FINAL REPORT
OCTOBER 2025

Douglas L. Smith Middle Basin

Wastewater Treatment Facility

Solids Treatment Conceptual Facility Plan

Prepared for:

Johnson County Kansas Wastewater

AUTHORIZATION NO. **21-04**

CONTRACT NO. **IMB1-CDM-21-04**

CDM Smith

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Acronyms and Abbreviations

16/7	16-hours-per-day, 7-days-per-week
ADF	Average Daily Flow
A	Amp
BFP	Belt Filter Press
BNR	Biological Nutrient Removal
BOCC	Board of County Commissioners
CDM Smith	CDM Smith Inc.
CHP	Combined Heat and Power
CIP	Capital Improvement Program
CMAR	Construction Manager at Risk
CPS	Construction Phase Services
CSP	Competitive Sealed Proposal
DB	Design-Build
DBB	Design-Bid-Build
DSST	Digested Sludge Storage Tank
EQ	Equalization
FAS	Fire Alarm System
FE	Portable Fire Extinguisher
$FeCl_3$	Ferric Chloride
FOG	Fats, Oils, and Grease
FRP	Fiberglass-Reinforced Plastic
ft	Foot (or Feet)
ft^3/op. hr	Cubic Feet per Operating Hour
GC	General Contractor
GMP	Guaranteed Maximum Price
gph	Gallons per Hour
gpm	Gallons per Minute
gpm/m	Gallons per Minute per Meter of Belt Width
GT	Gravity Thickener
H	Hydrant Protection
H_2S	Hydrogen Sulfide

hp	Horsepower
HVAC	Heating, Ventilation, and Air-Conditioning
in.	Inch
JCW	Johnson County Wastewater
KDHE	Kansas Department of Health and Environment
kW	Kilowatt
lb	Pound
MCC	Motor Control Center
Middle Basin	Douglas L. Smith Middle Basin WWTF
MMBtu/hr	Million British Thermal Units per Hour
MOP	Manual of Practice
MOPO	Maintenance of Plant Operation
NFPA	National Fire Protection Association
NG	Natural Gas
NR	No Requirement
OPCC	Opinion of Probable Construction Cost
PAF	Program Administration Fee
PDB	Progressive Design-Build
PEW	Plant Effluent Water
PLC	Programmable Logic Controller
PO_4-P	Inorganic Nitrogen and Orthophosphate
pph/m	Pounds per Hour per Meter of Belt Width
PS	Primary Sludge
psi	Pounds per Square Inch
R&R	Rehabilitation and Replacement
RDT	Rotary Drum Thickener
RNG	Renewable Natural Gas
scfm	Standard Cubic Feet per Minute
SRT	Solids Retention Time
TDH	Total Dynamic Head
TM	Technical Memorandum
TP	Total Phosphorus
TPS	Thickened Primary Sludge

TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge
V	Volt
VFA	Volatile Fatty Acids
WAS	Waste Activated Sludge
WWTF	Wastewater Treatment Facility
wet lb/op. hr	Wet Pounds per Operating Hour

Executive Summary

CDM Smith Inc. (CDM Smith) developed this Conceptual Facility Plan to summarize recommended improvements to solids processing equipment at the Johnson County Wastewater (JCW) Douglas L. Smith Middle Basin (Middle Basin) Wastewater Treatment Facility (WWTF). This report was developed to expand upon the overall Facility Plan for Middle Basin completed in September 2023, referred to herein as the 2023 FP. According to the 2023 FP, influent flows and loads are not projected to increase; therefore, expanding the overall solids treatment train capacity is not a major focus for future improvements. However, there are significant renewal and replacement needs surrounding the solids treatment systems that makes this a high priority for JCW. For example, there is no spare capacity in the digesters to remove one tank from service for inspection of the covers and insulation, leading to an equipment life risk and process treatment risk. Additionally, the amount of FOG added to the digesters is limited based on available volume in the digesters. As a result, additional digester capacity is a high priority item.

Primary objectives for this project are to consider the rehabilitation and replacement (R&R) of aging infrastructure for the solids treatment train, determine where major changes are necessary (where R&R is not feasible or where modifications will be beneficial to extend the mechanical reliability and operational flexibility), and recommend sequencing for maintenance of plant operations (MOPO) for the construction duration. Class V construction cost estimates are provided for the recommended modifications. This is followed by a grouping of line items into projects based on their priority of need which will be evaluated by JCW based on available budget.

Major improvements to the solids processing train include a new digested sludge storage tank (DSST), an associated DSST support building, and a new dewatering building. Other solids processing modifications are primarily the R&R of existing processing equipment. Improvements in this report are categorized in nine process areas as follows:

- **Primary Sludge (PS) Fermenter and Thickening**
  - Replace ineffective vertical mixers with jet mixing systems using chopper pumps and nozzles.
  - Revise fermenter hydraulics to eliminate gravity bottlenecks and ensure better volatile fatty acids (VFA) recovery.
  - Install new pH instrumentation for optimized solids retention time (SRT) control.
  - Upgrade the gravity thickener mechanism, gravity thickener drive, sludge and scum collection system, cover replacement, brickwork, and replace the oversized digester feed pumps.
- **Anaerobic Digester Rehabilitation**
  - Convert Digester No. 2 to a primary digester by replacing the floating cover with a fixed cover and using existing equipment for mixing and heating.
  - Replace tank covers, mixing pumps, heat exchangers, and recirculation equipment on all existing primary digesters.

  - Modify the area classification per National Fire Protection Association (NFPA) 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities* (2024 Edition), by relocating boilers and motor control centers to an unclassified support building (Building No. 4.1). A new SCADA programmable logic controller (PLC) will also be provided.
  - Install new digester header to the waste gas burners, located downstream of the existing condensate removal system.
  - Replace waste gas burners in kind.

- **New DSST and Support Building (Building No. 4.1)**
  - Construct a 200,000-gallon (gal) prestressed American Water Works Association (AWWA) D110 Type 3 concrete tank with Hydroseal cover for biogas storage.
  - Install two mixing pumps and three digested sludge feed pumps to feed the centrifuges.
  - House relocated boilers, electrical panels, MCCs, PLC, and pump systems in the support building.
  - Address floodplain requirements via no-rise certification and site elevation design.
  - New FOG access road and truck staging area.
- **Solids Processing Building (Building No. 2) Modifications**
  - Demolish existing belt filter presses (BFPs) and outdated polymer and ferric chloride ($FeCl_3$) systems.
  - Upgrade the waste activated sludge thickening polymer system to a permanent emulsion-based skid.
  - Address structural damage and corrosion through partial building renovation.
- **New Dewatering Building (Building No. 10.1)**
  - House three (one duty/two standby) centrifuges with automated conveyance systems in the new dewatering building.
  - Include a truck bay, laboratory space, polymer systems, odor control, and electrical room in the building.
  - Size the setup for 16-hours-per-day, 7-days-per-week (16/7) operations to eliminate third-shift staffing.
- **Centrate Equalization (EQ)**
  - Construct a 30,000 gal below-grade tank to provide 8 hours of storage to regulate nutrient sidestreams from dewatering.
  - Facilitate potential future sidestream treatment (e.g., deammonification).
- **Fats, Oils, and Grease (FOG) Receiving (Building No. 15)**
  - Replace FOG tanks with dome-bottom fiberglass tanks to improve grit removal and prevent operational disruptions.
  - Replace FOG pumps, heat exchangers, and in-line grinders.
- **Biogas Utilization**
  - Replace oversized GE Jenbacher combined heat and power (CHP) units with two 600-kilowatt, dual-fuel CHP systems optimized for existing biogas flow.
  - Relocate CHP infrastructure eastward to make room for the new dewatering building.
- **Ferric Chloride System (Building No. 14)**

- Replace tanks and dosing pumps in Building No. 14 to reduce struvite precipitation in the digestion and dewatering processes.

Figure ES-1 shows the overall modifications to the site plan, and **Figure ES-2** shows the improvements integrated into the solids process flow diagram.

