in the same condition as when delivered. If a return is approved by Seller, Goods may be returned for exchange or credit only. Seller shall give no cash refunds for returned Goods. Approved returned Goods are subject to a restocking charge of 15% of the invoiced value of such Goods and Buyer shall pay all transportation charges.

6. LIMITED WARRANTY.

(a) Subject to Section 6(e) and Section 7 below, Seller warrants title and that the Goods shall conform to Seller’s standard sales specifications in effect at the time of manufacture or the specifications agreed by the parties in writing and contained or referenced in the Order. Equipment components not manufactured by Seller which are incorporated in the Goods may, if specified elsewhere in the Contract, be subject only to warranties of Seller’s vendors and Seller hereby assigns to Buyer all such rights in such vendor’s warranties and will provide reasonable assistance in enforcing such rights.

(b) Buyer is solely responsible for determining that the Goods and their specification and scope are appropriate for Buyer’s intended use. Any advice or recommendations by Seller with respect to the Goods or the use of the Goods are provided in good faith based on tests or experience believed to be reliable but such advice or recommendations are not warranted. Buyer agrees that it is responsible for ensuring that Goods that comply with the warranties in Section 6(a) are fit and suitable for its purposes, requirements, processes, plant and equipment.

(c) To the maximum extent permitted by law, Seller makes no other representation or warranty of any kind, and hereby expressly disclaims all other representations or warranties, express, implied, statutory or arising from a course of dealing, usage of the trade or otherwise, including without limitation any representation or warranty as to merchantability, fitness for a particular purpose, or any other matter with respect to the goods, whether used alone or in combination with any other goods, substances processes or materials or services.

(d) In the event the exclusion of some or all of such warranties under section 6(c) for certain goods subject to this contract would be illegal, any additional warranty would be limited to the warranty required by applicable law and to the extent permitted by such law, would be subject to section 6(e) and section 7, and is conditioned upon use in accordance with label directions under normal conditions reasonably foreseeable to seller with buyer assuming the risk of any use contrary to label directions, under abnormal conditions or under conditions not reasonably foreseeable to seller.

(e) Seller’s sole liability and Buyer’s sole remedy for breach of warranty are specifically limited to the repair of the goods (or re-performance of services when applicable) or the cost thereof where Seller fails to perform such repair necessitate by a breach of warranty, and such liability and remedy are exclusive of all other liabilities and remedies. Should these remedies be found inadequate or to have failed of their essential purpose for any reason whatsoever, Buyer agrees that the return of the amount paid by buyer to seller for the purchase of the goods which fail to conform with the warranties set forth in section 7 shall be considered a fair and adequate remedy and prevent the remedies from failing of their essential purpose.

7. LIMITATION OF LIABILITY.

(a) The liability of Seller and its affiliates to Buyer under and in connection with the Contract is limited to the price allocable to the Goods giving rise to the claim and in no event shall the cumulative liability of Seller howsoever arising,

whether under warranty, contract, tort, negligence, strict liability, indemnification, defense or any other cause or combination of causes whatsoever, exceed the total payments received from Buyer under the Contract in connection with the Goods.

(b) To the extent permitted by law and notwithstanding any provision to the contrary in the contract, Seller shall not be liable for special, indirect, incidental or consequential damages, including without limitation, and loss of profits. Loss of business revenues, loss of capital, failure to realize expected profits or savings, overhead costs, loss by reason of service interruption or increased expense of operation, loss of goodwill, loss of reputation, loss of value in any intellectual property, damages or liquidated sums payable pursuant to other agreements or to other third parties, other economic losses, whether arising under warranty, contract; negligence (including negligent misrepresentation) or other tort, strict liability, breach of statute, indemnification, or any other cause or combination of causes, including any theories of concurrent liability arising from a duty of care by operation of law or otherwise.