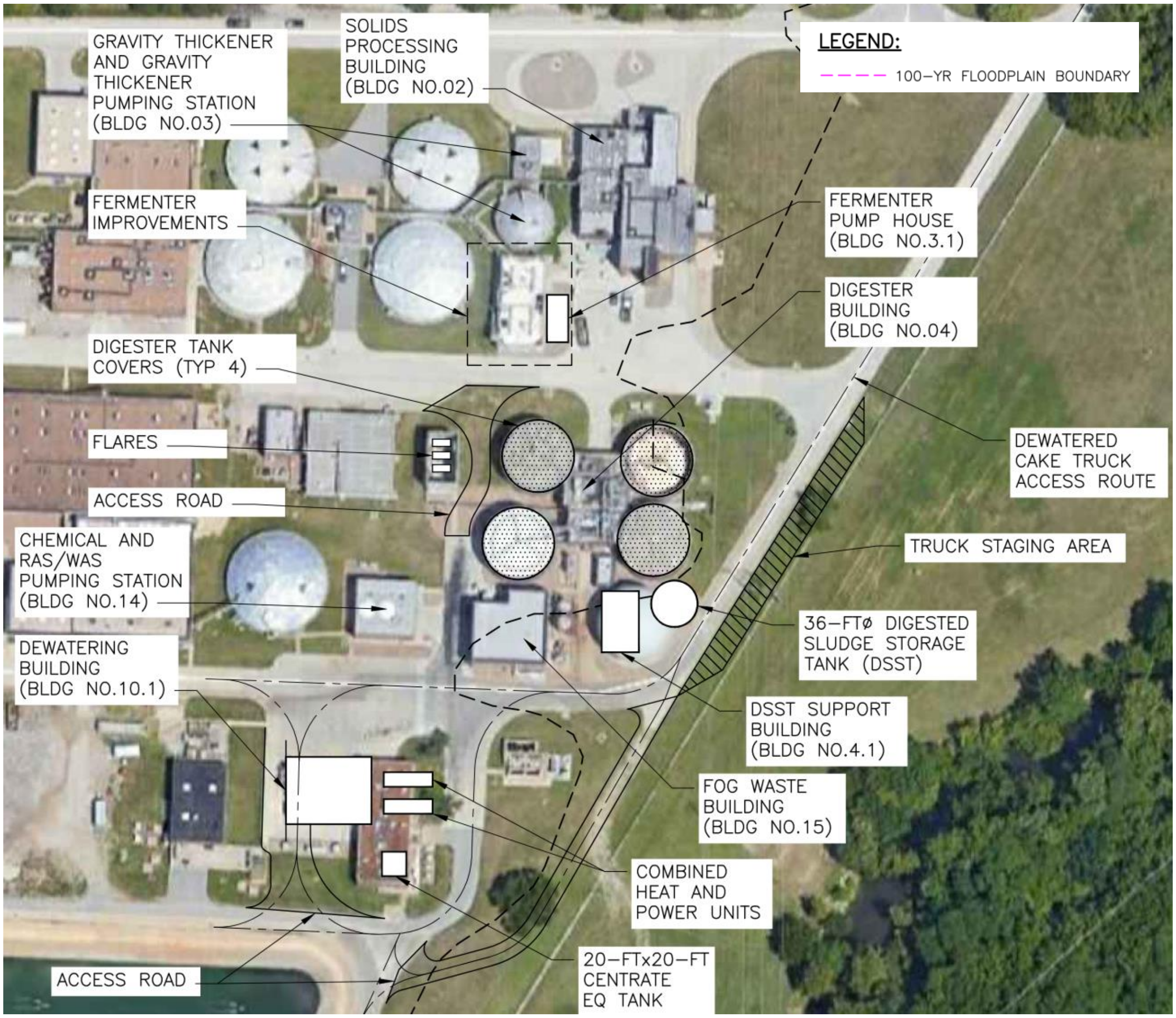


Figure ES-1 Proposed Site Plan

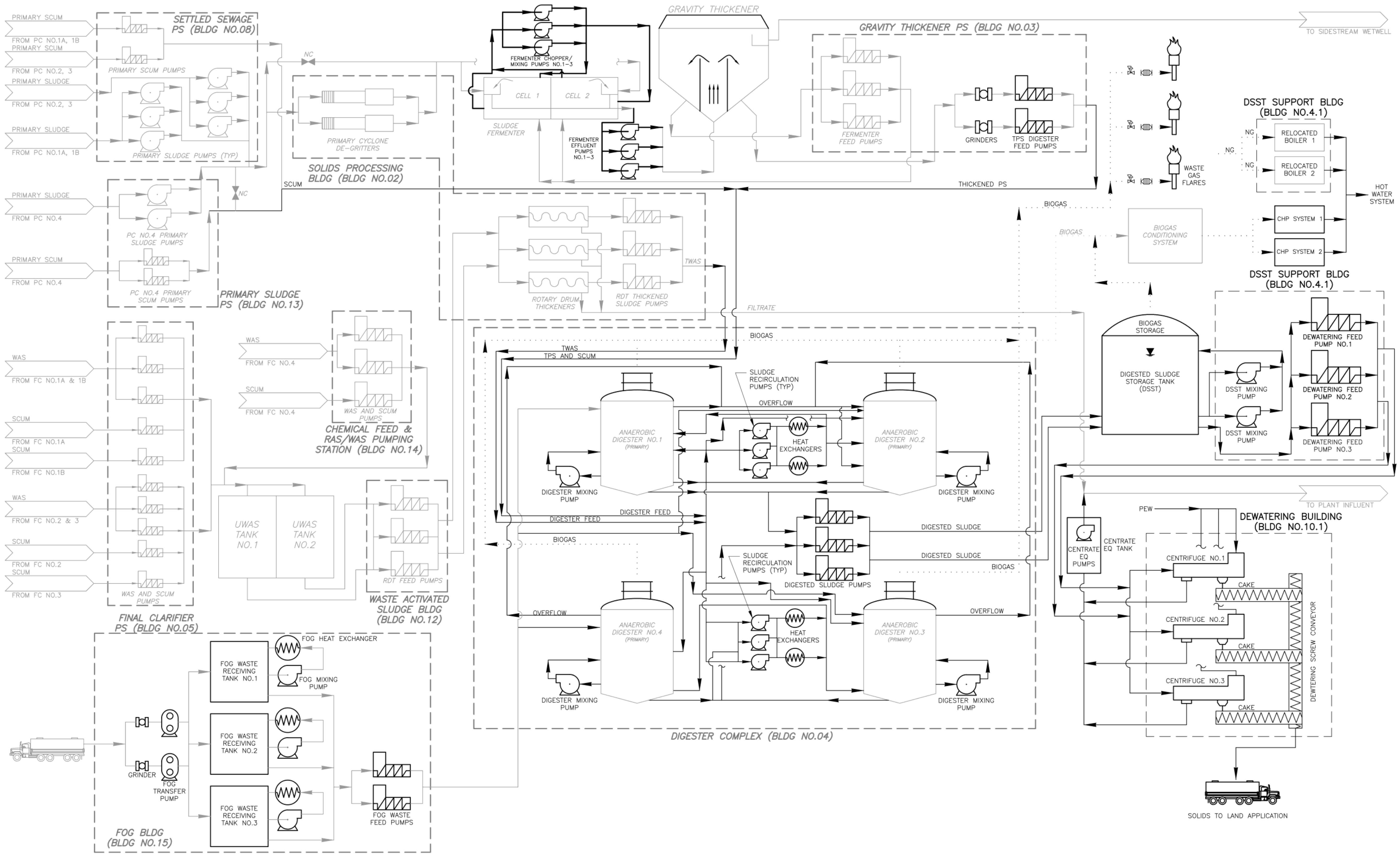


Figure ES-2 Proposed Process Flow Diagram

Related electrical improvements are included in some areas that have more complicated sequencing constraints or additional requirements for compliance with NFPA 820. These are further defined in **Section 2.0**. The total estimated opinion of probable construction cost (OPCC) is $120 million (2025 dollars) for all the work identified in this Facility Plan. During a scope prioritization exercise, CDM Smith, with the assistance of JCW, established a priority ranking for the process improvements. The costs for each project, including subtotaled costs, were organized by priority order and by a more general Low, Medium-Low, Medium, Medium-High, and High grouping to assist JCW in comparing costs to their available budget in the capital improvement program (CIP). Detailed line item costs and prioritization rankings are provided in **Table ES-1** and further detailed in **Sections 3.0 and 4.0**. The costs presented below represent the OPCC and do not include engineering or nonconstruction program administration fees. The priority groups were selected based on facility needs and construction sequencing, priority for digestion related activities first. This discussion is expanded in **Section 4.5**.

Table ES-1 Prioritization Rankings and Cost Breakdown of Improvements

Project Scope	Item Description	Priority Group	Rank[1]	2025 OPCC[2]	2025 Cumulative OPCC[2]	Priority Group OPCC[2]
Anaerobic Digester Rehab	Digester gas piping to flares	High	1	$891,000	$0.89M	$38.6M
New DSST and Support Bldg.	New road to FOG Building	High	2	$108,000	$1.0M	
New DSST and Support Bldg.	Demolition of gas membrane pad, DSST Tank and Support Building, associated piping and equipment, boiler relocation	High	3	$24,900,000	$25.9M	
New DSST and Support Bldg.	Converting Digester No. 2 to a primary digester and Digester No. 2 cover replacement and cleaning	High	4	$2,590,000	$28.5M	
Anaerobic Digester Rehab	All digester equipment – pumps and heat exchangers	High	5	$4,280,000	$32.8M	
Anaerobic Digester Rehab	Digester gas safety equipment	High	6	$629,000	$33.4M	
Anaerobic Digester Rehab	Digester No. 1 and 3 cover replacement and cleaning	High	7	$5,170,000	$38.6M	
Anaerobic Digester Rehab	Replace piping in Building No. 4	Medium-High	8	$7,780,000	$46.3M	$12.7M
Anaerobic Digester Rehab	Dedicated digester feed lines for TPS, Scum, and TWAS	Medium-High	9	$2,340,000	$48.7M	
Anaerobic Digester Rehab	Digester No. 4 cover replacement and cleaning	Medium-High	10	$2,590,000	$51.3M	
New DSST and Support Bldg.	Truck staging area for dewatered cake and fog hauling	Medium	11	$558,000	$51.8M	$39.9M
New Dewatering Building	Demolition of CHPs	Medium	12	$81,000	$51.9M	
New Dewatering Building	Demolition of Building 10 and temporary electrical power	Medium	13	$566,000	$52.5M	
New Dewatering Building	Dewatering building, including equipment, piping, and access roads. (Does not include centrate EQ tank and pump station)	Medium	14	$35,700,000	$88.2M	
Centrate EQ	Centrate EQ tank and pump station	Medium	15	$2,470,000	$90.7M	
Building No. 2 Modifications	Demolition of BFPs	Medium	16	$284,000	$90.9M	
Primary Sludge Handling	Digester feed pump replacement	Medium	17	$246,000	$91.2M	
Primary Sludge Handling	Fermenter improvements and gravity thickener rehab	Medium-Low	18	$8,600,000	$99.8M	$11.9M
Building No. 2 Modifications	Thickening polymer system	Medium-Low	19	$1,770,000	$101.6M	
Anaerobic Digester Rehab	Demolition and new waste gas burners	Medium-Low	20	$1,490,000	$103.0M	
FOG Receiving	FOG equipment replacement	Low	21	$4,870,000	$107.9M	$17.3M
Ferric Chloride System	Ferric tanks and pumps	Low	22	$966,000	$108.9M	
Biogas Utilization	New CHPs and associated piping	Low	23	$11,500,000	$120.4M	

Notes:

1. The rank presented is a combination of facility priorities and construction sequencing.
2. The costs presented represent the OPCC and do not include engineering or nonconstruction program administration fees.

Section 4.0 includes recommendations for implementation of solids processing improvements at Middle Basin, exploring three delivery alternatives. **Table ES-2** lists the duration and estimated cost for each option including the fee associated with the Construction Manager at Risk (CMAR) projects assuming all the scope items identified herein are part of the project. For each process area, MOPO constraints and a suggested sequence of construction are presented. Early work packages are evaluated to reduce the overall construction sequence for the larger improvement projects. Early work packages include work that does not require significant equipment procurement or commencing purchasing of long-lead-time items and can be considered for any alternative delivery option.

Table ES-2 Construction Delivery Alternatives

Option	Description	Total Project Duration	2025 OPCC
Alternative 1	One Design-Bid-Build (DBB) Project	6.4 years	$120 million
Alternative 2	One Construction Manager at Risk (CMAR) Project	5.8 years	$132 million
Alternative 3	CMAR (Digester) and DBB (Dewatering)	5.8 years	$125 million

A summary of recommendations is included in **Section 5.0.** Based on JCW's available budget and the prioritization of projects summarized in Table ES-1, four additional alternatives were developed. These options reflect different scope breaks and two distinct delivery methods. Only the High, Medium-High, and Medium Projects listed in Table ES-1 are anticipated to be included in the upcoming Solids Treatment Improvements Project:

- Alternative A1 – DBB of High and Medium-High Projects
- Alternative A2 – CMAR of High and Medium-High Projects
- Alternative B1 – DBB of High, Medium-High, and Medium Projects
- Alternative B2 – CMAR of High, Medium-High, and Medium Projects

These options reflect two different scope breaks and two different distinct delivery methods. The four project alternatives are summarized in **Table ES-3** below. The project scope is determined by the priorities outlined in **Table ES-1**, with the highest priority related to expanding digestion capacity, and JCW's available budget. The 2025 OPCC for these options ranges from $51.3M (Alternative A1) to $100M (Alternative B2). If only the High and Medium High projects are pursued, both DBB and CMAR delivery methods are feasible (Alternatives A1 and A2). However, if the Medium projects are added, selecting a CMAR (Alternative B2) is recommended due to limited contractor interest in DBB at the $90-100M range. Prequalifying bidders is preferred if Purchasing agrees; otherwise, CMAR is recommended for both scopes described below. Conceptual design drawings are included in **Appendix A** and preliminary project schedules are included in **Appendix B**.

Table ES-3 Recommended Project Summary and Construction Delivery Method

<table>
<tr><th></th><th>DBB of High & Medium High Projects</th><th>CMAR of High & Medium-High Projects</th><th>DBB of High, Medium-High, and Medium Projects</th><th>CMAR of High, Medium-High, and Medium Projects</th></tr>
<tr><td>Alternative</td><td>A1</td><td>A2</td><td>B1</td><td>B2</td></tr>
<tr><td>2025 OPCC</td><td>$51.3M</td><td>$56.4M</td><td>$91.2M</td><td>$100M</td></tr>
<tr><td>Scope</td><td colspan="2">▪ Replace digester gas piping to flares + construct new FOG road
▪ DSST Tank and Support Building
▪ Conversion of Digester 2 to a primary digester
▪ Replacement of digester equipment
▪ Digester cover + cleaning (No. 1-4)
▪ Replace digester piping and digester feed lines</td><td colspan="2">Same as Alternative A plus:
▪ Truck staging area
▪ Dewatering Building (Building No. 10.1)
▪ Centrate EQ
▪ Demolish BFPs
▪ Replace TPS Digester Feed Pumps</td></tr>
<tr><td>Advantages</td><td>▪ Specification based
▪ Fewer indirect costs
▪ Low price selection
▪ High level of interest from potential GCs
▪ No preconstruction services cost
▪ Less administrative time by JCW
▪ Construction cost risk is equivalent but managed differently
▪ More interest from potential contractors compared to Alternative B1 Project[1]</td><td>▪ Contractors involved in MOPO during development stages, allowing for costs to be captured and sequencing to be prioritized during early phases
▪ GC can help manage risk and provide VE input
▪ GC review of design during development
▪ Accelerated schedule compared to DBB
▪ Construction cost risk is equivalent but managed differently
▪ Can leverage early procurement packages to reduce escalation
▪ Open books on project costs
▪ Lower cost compared to Alternative B2 Project[2]</td><td>Same as Alternative A1 plus:
▪ More scope</td><td>Same as Alternative A2 plus:
▪ More scope
▪ More interest from potential contractors compared to Alternative A2 Project</td></tr>
<tr><td>Disadvantages</td><td>▪ Complicated bid form with many alternates
▪ Constructive cost tracked by Engineer and not GC
▪ Limited GC VE ideas during design
▪ Equipment selected by lowest cost
▪ Closed books on project financials
▪ Early procurement required to accelerate schedule</td><td>▪ Multiple procurement packages could require more Owner input
▪ Potential for multiple GMPs
▪ Extended design time due to Contractor ROM estimates
▪ CMAR fee and preconstruction fee adds cost
▪ Reduced level of interest for some subcontractors to work on CMARs compared to DBB
▪ More cost compared to DBB
▪ Less interest from potential contractors compared to Alternative B2 Project[2]</td><td>Same as Alternative A1 plus:
▪ Less interest from potential contractors to Alternative A1 Project</td><td>Same as Alternative A2 plus:
▪ Highest Cost</td></tr>
</table>

Notes:

[1] Only applies to Alternative A1

[2] Only applies to Alternative A2

1.0 Introduction

Johnson County Wastewater (JCW) owns and operates the Douglas L. Smith Middle Basin Wastewater Treatment Facility (Middle Basin) located at 10001 College Boulevard in Overland Park, Kansas. CDM Smith Inc. (CDM Smith) developed a Facility Plan for Middle Basin and issued the final report in September 2023. The plan is referred to herein as the 2023 FP. The 2023 FP identified entire plant improvements needed to maintain reliable and efficient operations at Middle Basin and to meet future effluent quality requirements.

Expanding on the 2023 FP, CDM Smith was contracted by JCW to perform a conceptual design study of solids handling improvements for Middle Basin. According to the 2023 FP, influent flows and loads are not projected to increase; therefore, expanding the overall solids treatment train capacity is not a major focus for future improvements However, there are significant renewal and replacement needs surrounding the solids treatment systems that makes this a high priority for JCW. A draft Solids Improvements Concept Development Technical Memorandum (TM) (referred to as TM 1) was issued in March 2025. TM 1 summarizes the recommended major solids improvements necessary to replace aging infrastructure and optimize treatment.

Following TM 1, a draft Implementation Plan TM (referred to as TM 2) was provided in June 2025. TM 2 is a supplement to TM 1 and compares multiple construction delivery approaches and summarizes construction sequencing and maintenance of plant operations (MOPO) design requirements to address the improvements outlined in TM 1.

The recommended improvements outlined in TMs 1 and 2 are grouped into the following categories:

- Primary Sludge (PS) Fermentation and Thickening
- Anaerobic Digestion Rehabilitation
- Digested Sludge Storage Tank (DSST) and New DSST Support Building (Building No. 4.1)
- Solids Building (Building No. 2) Modifications
- New Dewatering Building (Building No. 10.1)
- Centrate Equalization (EQ)
- Fats, Oils, and Grease (FOG) Receiving
- Biogas Utilization
- Ferric Chloride ($FeCl_3$) Chemical System

This report summarizes the recommendations and implementation plan for the proposed improvements outlined in TMs 1 and 2. A final copy of this report will be provided to the Kansas Department of Health and Environment (KDHE).

1.1 Background

Middle Basin was built in the early 1980s and is rated for 14.5 million gallons per day average day flow (ADF). Middle Basin is a biological nutrient removal (BNR) facility with primary treatment, anaerobic digestion, and a FOG waste receiving station. Over the past 40 years, the plant has been modified more than 30 times. Upgrades have ranged from minor mechanical system upgrades to conversion to a BNR treatment process. The main solids streams processed at Middle Basin are PS, waste activated sludge (WAS), and hauled FOG waste.

Middle Basin was originally constructed under Contract 1, which included the Gravity Thickener, Digester No. 1 and Digester No. 2, and the Solids Processing Building (for dewatering equipment). Major upgrades to the solids handling facilities at Middle Basin include:

- Additional solids handling equipment (WAS thickening centrifuges and additional belt filter press) and anaerobic digestion capacity (Digester No. 3) under Contract 3 in 1984.
- Additional anaerobic digester capacity (Digester No. 4) and installation of the FOG receiving system under Contract 19 in 2011.
- Dewatering improvements under Contract 23 in 2014.
- FOG mixing improvements and programmable logic controller (PLC) upgrades under Contract 33 in 2023.
- Replacing the thickening centrifuges with rotary drum thickeners (RDTs) under Contract 34 in 2023.

Figure 1-1 shows the overall proposed modifications to the site plan, and **Figure 1-2** shows the proposed improvements integrated into the solids process flow diagram.

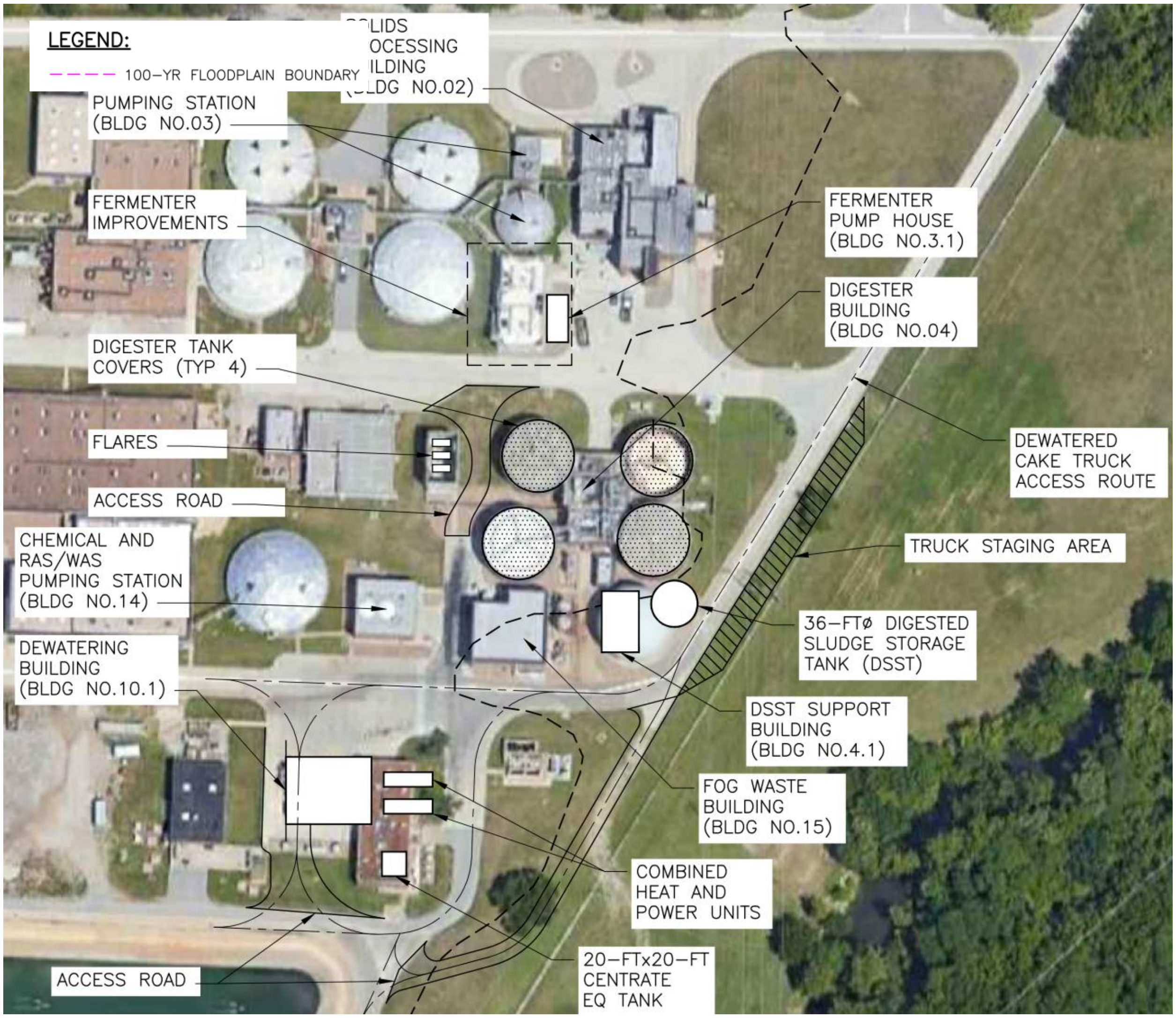


Figure 1-1 Proposed Site Plan

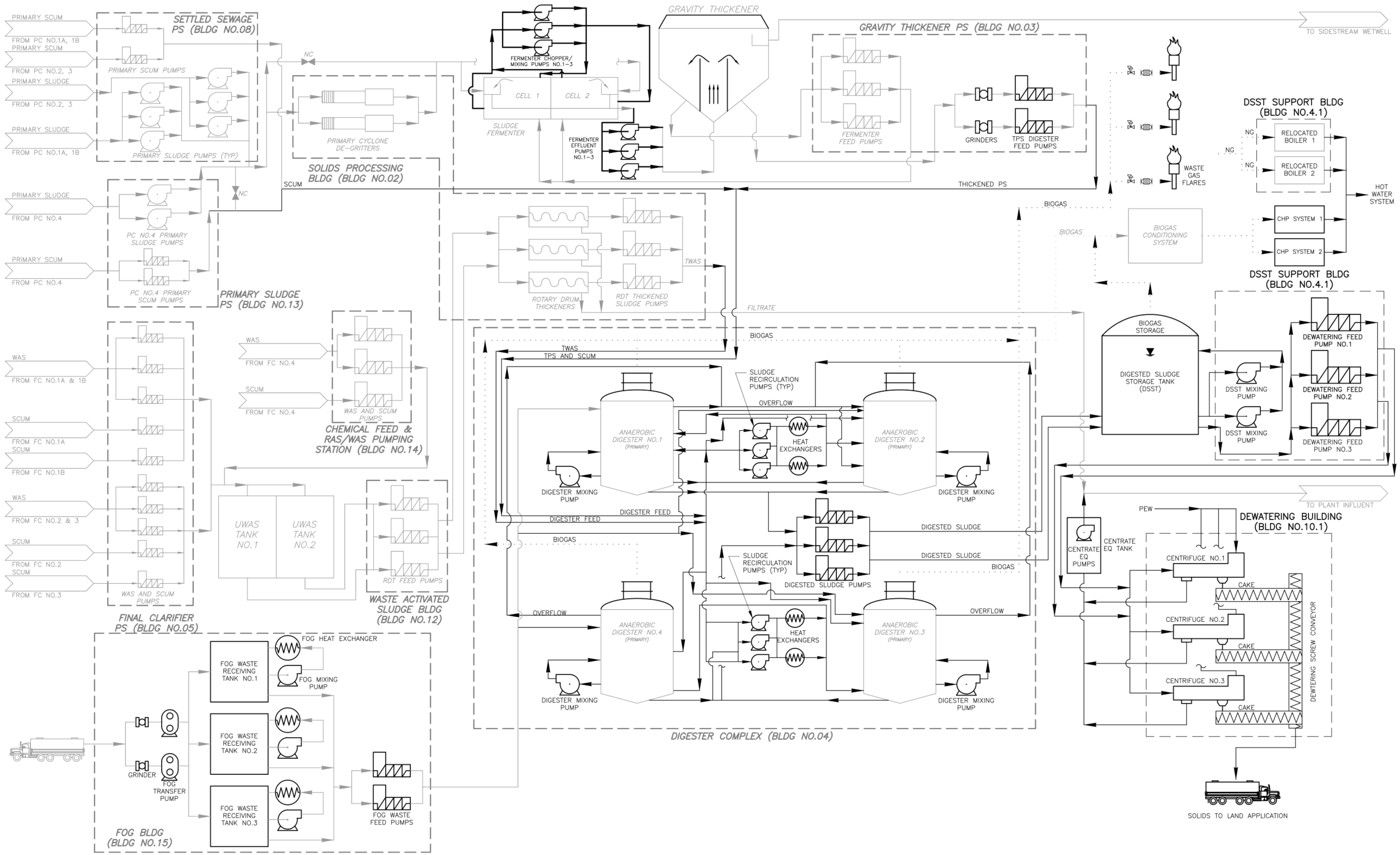


Figure 1-2 Proposed Process Flow Diagram

The liquid treatment process at Middle Basin includes four modified Johannesburg BNR trains. BNR Train 1 has two dedicated primary and final clarifiers. BNR Trains 2, 3, and 4 each have one dedicated primary and secondary clarifier. Currently, WAS from BNR Trains 1 and 4 is thickened by RDTs.