8. SAFE STORAGE HANDLING AND USE; ASSUMPTION OF RISK; INDEMNIFICATION.

Buyer acknowledges that it is familiar with the risks associated with the storage, handling and use of Goods and any waste resulting therefrom. Accordingly and notwithstanding anything to the contrary set forth in the Contract, Buyer covenants and warrants and shall ensure that (i) that it and its employees, agents, carriers and customers are familiar with and adhere to all necessary and appropriate precautions and safety measures to safely store, handle or use the Goods; (ii) it and its employees, agents, carriers and customers shall comply with all applicable Laws, including without limitation, environmental laws and regulations pertaining to the storage, handling and use of Goods; (iii) shall obtain and comply with all required permits and licenses. Seller takes no responsibility for, and Buyer assumes all risks associated with waste characterization, regulatory status and chemical composition of any product, process, material, waste or substance into which the Goods are incorporated or applied. Without limiting the foregoing, Buyer shall further ensure that all storage tanks, vessels, and pipes, hoses and valves and other components used by Buyer or its employees, agents, carriers and customers to store, handle and transfer Goods which are bulk chemicals are properly installed and maintained to prevent injury, death or loss of containment during storage, handling and transfer of such Goods. If Buyer resells or distributes Goods to third parties, Buyer assumes responsibility for ensuring that it provides detailed instructions to such third parties regarding safe storage, handling and use of those Goods and any Storage Items or packaging in which such Goods are stored. To the maximum extent allowed by law, Buyer assumes all risks and liability whatsoever for all injuries, losses and damages to persons or property or otherwise and shall indemnify, defend and hold harmless Seller and Seller's employees and agents against all claims, damages, losses, costs, liabilities, and other expenses (including investigation and attorneys' fees) that Seller incurs or may be obligated to pay as a result of (i) Buyer's, its employees', agents', carriers' or customers' handling, possession, further processing, storage, use treatment, transportation, disposal, sale or other use or disposition of the Goods, whether used alone or in combination with other products, materials, substances or wastes, (ii) Buyer's, its employees', agents', carriers' or customers' violation or alleged violation of any Law, or (iii) Buyer's breach of any of its obligations set forth herein.

9. FORCE MAJEURE. Shipments or deliveries may be totally or partially suspended or delayed by Seller during any period in which the Seller may be prevented or hindered from manufacture, delivery or supply through any circumstances outside Seller's reasonable control or where such manufacture, delivery or supply is rendered materially more expensive by such circumstances. Circumstances beyond Seller's reasonable control shall include, without limitation, strikes, lockouts or other labor difficulty; acts of carriers; acts of God; acts of civil or military authorities; acts or omissions of Buyer; war; riot; fire; explosion; acts of terrorism; flood; any inability to obtain or lack of any necessary or adequate materials, inputs, fuel, power, labor, equipment, containers, facilities or services on usual terms; power or water shortage; accidents or breakdowns or failures of plant or machinery or apparatus; delays, congestions or blockages at sea ports or transport depots or software, hardware or communication network; changes in applicable Laws; or any other event, whether or not enumerated herein, beyond the reasonable control of Seller that makes impractical the manufacture, transportation or shipment of the Goods or of a material or other resource upon which the manufacture, transportation or shipment of the Goods depends. Seller shall not incur any liability to Buyer in respect of such suspension.

10. INTELLECTUAL PROPERTY.

Seller is the sole and exclusive owner of the Intellectual Property in the Goods and processes incorporated in such Goods, and the rights attached to that Intellectual Property. Nothing herein grants to Buyer any right, title or interest in or to any of the Intellectual Property in the Goods. Buyer shall not claim to have acquired any right, title or interest to the Intellectual Property in the Goods by virtue of purchasing Goods sold hereunder. Buyer shall not deconstruct, reverse compile or reverse engineer the Goods in any way for the purpose of deciphering or replicating the chemical composition of the Goods. As used herein, "Intellectual Property" means any intellectual or industrial property right anywhere in the world including, without limitation, any patent, patent application, utility model, copyright (including copyright in manuals, databases, and promotional materials), registered design and other design rights, unpatented secrets and innovations, confidential information, and any other rights that may subsist anywhere in the world in improvements, inventions and other manufacturing processes or technical and other information of Seller. Buyer shall not resell, distribute or supply the Goods to any third party for any reason without Seller's prior written consent

11. CONFIDENTIALITY; ENTIRE AGREEMENT; AMENDMENTS; CHANGES TO TERMS AND CONDITIONS.

(a) All information that Buyer acquires from Seller hereunder, directly or indirectly, and all information that arises out of the sale of the Goods hereunder, concerning such Goods and/or proprietary processes involved, including information concerning Seller's current and future business plans, information relating to Seller's operations, know-how, and other

Seller-furnished information shall be deemed Seller's "Proprietary Information". Buyer shall (a) hold Seller's Proprietary Information in strictest confidence, (b) not disclose it to others, (c) use it solely for purposes of this Agreement and (d) upon Seller's request, either promptly deliver to Seller all such Proprietary Information that is in written, electronic or other form, including copies and summaries, or, at Seller's option, destroy such Proprietary Information and provide Buyer certification of such destruction. The obligations under this Section shall survive the expiration or termination of the Contract.