Since January 2023, BNR Train 2 has used selective sludge wasting from an inDENSE™ hydrocyclone system, and in March of 2024, a second inDENSE™ skid was added to allow for selective sludge wasting from BNR Train 3. The overflow from the inDENSE™ hydrocyclones is wasted from the system and the underflow is returned to the BNR process. WAS from BNR Trains 2 and 3 (e.g., the overflow from the inDENSE™ system) is sent to the plant drain, which is returned to the head of the plant. As such, WAS from BNR Trains 2 and 3 is distributed to all the primary clarifiers and cothickened with PS.

PS is sent to degritting, followed by fermentation and gravity thickening. A portion of the thickened primary sludge (TPS) is pumped to the sludge fermenter to increase the fermenter's solids retention time (SRT). Supernatant from the gravity thickener is sent to the sidestream wet well.

TPS, scum, and thickened waste activated sludge (TWAS) are anaerobically codigested with outside FOG. Digested sludge is dewatered by belt filter presses (BFPs) and the dewatered Class B biosolids are land applied. BFP filtrate is returned to the sidestream wet well. **Drawings G-2 to G-6** include process flow diagrams for the solids treatment processes. **Figure 1-3** is a simplified block flow diagram of the current solids treatment processes at Middle Basin.

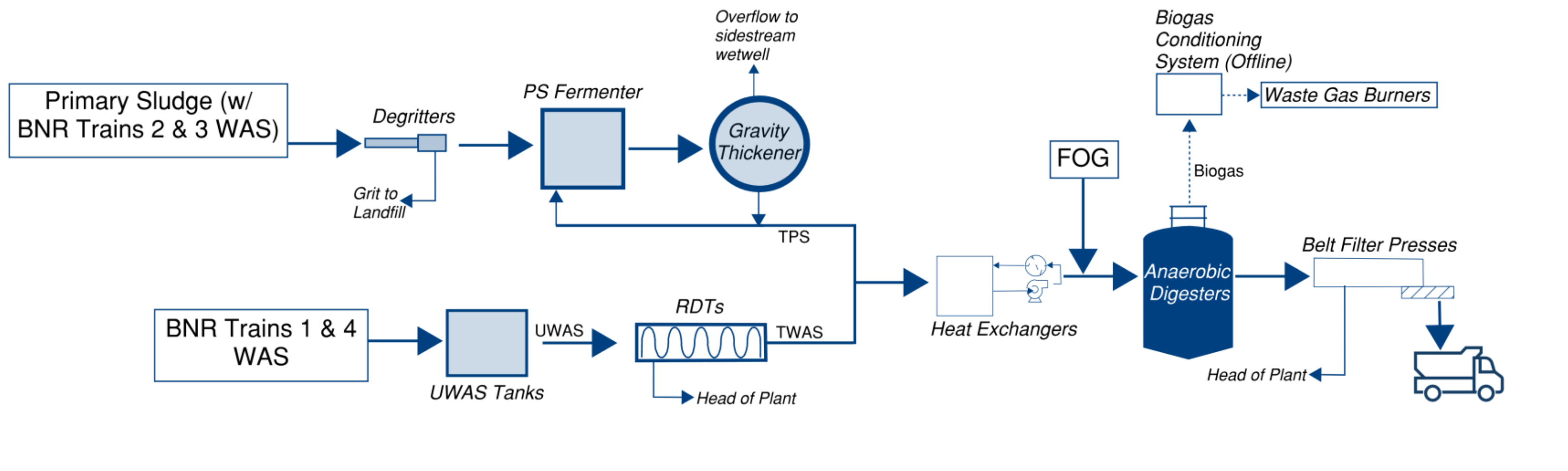


Figure 1-3 Middle Basin Solids Stream Existing Block Flow Diagram

1.2 Summary of Previous Facility Plan

The 2023 FP recommended three major solids improvement projects to replace aging infrastructure and optimize treatment. Those projects are summarized below.

- **Project No. 9 Anaerobic Digestion Improvements**: The 2023 FP identified anaerobic digestion improvements that would increase digestion and process capacity and provide redundancy. Those improvements include:
  - Rehabilitating the primary digesters and converting the secondary digester to a primary digester. Digester rehabilitation will include new covers and replacement of all mechanical equipment in Building No. 4.
  - Constructing a new DSST with a gas membrane cover and a support building for the mixing pumps, dewatering feed pumps, and biogas storage cover blower.
  - Constructing a new TPS, TWAS, and scum force mains.
  - Evaluating and improving separation of the classified and unclassified spaces in Building No. 4 in compliance with National Fire Protection Association (NFPA) 820, *Standard for Fire Protection in Wastewater Treatment and Collection Facilities* (2024 edition).
- **Project No**. **16 New Solids Processing Building**: The existing solids processing equipment in Building No. 2, including the PS degritters and BFPs, is in poor condition. Building No. 2 has visible structural cracking, exposed rebar, and unsound concrete. The equipment and heating, ventilation, and air-conditioning (HVAC) system show signs of pervasive corrosion due to the off-gassing of chlorine used for disinfecting the plant effluent water (PEW) that feeds the BFPs. Project No. 16 recommends a new Solids Processing Building be constructed to improve the reliability of the solids processing system, including the ferric chloride and polymer storage and feed systems. The 2023 FP recommended reducing the third-shift operations labor by sizing the dewatering equipment for 16-hours-per-day, 7-days-per-week (16/7). The necessary improvements identified in this project include:
  - Constructing a new solids processing building to house three new dewatering centrifuges (one duty, two standby) to replace the BFPs. The new solids processing building will also include conveyors to a truck bay, a new electrical room, and a new ferric chloride and polymer storage and feed system.
  - Replacing the three existing digested sludge feed pumps with larger pumps to accommodate the centrifuge configuration.
- **Project No**. **23 Cogeneration System:** Middle Basin has an existing CHP system that consists of two 1,000-kilowatt (kW) generators with heat recovery. There is space for a third unit. The CHP system can operate on biogas produced by the anaerobic digesters or on natural gas; however, the engines are oversized for the current biogas flow. The equipment is also approaching the end of its useful life. Project No. 23 calls for demolishing the existing CHP system and installing two smaller-sized (600 kW) CHP systems better suited for biogas flows.

The 2023 FP also identified several other solids-related projects including fermenter improvements in **Project No. 19 Fermenter Improvements and Supplemental Carbon**. The existing PS fermenter has poor performance because of unreliable mixing from ragging and scum buildup on the surface. No instrumentation currently monitors the operating conditions. The gravity thickener inlet is prone to clogging with rags and solids, which results in a hydraulic bottleneck that does not allow passive gravity flow. Project No. 19 recommended a new jet mixing system in lieu of the top-entry mixers. The jet mixing system would include inline chopper pumps, and grinders and pumps to convey fermentate to the gravity thickener. Level, oxidation-reduction potential, pH, and turbidity sensors are recommended to monitor fermenter performance.

Project No. 24 Gravity Thickener Sludge Thickening Equipment and Primary Clarifiers 1A, 1B, 2, and 3 Sludge and Scum Equipment R&R identified that the sludge collection equipment for the gravity thickener and primary clarifiers will need near-complete replacement. The primary clarifier scum piping clogs frequently with grease, which requires weekly jetting.

The FOG receiving system was originally installed under Contract 19 in 2011 and was recently upgraded under Contract 33 in 2023. This system allows the plant to receive FOG from local industries, which is fed to the anaerobic digesters to increase biogas production.

Overall, the major recommended improvements offered in the 2023 FP for each project discussed in this section remained consistent for this evaluation. Some scope items have been added, including waste gas burners, new digester gas piping, and new piping in the digester building, and replacing all FOG equipment in kind. The location of the new dewatering building (Building No. 10.1) was also moved outside the 100-year floodplain. The PS fermenter jet mixing pumps and fermenter sludge pumps are housed in one building (Building No. 3.1) in lieu of two separate pump houses. Other changes to minor scope items are described in their respective sections.

1.3 Report Content

The contents of this report include:

- Section 2.0 – Summary of Proposed Improvements
- Section 3.0 – Opinion of Probable Construction Cost
- Section 4.0 – Implementation Plan and Schedule
- Section 5.0 – Summary of Recommendations

Proposed improvements and design criteria are presented in each section.

Appendix A contains conceptual design drawings for improvements to the existing solids processing building, the anaerobic digesters, the new digested sludge storage tank (DSST) and associated support building, the new dewatering building, the new fermenter mixing pump house, and the EQ basin. **Appendix B** contains proposed schedules for implementing the new facilities.

2.0 Summary of Proposed Improvements

This section summarizes recommended solids improvements, as identified by the 2023 FP and detailed in TM 1. The proposed improvements are encompassed in nine unit processes:

- PS Fermenter and Thickening
- Anaerobic Digester Rehabilitation
- New DSST and Support Building (Building No. 4.1)
- Building No. 2 Modifications
- New Dewatering Building (Building No. 10.1)
- Centrate EQ
- FOG Receiving
- Biogas Utilization
- Ferric Chloride System

Details of the proposed improvements for each unit process are provided in this section, including process modifications, design criteria, and yard piping considerations. For some processes, area classification and electrical improvements are also discussed.

2.1 Primary Sludge Fermenter and Thickening

The PS fermentation and thickening system includes the fermenter (two cells), PS gravity thickener, fermenter feed pumps, and TPS digester feed pumps. The fermenter generates volatile fatty acids (VFAs) to supplement the BNR process for improved nitrogen and phosphorus removal. Ragging and scum/foam accumulation in the fermenter cells creates hydraulic issues and operational problems for JCW staff. Options for improved mixing, hydraulics, and monitoring are identified and described below.

2.1.1 Overview

PS is fermented using a two-stage mixed fermenter/thickener installed in 2006. The fermenter is designed to ferment PS particulates and organics, to produce VFAs which are fed to the BNR process to improve enhanced biological phosphorus removal. The fermenter has historically yielded 0.05 to 0.1 grams of VFAs per gram of volatile suspended solids.

Thin PS (0.5 percent [%] TS) is pumped to the fermenter mixing/vortex zone. Gravity-thickened fermented sludge is returned from the bottom of the gravity thickener and mixes with PS at the mixing/vortex zone. The fermented sludge in the fermenter mixing cells flow over an effluent weir where it discharges to the gravity thickener (GT) via gravity.

The PS stream and the fermented and thickened sludge are combined at the fermented sludge mixing vortex zones to provide elutriation, which releases the VFAs from the trapped interstitial water inside the pores and crevices of the fermented sludge. The fermenter was designed for an SRT of 3 to 5 days. The GT overflow, which includes the VFA-rich fermentate, is pumped back to the head of the BNR basins where it can be directed to any of the BNR trains. **Figure 2-1** shows the current PS fermenter configuration.

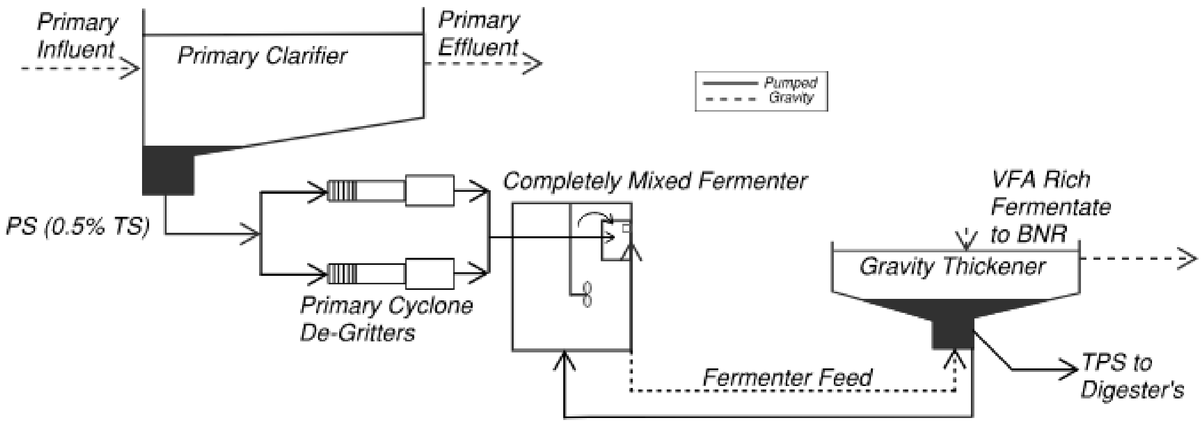


Figure 2-1 Current Middle Basin PS Fermenter Configuration (Mixed Fermenter/Thickener, One Fermenter Cell Shown)

No instrumentation inside the existing fermenters monitors their operating conditions. The fermenter headspace is ventilated, and off-gas is monitored for hydrogen sulfide (H_2S). A portion of the TPS is wasted to the anaerobic digesters.

Table 2-1 provides the design parameters for the PS fermenter. JCW typically operates one cell (half) of the fermenter. The GT historically performs 70% solids removal, thus lowering the overall SRT of the fermenter system as solids are wasted in the GT overflow. However, fermentation is likely occurring in the GT sludge bed, providing additional fermentation.

Table 2-1 PS Fermenter Design Criteria

Parameter	Units	Value
Shape	-	Rectangular
Cell Quantity	-	2
Side Water Depth	ft	23.5
Volume, Total	gal	420,000
Mixing	-	Top-Entry, Vertical-Shaft Mechanical Mixers
Mixer Quantity	-	2, 1 per Tank
Mixer Power	hp	15
Methane Control	-	Single-Drop, Coarse-Bubble Aeration
Design SRT	day	3–5
Current Operating SRT, One Cell	day	1–1.5

Notes: ft – feet; hp – horsepower

The proposed improvements for the fermenter system are shown in **Figure 2-2.** The improvements encompass mixing, hydraulics, and controls, which are discussed in the subsections that follow.

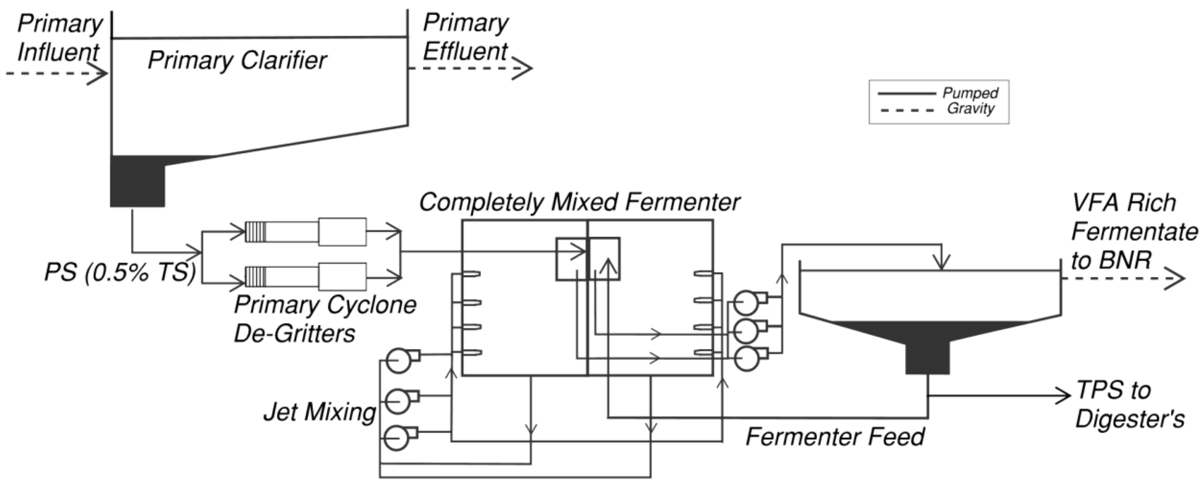


Figure 2-2 Proposed Modifications to the PS Fermenter and Thickening System

2.1.2 Fermenter Mixing

JCW has experienced issues with ragging impeding mixing in the PS fermenter. The current fermenter is designed to mix fermentate using slow-speed, top-entry mixers. Intermittent mixing can be performed to allow additional fermentation in the thicker sludge blanket at the bottom of the tank. Because of maintenance issues with the mixers, the fermentate is not currently being mixed.

It is recommended to replace the existing top-entry mixers with a jet mixing system that includes two inline chopper pumps (one dedicated per cell) with a common swing pump. Large-opening, jet mixing nozzle assemblies can provide a relatively clog-free outlet with gentle and continuous mixing flow. Large debris in the PS (e.g., rags) will be chopped up by the cutting impellers in the chopper pumps to prevent clogging the jet mixing nozzles. It is also recommended to include nozzles placed at varying elevations along the height of the fermenter wall to break up scum and foam accumulation.

Table 2-2 provides the recommendations for the design criteria of the jet mixing system. CDM Smith recommends further refining the PS handling systems design criteria based on future changes with the PS pumps and the resulting impact to overall PS pumping volumes. A prefabricated Fermenter Pump House (Building No. 3.1) will be located at the east side if the fermenter structure will house the fermenter effluent pumps and the jet mixing pumps, as shown in **Drawings 03.1-M-1, 2, and 3**.

Table 2-2 Fermenter Jet Mixing Design Parameters

Parameter	Units	Value
Quantity	-	2 Duty, 1 Swing
Type	-	Horizontal Chopper
Tank Turnover	minutes	120
Flow	gpm	1,700
TDH	ft	40
Motor	hp	40
Nozzle Assemblies	-	Glass-Lined 304 Stainless Steel

Notes: gpm – gallons per minute; TDH – total dynamic head

2.1.3 Fermenter Hydraulics

The passive gravity flow between the fermenter and the GT is a hydraulic bottleneck, particularly when a thick layer of scum, foam, and rags clog the outlet weir into the fermenter mixing zone. It is recommended to lower the weir into the mixing zone and pump out of the fermenter (from the mixing zone) to the GT. This ensures the flow that is pumped to the GT feed well includes elutriated VFAs from the fermenter effluent. This elutriation is performed by thin PS that collides and mixes intensely with the fermented sludge that flows into the mixing vortex zone. Lowering the weir will reduce the risk of scum buildup at the top of the tank, which has historically restricted flow.

For this reason, it is recommended to tie the suction of the fermenter sludge pump into the existing 8-inch VFA-to-thickener feed pipe that discharges to the GT. This ensures that flow is pumped out of the mixing (elutriation) zone has been elutriated prior to gravity thickening. The transfer pumps will be contained in Building No. 3.1 next to the jet mixing pumps. **Table 2-3** lists the design criteria for the fermenter transfer pumps and **Figure 2-3** is a section view of the fermenter mixing/elutriation zone modifications.

Table 2-3 Fermenter Sludge Pumps

Parameter	Units	Value
Quantity	-	2 Duty, 1 Swing
Type	-	Screw Impeller
Flow	gpm	600
TDH	ft	30
Estimated Motor Power	hp	25

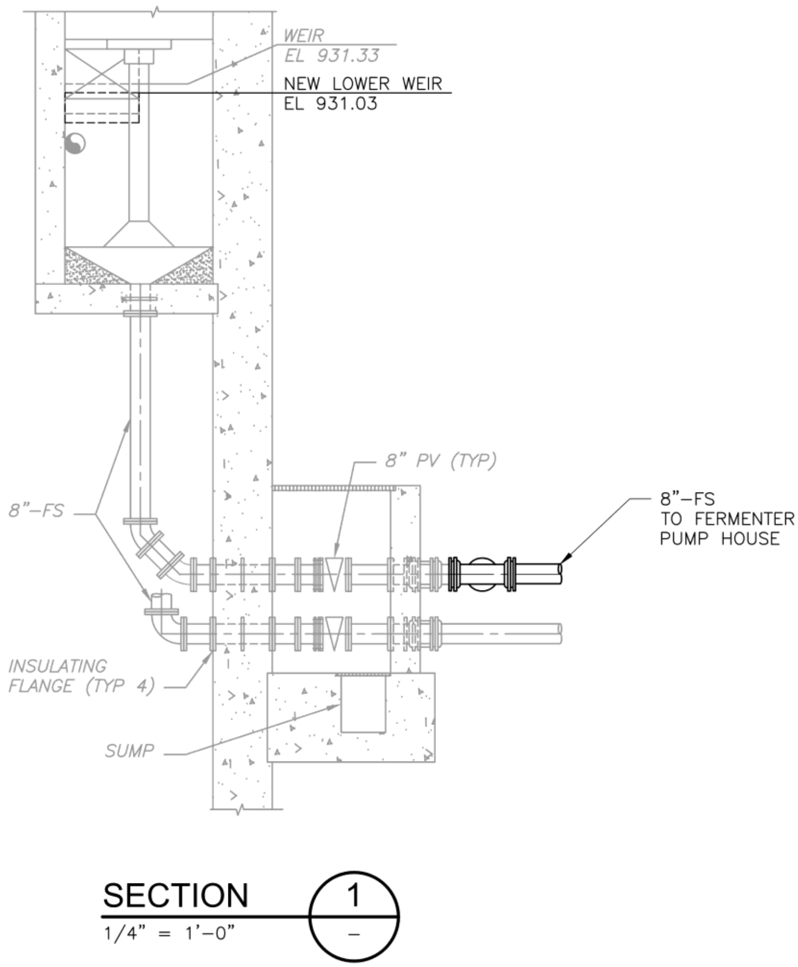


Figure 2-3 Section View of Fermenter Mixing/Elutriation Zone

2.1.4 Fermenter Solids Retention Time Control

It is recommended that pH sensors be installed at the overflow weir of each fermenter to monitor the fermentation process. pH control can provide simple operational insight on the fermentation process and determine whether the fermenter feed pumps need to be turned up or down to control the SRT. A pH of 5 to 6 should be maintained, which indicates acidogenesis/acetogenesis is occurring. This low-pH range (below 6) also inhibits methanogenesis, which should be avoided to minimize the growth of methane-formers, which will consume the VFAs generated. However, if the pH is lower than 5, this signifies the fermenter SRT is too long and methane production may increase. When the pH is greater than 6, fermentation is likely minimal because of the SRT being too short (generally considered to be less than 2 to 3 days in summer months or less than 4 days in winter months).

2.1.5 Gravity Thickener

The existing GT center column feed well, drive mechanism, rake arms, weirs, and skimmers were last replaced with stainless steel equipment in 2003. It is recommended to replace all internal components with new equipment.

The TPS digester feed pumps, which pump TPS from the GT to the digesters, are located in Building No. 3. They are currently oversized and cannot turn down to the required flow rate to maintain a high enough SRT for the PS fermentation system. For that reason, it is recommended to replace the TPS digester feed pumps. **Table 2-4** lists the TPS digester feed pump design criteria. The flow rate of the TPS digester feed pumps was determined by preliminary modeling that targeted an overall system SRT of 3 days for the PS fermentation process.