(b) The Contract constitutes the entire agreement of the parties with respect to the purchase and sale of Goods and supersedes and excludes all prior and other discussions, representations (contractual or otherwise) and arrangements relating to the supply of Goods, including but not limited to, those relating to the performance of Goods or results that ought to be expected from using the Goods. Nothing in the Terms and Conditions is

12. GOVERNING LAW.

The rights and duties of the parties and any dispute regarding the sale of Goods covered hereby shall be resolved according to the laws of the state of Colorado, without regard to its conflicts of law provisions. Buyer hereby agrees to submit to the non-exclusive jurisdiction of the courts in the state of Colorado. Any controversy or claim arising out of or relating to the sale of Goods or the dealings between the parties shall be settled exclusively by arbitration in Denver, Colorado by a single arbitrator pursuant to the American Arbitration Association's Commercial Arbitration rules then in effect, and judgment upon the award shall be entered in any court having jurisdiction thereof. The prevailing party in any arbitration proceeding shall be entitled to recover its reasonable attorneys' fees and costs, in addition to any other relief obtained.

13. WAIVER.

No failure to exercise nor any delay or omission in exercising any right, power or remedy by Seller operates as or constitutes a waiver. A single or partial exercise by Seller of any right, power or remedy does not preclude any other or further exercise by it of that or any other right, power or remedy. A waiver is not valid or binding on Seller unless made in writing. No failure by Seller to exercise, nor any delay or omission by Seller in exercising any right, power or remedy nor any representation made or conduct carried out by Seller under the Contract or in connection with the supply of Goods or any of them shall constitute or provide grounds for a common law or equitable estoppel.

14. SEVERANCE.

If any provision of the Terms and Conditions or its application to any person or circumstances is or becomes invalid, illegal or unenforceable, the provision shall so far as possible be read down to such extent as may be necessary to ensure that it is not invalid, illegal or unenforceable. If any provision or part of it cannot be so read down, the provision or part of it shall be deemed void and severable and the remaining provisions of the Terms and Conditions shall not in any way be affected or impaired.



8150 S. Akron Street, Suite 401, Centennial CO 80112

LIMITED WARRANTY

Ixom Watercare Inc. (IXOM) warrants all new equipment manufactured by IXOM against defects in material and workmanship, and will repair or replace at IXOM's expense, F.C.A. shipping point, any part(s) returned to IXOM which upon IXOM's examination are shown to have failed under normal use and service within twelve (12) months from date of equipment start-up, or eighteen (18) months from shipment to the purchaser, whichever occurs first. The warranty for repaired or replacement equipment shall continue for the remainder of the original warranty period, or for a period of six (6) months, whichever is longer. IXOM shall not be responsible for providing working access to the defective equipment, including disassembly and reassembly of the equipment, or for providing transportation to and from the repair facility, all of which shall be at purchaser's expense.

When the nature of the warranty item is such that it is appropriate in the judgment of IXOM to make such repairs or modifications at the site of operation, purchaser agrees to provide site access to IXOM or its sub-contractors, during normal working hours 8:00 a.m. to 5:00 p.m., Monday through Friday, exclusive of holidays. Labor performed at other times at the request of purchaser will be billed at the applicable rate then prevailing for services provided.

THE FOREGOING WARRANTY SHALL CONSTITUTE THE SOLE AND EXCLUSIVE REMEDY OF PURCHASER AND IS IN LIEU OF ALL OTHER WARRANTIES, REPRESENTATIONS, CONDITIONS, RIGHTS AND REMEDIES WITH RESPECT TO THE QUALITY, CONDITION OR PERFORMANCE OF THE EQUIPMENT, WHETHER EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE AND WHETHER WRITTEN OR ORAL. ALL OTHER WARRANTIES, REPRESENTATIONS, CONDITIONS, RIGHTS AND REMEDIES, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY, DURABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXPRESSLY DISCLAIMED AND EXCLUDED TO THE FULLEST EXTENT PERMITTED BY LAW. IXOM SHALL NOT BE LIABLE FOR ANY CONTINGENT, SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGE OR LOSS OF ANY KIND, INCLUDING BUT NOT LIMITED TO, LOSS OF PROFITS, DUE TO PARTIAL OR COMPLETE INOPERABILITY OF IXOM'S EQUIPMENT FOR ANY REASON WHATSOEVER.

IXOM only warrants equipment that has been paid for in full and which was put into service for its intended purpose. The warranty contained herein shall not apply to normal wear and tear, defects in materials provided by purchaser, or those items such as media, resin, and the like that are normally replaced or consumed as part of routine operation or maintenance of the equipment.

The warranty contained herein shall terminate if the equipment failure giving rise to a claim under warranty results from (a) unauthorized modification, repair or alteration, (b) improper or abnormal operation, application, maintenance or installation, (c) damage during shipment, or (d) operation, handling or other dealings with the equipment in a negligent manner.