Table 2-4 TPS Digester Feed Pumps

Parameter	Units	Value
Quantity	-	2 (1 Duty, 1 Standby)
Type	-	Progressive Cavity
Flow	gpm	30
TDH	ft	60
Estimated Motor Power	hp	10

2.1.6 Yard Piping

The following yard piping will be routed to and from Building No. 3.1:

- Two 10-inch fermented sludge mixing pipes (jet mix suction) from each fermenter cell to the Fermenter Pump House
- Two 10-inch fermented sludge mixing pipes (jet mix discharge) from the Fermenter Pump House to each fermenter cell
- Two 8-inch fermented sludge transfer pipes (one from each fermenter cell) to the Fermenter Pump House
- One 6-inch fermented sludge transfer pipe to the GT from the Fermenter Pump House

2.2 Anaerobic Digestion Rehabilitation

This section describes the existing anaerobic digesters and the necessary improvements to increase primary digester capacity and to meet area classification requirements. Improvements to the Digester Building (Building No. 4) and yard piping are discussed.

2.2.1 Overview

The digester complex consists of Anaerobic Digesters No. 1, 2, 3, and 4 and the Digester Building (Building No. 4). Digesters No. 1, 3, and 4 are primary digesters and Digester No. 2 is an unheated secondary digester (although it can be heated). Each digester is 55 ft in diameter and has a 30 ft sidewall height. Middle Basin's digesters currently operate at an average SRT of 26 days, and an SRT of 15 days at maximum month conditions. With one digester offline, the SRT drops to 17 days and 10 days for average flow and maximum month conditions, respectively.

Each digester is mixed with dedicated WEMCO Model CF3 jet mixing pumps rated at 1,400 gpm and 40 ft of total head using 50 hp motors. There are no redundant mixing pumps. The digesters at full load have a tank turnover time of 380 minutes. The mixing system has a power input of 0.09 hp per 1,000 gal and a velocity gradient of 12.8 per second with direct flow, which meets the Manual of Practice (MOP) 8 recommendation for mixing. Digester sludge is recirculated through heat exchangers using 350 gpm WEMCO model D4K pumps. There are six recirculation pumps and four sludge tube-in-tube heat exchangers.

When a digester is offline for maintenance, JCW stops FOG feed to the digesters to minimize the risk of overloading the remaining digesters based on SRT and VS loading. The lack of redundancy creates maintenance challenges and reduces operational flexibility. Because of this, it is recommended to convert Digester No. 2 to a primary digester and construct a DSST in the location of the gas storage tank. The DSST is discussed in **Section 2.3**.

The existing heat exchangers for Digester No. 2 are adequate to use for process heating and are recommended for replacement as part of the R&R scope. The existing Digester No. 2 floating steel cover is recommended to be replaced with a new fixed steel cover. Digester feedstock is fed into the existing three primary digesters, but it is recommended to equally feed the four primary digesters after converting Digester No. 2 to a primary digester. Modifications to the digester feed valves for the combined sludges (PS and TWAS) and the separate FOG feed would be required. Additionally, modifications will be made to the existing digester overflow piping so that overflow from the four primary digesters is pumped to the new DSST. Three digested sludge pumps will be provided within Building No. 4.

Ferric chloride is added to the anaerobic digesters in an upstream digester feed line and is dosed at approximately 0.85 gal of ferric chloride per 1,000 gal of sludge.

2.2.2 Digester Rehabilitation

It is recommended that the tank covers and mechanical equipment be replaced because of aging infrastructure and to maintain process stability. The digester improvement project is recommended to be a comprehensive project and include new fixed steel digester covers, replacement of all pumps (including mixing, recirculation and digested sludge transfer pumps), replacement of heat exchangers, hot water system, digester cleaning, structural repairs to the tanks, replacement of the tank insulation, coating of tanks, and miscellaneous architectural repairs. In addition, CDM Smith and JCW agreed that piping and valves should be replaced. It is also recommended that the sludge and scum lines feed the digesters directly or downstream of the heat exchangers to reduce the risk of vivianite formation.

Drawings 04-DM-1, 04-DM-2, 04-DM-3, 04-M-1, 04-M-2, and 04-M-3 provide more details of the improvements. **Table 2-5** lists the design criteria for the equipment being replaced. All equipment except the digested sludge transfer pumps would be replaced in kind. It is recommended that the layout be reviewed during final design for consideration of installed redundancy. Vertical mounted pumps could be considered to reduce equipment footprint to allow space for redundant units. The digested sludge transfer pumps will now pump from the digesters to the new DSST (**Section 2.3**); it is expected the new digested sludge transfer pumps will be similar in size to the existing pumps. The MOPO for the digester rehabilitation is discussed in **Section 4.1**.

Table 2-5 Digester Rehabilitation Equipment Design Criteria

Criteria	Value
Fixed Steel Covers	
Quantity[1]	4
Type	Fixed Steel Covers
Tank Diameter, ft	55
Tank Volume, gal	530,000
Digester Mixing Pumps	
Quantity	4 (1 per Digester)
Type	Horizontal Chopper
Flow, gpm	1,400
TDH, ft	40
Motor Power, hp	50
Digester Recirculation Pumps	
Quantity	6 (4 Duty/2 Spare)
Type	Recessed Impeller
Flow, gpm	350
TDH, ft	15
Motor Power, hp	3
Heat Exchangers	
Quantity	4 (1 per Digester)
Type	Tube-in-Tube
Heating Value	750,000 Btu/hr ea
Digested Sludge Transfer Pumps	
Quantity	3 (1 Duty/2 Spare)
Type	Progressive Cavity
Flow, gpm	60
Discharge Pressure, psi	60
Estimated Motor Power, hp	20

Notes: psi – pounds per square inch

[1] Depending on available funds, cover replacement on Digester No. 4 could be delayed to a future project as this digester was installed more recently (Contract No. 19 from 2011).

2.2.3 Digester Building

With the additional digestion capacity and required processing equipment, additional indoor space will be needed to safely operate and maintain the digestion process. A new DSST support building (Building No. 4.1) is recommended and will be located southeast of Building No. 4. This building is further discussed in **Section 2.3**.

In addition to new Building No. 4.1, upgrades are required within the existing digester building to meet NFPA 820 (2024 edition) area classification separation requirements. As discussed in the 2023 FP and *Hot Water Loop and Fog Improvements, Phase 2, Technical Memorandum – Task 3.0 Building 4 Space Classification* (prepared by HDR, dated December 2, 2019), Building No. 4 should be classified as Class I, Division 1 under NFPA 820. Currently, hot water boilers and electrical equipment are located in this classified space. It is critical that boilers and the electrical equipment be moved to an unclassified space, thus it is recommended to relocate them to new Building No. 4.1, in an unclassified room. Since the boilers were replaced in 2019 with high-efficiency, natural-gas-fired boilers, it is recommended to relocate them instead of replacing them. The boiler room should be sized to accommodate replacing the existing boilers with biogas and NG fueled boilers should JCW elect to use biogas for digester heat in the future. The electrical equipment, such as motor control centers (MCCs), variable frequency drives (VFDs), and PLCs, will be replaced and located in new Building No. 4.1. MOPO during the boiler relocation and electrical equipment replacement will be critical and is discussed in **Section 4.1**.

2.2.4 Miscellaneous Biogas Safety Equipment

Miscellaneous biogas safety equipment upgrades are recommended because of the age of the existing equipment. The existing flame arresters and pressure relief valves at each digester and three 6-inch waste gas burners are at the end of their service life and these should be replaced. This equipment will be replaced in kind.

With the replacement of the waste gas burners, a new digester gas header pipe is proposed to better manage condensate. The low point in the biogas system is in Building No. 16 and consists of two 10-inch (in.) sediment traps and a flame arrestor. However, with the biogas upgrading equipment offline, the low point is not in the direct flow path of biogas being flared. For flared gas, the only operating condensate collection point is a single sediment trap located at the waste gas burners. It is recommended that the digester gas header pipe be rerouted so that condensate can be collected at the existing low point before being routed to the waste gas burners. Additionally, this rerouting will provide the opportunity to raise the elevation of the digester gas pipe to provide a clear path for a secondary road to be added to the FOG building. **Table 2-6** and **Drawings C-3, C-4, 04-DM-4,** and **04-M-4** provide more details.

Table 2-6 Biogas Safety Equipment Design Criteria

Criteria	Value
Digester Gas Safety Devices	
Quantity, per digester	2
Line Size, in.	4
Waste Gas Burners	
Quantity	3 (1 Duty, 2 Standby)
Size, in.	4
Peak flow	650 scfm
Type	Candlestick

Note: scfm – standard cubic feet per minute

2.2.5 Yard Piping

Currently, there is only one 6-inch ductile iron feed line that combines TPS, TWAS, and scum. This line was installed as part of Contract 1 in 1979. It is recommended that this line be abandoned in place and three separate glass-lined pipes be installed: one for TPS, one for TWAS, and one for scum. Each line would be 6 in. in diameter and approximately 300, 360, and 1,100 ft long, respectively. The two thickened sludge lines would be routed from Building No. 2 to Building No. 4. The new scum line would be routed from the settled sewage pump station to Building No. 4. Cleanouts would be provided to allow for jetting to prevent plugging issues.

In lieu of providing a separate scum line to Building No. 4, this pipe could be combined with the TPS force main, allowing for increased velocity to reduce the risk of plugging. This would save approximately 300 ft of scum piping. In general, because of the complexity of the yard pipe routing and likelihood of conflicts, it is recommended to carry a significant allowance to deal with these issues during construction. **Drawing C-04** provides more details on the yard piping improvements.

2.2.6 Electrical Improvements

The process and building mechanical loads, and lighting panelboards at Building No. 4 are fed by two MCCs (MCC-5A and MCC-5B), both of which are currently in the process area of Building No. 4. In accordance with NFPA 820, the equipment room at the operating level is classified as Class I, Division 1. An electrical room will be constructed within Building No. 4.1 to provide unclassified space to locate new electrical equipment serving the Digester Building in compliance with NFPA 820. This is discussed in **Section 2.3.3**. Furthermore, MCC-5A provides power to existing MCC-14A, and MCC-5B provides power to existing MCC-14B. Both MCC-14A and MCC-14B are in the electrical room of Building No. 15 (FOG Building). MCC-14A and MCC-14B are currently in good condition and do not require replacement. **Drawings E-2 and E-3** provide details.

A new duct bank will be installed between Building No. 4 and new Building No. 4.1 to route circuits from new MCC-5A, MCC-5B, and panelboards to their respective loads within Building 4.

Figure 2-4 Hydroseal Launder Detail

2.3 Digested Sludge Storage Tank and Support Building

To accommodate the conversion of Digester No. 2 to a primary digester, a new DSST and support building (Building No. 4.1) are recommended for storing digestate prior to dewatering, storing biogas, and housing associated equipment. The new DSST and Building No. 4.1 are recommended in the location of the existing biogas storage membrane pad. A volume of 200,000 gal is recommended for the application, with a diameter of 36 ft and height of 26.6 ft. This volume provides 3 days of storage at average flow conditions. A prestressed American Water Works Association D110 Type 3 concrete tank with a Hydroseal cover (by Ovivo) is recommended for the DSST. A Hydroseal cover floats in an internal or external launder, allowing for a liquid seal to isolate biogas from atmospheric air. This launder can be made of either concrete or stainless steel. A PEW connection is needed to keep the liquid seal full. It is recommended that this flow be continuous in the winter to prevent freezing, but flow could be controlled by a level instrument, such as a float, during other times of the year. Biogas storage is provided within the headspace of the tank. The depth of the

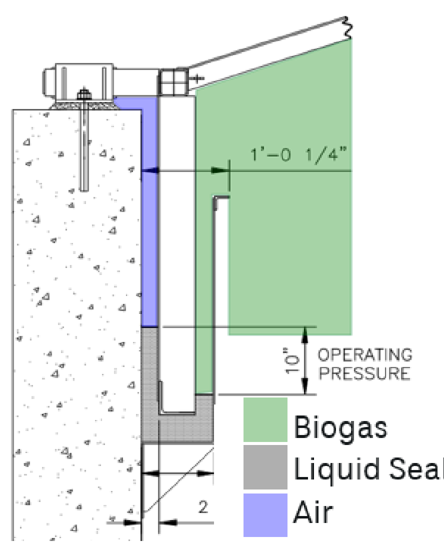


Figure 2-5 Hydroseal Section

launder determines the biogas storage during full-tank conditions, however, as the tank is emptied, the headspace becomes additional biogas storage. Since the liquid seal is isolated from the sludge contents, this cover allows variable digestate storage for the entire volume of the tank. **Figures 2-4** and **2-5** show the Hydroseal launder detail and section, respectively. This cover will allow the tank to be pumped empty while also providing biogas storage in the tank headspace. The headspace will be connected to the digester gas piping network.

Proposed Building No. 4.1 is located next to the DSST and will have an approximate footprint of 31 by 50 ft. This building will have a lower basement level with an approximate footprint of 24 by 50 ft. This building will include two DSST mixing pumps, three centrifuge feed pumps (DSST discharge pumps), an electrical room, a boiler room for the two relocated natural gas boilers, and a 7.5 by 5 ft hatch located in the basement pump room. The pumps will be located in the basement level to maintain a flooded suction, while the electrical room and boiler room will be at grade. **Drawing 04.1-M-01** provides more detail for Building No. 4.1. **Table 2-7** lists the design criteria for the DSST and associated equipment.

Table 2-7 DSST and Associated Equipment Design Criteria

Criteria	Value
DSST	
Tank Dimensions, in. (diameter and height)	36 × 26.6
Tank Volume, gal	200,000
Launder Dimension, in. (width and depth)	36 × 72
DSST Mixing Pumps	
Quantity	2 (1 Duty/1 Spare)
Type	Horizontal Chopper
Flow, gpm	1,000
TDH, ft	30
Estimated Motor Power, hp	15
Centrifuge Feed Pumps	
Quantity	3 (1 Duty/2 Spare)
Type	Progressive Cavity
Flow, gpm	90
Discharge Pressure, psi	60
Estimated Motor Power, hp	30

2.3.1 Yard Piping

The following yard piping will be routed to and from the new DSST and Building No. 4.1:

- Two 8-inch digested sludge piping from the digested sludge transfer pumps in Building No. 4 to the DSST
- Two 8-inch digested sludge mixing pipes (suction and discharge piping) from/to the DSST to/from Building No. 4.1

- Two 8-inch centrifuge feed pipes from DSST to Building No. 4.1 for the centrifuge feed pump suction piping
- Two 8-inch centrifuge feed pipes from Building No. 4.1 to the new Dewatering Building for centrifuge feed
- Two 6-inch hot water pipes for the relocated boiler piping loop to/from Building No. 4 from/to Building No. 4.1

2.3.2 Floodplain Considerations

As shown on **Drawing C-2**, both the DSST and Building No. 4.1 will be located in the 100-year floodplain boundary, which will require coordination with the City of Overland Park. A flood study will be required, which consists of a hydrological model and a site plan of the proposed construction. The purpose of the study is to determine if the project will increase flood heights. After the hydrological model is completed, a No-rise Certification needs to be submitted with the technical data and signed by a registered professional engineer in the State of Kansas.

A preliminary application of the flood study is recommended to be submitted at 30% design for preliminary plan approval. A resubmission of the application is then required when the construction submission is sent to the City for final plan approval. Additionally, the City indicated that if the work associated with the new roadway and truck staging area (discussed in **Section 2.5**) requires the floodplain to be filled, coordination is required with the Kansas State Board – Department of Water Resources.

The City of Overland Park indicated the following design requirements for the DSST and Building No. 4.1:

- The new building slab must be elevated a minimum of 2 ft above the 100-year floodplain limit or meet the 500-year floodplain limit.
- All piping that exits the building must have its invert a minimum of 2 ft above the 100-year boundary. Underground piping and vaults are exempt from these requirements.

2.3.3 Electrical Improvements

An electrical room will be constructed within Building No. 4.1 to accommodate the unclassified space requirements for the Digester Building's electrical system in full compliance with NFPA 820 standards. The existing MCC-5A and MCC-5B will be replaced by new MCC-5, rated at 2,000-amp (A), 480-volt (V), three-phase, and featuring a main-tie-main configuration and automatic source transfer. Each main-tie breaker will have a kirk key interlock. This new MCC-5 will supply power to new process and building mechanical loads in both Building No. 4 and Building No. 4.1. The loads will be distributed equally between Bus A and Bus B of MCC-5 to enhance the reliability of plant operations. Additionally, a new 120/208 V, three-phase lighting panel will be installed to support the mechanical, lighting, and receptacle loads of Building No. 4.1. Two new 240/120 V, single-phase lighting panels and two 480 V power panels will be provided as replacements for lighting panels LP-5 and L5A, and power panels PP-5 and PP-5A to provide power to their existing loads. Furthermore, new MCC-5 will also deliver power to existing MCC-14A and MCC-14B located in Building No. 15 (FOG Building). MCC-5 one-line diagrams 1 and 2 on **Drawings E-2 and E-3**, respectively, provide details.

Upstream transformers T5 and T11 are rated for 750 kV, 12.47 kV-277/480 V, three-phase. Based on these ratings, they do not have sufficient capacity to support the loads on new MCC-5, so they will be replaced with new 1,500 kVA, 12.47 kV-277/480 V, three-phase transformers.

The new network, security, and PLC panels will be installed inside the new electrical room. The MCC-5 electrical room layout on **Drawing E-5** provides details.

2.4 Building No. 2 Modifications

This section describes the modification of the existing Solids Processing Building (Building No. 2), which includes recommendations to demolish the existing BFPs and install a new emulsion polymer system for WAS thickening.

2.4.1 Overview

Building No. 2 houses two PS cyclone degritters, three RDTs that thicken WAS, five TWAS pumps (three dedicated to each RDT and two connected to the sludge wet well configured to receive outside sludges from other facilities), and three BFPs that discharge to a dewatering solids conveyor. TWAS is stored in standpipes located on the lower level of Building No. 2 prior to being pumped to the anaerobic digesters. A permanent dry polymer system is installed to serve both the RDTs and BFPs. Temporary updates have been made to allow emulsion polymer use for thickening.

Carollo Engineers prepared a Corrosion Assessment Evaluation Report in 2023 of the BFP room in Building No. 2. The major equipment and ancillary components in the BFP room were inspected. The causes of metals corrosion were compounding factors that included high humidity, generally warm temperatures, exposure to hydrogen sulfide gas, and exposure to chlorine vapors and chlorides in the PEW.

In 2024, Carollo Engineers submitted a Concrete Condition Assessment Report that focused on the BFP room in Building No. 2. The assessment identified spalled concrete attributed to chloride-induced reinforcement corrosion. The locations of spalled concrete were around a cutout in the northwest ceiling of level 2 where a prior ventilation system was located, the floor slab of level 2 near the south stairwell, and the floor slab of level 1 around the floor drain and access hatch.

Based on the findings from these condition assessments, the BFPs, polymer system, and ferric chloride feed system are recommended to be demolished and replaced with centrifuges, an emulsion polymer system, and a new ferric chloride feed system. The centrifuges will be located in a new dewatering building (Building No. 10.1), which is discussed in **Section 2.4.3**, and the ferric chloride system will be located in the RAS/WAS Chemical Building (MB-14).

2.4.2 Building No. 2 Improvements

2.4.2.1 WAS Thickening

As part of the Solids Thickening Improvements Project (Contract 34), the three thickening centrifuges were replaced with three Alfa Laval Model Aldrum G3 Mega RDTs. The RDTs were commissioned in March 2024. Improvements are recommended to the polymer system associated with thickening, as discussed in **Section 2.4.2.3.** Other improvements to WAS thickening are not anticipated for this project.

2.4.2.2 Dewatering

Three Model SMX-S12 2.0-meter, three-belt Andritz BFPs were installed under Contract 23 in 2014 and are used to dewater anaerobically digested sludge. One or two units operate most days, almost constantly with a total average feed of 40 gpm. Average feed solids is 1.7%, which increases to 17% after dewatering and is within the expected typical range of 10% to 20% for anaerobically digested sludge. Cake from each BFP is discharged to a dedicated conveyor that discharges onto a common loading conveyor to a truck for haul-off.

Hydraulic loading to the BFPs is 22 gallons per minute per meter of belt width (gpm/m), while solids loading is 185 pounds per hour per meter of belt width (pph/m). These are both below industry guidance of 30 to 80 gpm/m and 400 to 800 pph/m for anaerobically digested BNR sludge.

Ferric chloride is added to the BFP feed to precipitate phosphorus, reduce phosphorus recycle, and help dewaterability. The ferric chloride dose is 3.6 gal of ferric chloride per 1,000 gal of sludge. There are no standards for ferric chloride addition.

The BFPs have a limited remaining life due to the corrosive conditions in Building No. 2. BFP No. 3 underwent rehabilitation a few years ago and will require another in the near future. BFP No. 1 was recently rehabilitated in August 2025. Due to the limited remaining useful life of the BFPs and consistent rehabilitation expected, CDM Smith recommends replacing the BFPs with dewatering centrifuges in a new building, sized for 16/7 operation (**Section 2.5.2**).

2.4.2.3 Thickening Polymer System

A permanent dry polymer system is installed to serve both the RDTs and BFPs. The dry polymer is delivered in supersacks and stored in Building No. 2. The polymer is unloaded using a bulk bag unloading system and pneumatically sent to a wetting device. Wetted polymer is diluted in a polymer mix tank to 0.5% solution and transferred to aging tanks. Since the RDT project, a temporary emulsion polymer system has been added to the polymer room for thickening. Currently, this is not a permanent installation, and polymer dilution is achieved manually. Polymer for dewatering still uses the existing dry polymer system.

The RDT polymer dosage controls is automated based on the UWAS total suspended solids (TSS) content and flow. Typical dosage for thickening WAS at Middle Basin is 5 to 12 lb of polymer per ton of dry solids. It is recommended that the thickening emulsion polymer system be made permanent and the existing dry polymer system be demolished once the BFPs are demolished; thickening polymer design criteria are summarized in **Table 2-8** and **Table 2-9**. The emulsion system would be dedicated to the RDTs and would likely be installed after the BFPs are decommissioned.

This system would consist of a progressive cavity polymer pump to supply neat emulsion polymer from the polymer storage tote to the mixing chamber of a polymer blender system. Water from the service water system will be provided to the polymer unit and supply the mixing chamber. The neat polymer and service water will mix within the mixing chamber on skid and then the solution will be sent directly to the RDTs existing polymer injection points on the sludge feed line. No intermediate pumping is required. All components of the system, including the polymer pump and mixing chamber, will be located on a single skid.

It is expected that the plant will use approximately one to two polymer totes per month for thickening. Because of the challenges of polymer tote usage, such as cleaning and disposing of the toes, bulk polymer storage was explored. Bulk polymer would be delivered by a full truck load of 5,000 gal. The two existing aging tanks, equaling a total volume of 4,400 gal, could be used as storage tanks. At ADF conditions, 4,400 gal of neat polymer would provide 13 months of storage for thickening. Emulsion polymer has a shelf life of 6 months if stored and mixed properly. Because of the shelf life, it is not recommended to use bulk polymer storage tanks or reuse the polymer aging tanks. Totes are best suited for the polymer demand of WAS thickening. If desired, a tote cleaning station can be provided in Building No. 2 to accommodate the challenges associated with polymer tote usage.

Table 2-8 Thickening Polymer Design Criteria

Criteria	Maximum Month	Annual Average
Percent Active (%)	40%	40%
Emulsion Polymer Solution Usage (gal of neat polymer solution per day)[1]	35	20
Polymer Solution Concentration (% weight)	0.25%	0.25%
Polymer Solution Usage (neat polymer + water) (gpm)[2]	7	4

Notes:
1 Based on a 24-hour-per-day operating schedule.
2 Assuming polymer dosage of 9 lb/dry ton of TS.

Table 2-9 Recommended Thickening Polymer System

Criteria	Value
275 Gal Neat Polymer Storage Totes	
Quantity	2
Average Days of Storage per Tote	25
Polymer Solution Skids	
Quantity	3
Motor Power, hp	5

2.5 New Dewatering Building (Building No. 10.1)

This section details the new Dewatering Building (Building No. 10.1) and its associated dewatering equipment, including dewatering centrifuges, dewatered cake conveyance, and the polymer system.

2.5.1 Overview

It is recommended to construct a new dewatering building that will house three new dewatering centrifuges (one duty, two standby), cake conveyors, a drive-through truck bay, an electrical room, odor control, and a polymer storage and feed system. This building was previously recommended in the 2023 FP to be located near the existing influent pump station (IPS) to limit truck traffic through the site.

Consideration was given to combine Building No. 10.1 and Building No. 4.1 as a cost-saving measure for construction. Ultimately, after evaluating the issues with truck traffic, the long suction piping needed for the DSST, and various site limitations, the decision was made to maintain two separate buildings.

Building No. 10.1 is recommended to be constructed in the location of the existing CHPs. The recommended CHP system is discussed in **Section 2.8**; the system would be located east of its current location (in the existing location of Building No. 10). The existing dewatering equipment (BFPs) will continue to be maintained and rehabilitated for approximately 10 years until the new dewatering building is constructed. Upon construction of Building No. 10.1, the existing BFPs and associated dewatering equipment will be decommissioned and removed. Centrifuges were selected for dewatering operation based on JCW's experience with centrifuges at other facilities.

It is recommended that Building No. 10.1 be two stories tall with an approximate footprint of 70 by 55 ft on the lower level and 50 by 55 ft on the upper level. Improvements to the site's access roads are recommended, including constructing a new road on the east side of the building, adjacent to the northeast corner of Equalization Basin No. 2, and constructing a designated truck staging area. The new access road will allow trucks to drive through Building No. 10.1 while reducing overall truck traffic on-site. The truck staging area provides a space for dewatered cake and FOG trucks to wait while other vehicles are being loaded at the dewatering facility or unloaded at the FOG building. Both of these improvements are located in the 100-year floodplain boundary. It is recommended to perform this work with the DSST project discussed in **Section 2.3**.

The recommended building will house three centrifuges on the upper level, each with an inclined conveyor to convey dewatered cake to a truck leveling conveyor. An access platform will be provided around the centrifuges for ease of maintenance. The upper level will also contain a laboratory/control room. The lower level will include a drive-through truck bay for accepting dewatered cake, a polymer room, a bulk polymer storage area, an electrical room, and a restroom. Odor control will be provided for the truck bay. Additionally, a connection point to the centrate EQ tank will be provided; it is recommended that the odor control system be sized for handling both volumes.

2.5.2 Dewatering Centrifuges

The recommended dewatering system will meet both KDHE and Ten State Standards. KDHE Section XI.F.3 requires that duplicate units or alternative means for disposal of the sludge must be provided. Ten States Standards Sections 88.1 and 88.3 require sufficient capacity to dewater the sludge produced with the largest unit out of service.

The centrifuges are sized to meet a dewatering schedule of 16/7 to reduce third-shift operations labor. The equipment will also be sized so that one unit can handle the maximum month flow condition. The other two centrifuges will be standby units, thus meeting the applicable design standards. **Table 2-10** summarizes the recommended dewatering design criteria required to meet the dewatering schedule, and the flows and loads summary from the mass balance.

Table 2-10 Recommended Dewatering Design Criteria

Parameter	Unit	Average Annual	Maximum Month
Dewatering Operating Schedule	Hrs/op. wk	112	112
Digested Sludge to Dewatering	Dry lb/week	59,000	92,000
	Gal/week	404,000	610,000
	Dry lb/ op. day	8,400	13,200
	Gal/op. day	58,000	87,000
Solids Loading	dry lb/op. hour	528	824
Hydraulic Loading	gal/op. minute	60	91

The centrifuges will be located on the second floor of the new building. Digested sludge will be fed via two force mains from three feed pumps in Building No. 4.1. Dewatered cake will drop down into dedicated inclined screw conveyors, which will be operated in reverse during centrifuge start-up, and the resulting "slop" in addition to PEW flushing water will be directed to the drains. Upon completion of centrifuge start-up activities, the screw conveyor direction will operate in the forward direction and convey dewatered biosolids to the truck leveling conveyor. The three inclined screw conveyors will have a second outlet that can be used to bypass the leveling conveyor if required, eliminating the leveling conveyor as a single point of failure for dewatering. The truck leveling conveyor will be outfitted with three inlets from the centrifuges and three outlets. The outlets will include slide gates that operators can open and close to promote even layering of the dewatered cake into truck beds. A camera system is recommended to monitor the filling operation and help determine which gate should be opened. Screw conveyors were selected for cake transfer based on JCW's experience with maintaining screw conveyors with the current BFPs and compatibility with centrifuge operation.

Centrate from the dewatering operation will drain through the centrate chute. Centrate will be conveyed to the centrate EQ tank discussed further in **Section 2.6**.

Four centrifuge manufacturers were evaluated: Andritz, Alfa Laval, Flottweg, and Westfalia. The centrifuge bowl and back drive scroll are powered by separate motors on VFDs. The VFDs and other control systems will be housed in dedicated main control panels that will be located in the dewatering building electrical room. Each centrifuge will have a local control panel on the upper level. **Table 2-11** provides a summary of the centrifuge manufacturers that were reviewed.

Table 2-11 Dewatering Centrifuges Equipment Summary

Parameter	Andritz	Alfa Laval	Flottweg	Westfalia
Model	D4L	Aldec 44	C4E	Prime 4000
Bowl Diameter, in.	17	17	18.5	15.75
Main Drive Power, hp	50	40	40	30
Back Drive Power, hp	10	20	10	15
Equipment Weight, lb	5,000	8,000	6,100	-
Lubrication	Grease	Grease	Grease	Grease
Dimensions, in. (length, width, and height)	120 × 42 × 71	181 × 42 × 59	138 × 45 × 40	-
Cost for Three Units	$800,000	$995,750	$926,300	$900,000

Note: lb – pound

2.5.3 Conveyors

Each centrifuge will have a dedicated inclined shaftless screw conveyor that will convey dewatered cake to the leveling conveyor. The inclined conveyors will be sized to accept dewatered cake from one centrifuge. For the truck leveling conveyor, it is recommended to be sized to accept cake from all three centrifuges operating at the maximum month flow condition. This operation is unlikely; however, it will provide flexibility for the plant to adjust operating schedules as needed.

Table 2-12 summarizes the design criteria for the recommended cake conveyors.

Table 2-12 Recommended Cake Conveyors Design Criteria

Criteria	Value
Inclined Screw Conveyors	
Quantity	3
Type	Shaftless
Throughput, wet lb/op. hr	3,900
Throughput, ft^3/op. hr	71
Truck Leveling Conveyor	
Quantity	1
Type	Shaftless
Throughput, wet lb/op. hr	11,800
Throughput, ft^3/op. hr	214

Notes: wet lb/op. hr – wet pounds per operating hour; ft^3/op. hr – cubic feet per operating hour

2.5.4 Polymer Systems

A new emulsion polymer system is recommended to be dedicated to the centrifuges in Building No. 10.1. During the thickening RDT commissioning in March 2024, JCW used emulsion polymer from a tote instead of dry polymer. This testing resulted in cleaner filtrate and higher hydraulic throughput. From this previous experience, bulk delivered emulsion polymer with aging is recommended for dewatering.

The recommended emulsion polymer system will include one indoor bulk storage tank, two polymer mixing pumps, two polymer dilution units, two aging tanks, and three polymer feed pumps. The bulk tank will be sized for receiving a full load of polymer (typically 5,000 gal). This provides approximately 3 months of storage at average flow conditions, which is within the recommended polymer shelf life. Mixing pumps will be sized to turn over a full tank every shift, or every 8 hours. Polymer dilution units will be sized to create a target polymer solution concentration of 0.25% to 0.5% and transfer the solution to the aging tanks. The two aging tanks will supply the polymer feed pumps. Each centrifuge will have a dedicated polymer solution feed pump. The polymer system will be sized for a maximum polymer dosage of 40 lb of active polymer per dry ton of solids.

For each emulsion polymer blending unit, polymer pumps will supply neat emulsion polymer from the polymer storage tank to the mix chamber for activation and dilution. Service water will be provided to the polymer unit and supply the mixing chamber.

It is recommended that the aging tanks be sized to provide a minimum of 30 minutes of aging at the maximum month operating condition. It is recommended that three additional polymer feed injection points be located on each of the centrifuge feed pipes. This will allow start-up and commissioning testing to determine the optimal injection feed point. Dewatering polymer design criteria is summarized below in **Table 2-13**. **Table 2-14** below summarizes the recommended polymer equipment.

Table 2-13 Recommended Dewatering Polymer Design Criteria

Criteria	Maximum Month	Annual Average
Percent Active (%)	40%	40%
Emulsion Polymer Solution Usage (gal of neat polymer solution per day)[1]	51	79
Polymer Solution Concentration (% weight)	0.50%	0.50%
Polymer Solution Usage (neat polymer + water) (gpm)	7	4

Table 2-14 Recommended Polymer Equipment

Criteria	Value
Bulk Neat Polymer Storage Tank	
Quantity	1
Type	Double-Walled Vertical Tank with Sloped Bottom
Material	Polyethylene
Storage Capacity, gal	5,000
Neat Polymer Mixing Pumps	
Quantity	2
Type	Progressive Cavity
Flow, gpm	20
Motor Power, hp	5
Drive Type	Constant Speed
Polymer Aging Tanks	
Quantity	2

Criteria	Value
Type	Double-Walled Vertical Tank with Sloped Bottom
Material	Polyethylene
Storage Capacity, gal	600 Total (300 per tank)
Polymer Solution Pumps	
Quantity	3
Type	Progressive Cavity
Flow, gpm	7
Discharge Pressure	100
Motor Power, hp	5
Drive Type	Variable Speed

It is recommended that the polymer system be located within a containment area. This can be achieved by providing a floor sloped to a sump so the area can be pumped out if there is a leak. It is recommended that the space be provided on grating with 18 inches of depth under the area for containment, excluding where the equipment pads are located.

2.5.5 Yard Piping

The following yard piping will be routed to and from the new dewatering building:

- Digested sludge (centrifuge feed) from the DSST to the digester building to the centrifuges
- Centrate from the centrifuge to centrate tank
- Centrate from centrate tank to the primary clarifier splitter box
- PEW for centrifuge needs and polymer system
- Potable water for bathroom, hose station, and laboratory
- Sanitary for bathroom
- Drains from building drains and centrifuge washwater from cleaning cycle
- Ferric chloride for dewatering

2.5.6 Area Classification

The proposed Dewatering Building's area classification will be defined in accordance with NFPA 820. NFPA 820 defines requirements for "Dewatering Buildings" in Table 6.2.2(a), Row 12. Because of the risk of methane accumulation from sludge processing, dewatering buildings are classified as Class I, Division 2 (with less than 6 air changes per hour for ventilation) or derated to unclassified (with a minimum of 6 air changes per hour). It is recommended that 6 air changes per hour be provided the air be sent to an odor control system. **Table 2-15** summarizes the requirements of NFPA 820 for each space.

Table 2-15 Dewatering Building NFPA 820[1] Area Classification Summary

NFPA Row	Location and Function	Ventilation Rate Required	Hazard Classification	Extent of Classified Areas	Fire Protection Measures[2]
12a	Dewatering Room	Continuously ventilated at six air changes per hour	Unclassified	-	H, FE, FAS
13a	Truck Bay	Continuously ventilated at six air changes per hour	Unclassified	-	H, FE, FAS
-	Electrical Room	N/A	Unclassified	-	NR
-	Laboratory/Control Room	N/A	Unclassified	-	NR
-	Polymer Room	N/A	Unclassified	-	NR
-	Restroom	N/A	Unclassified	-	NR
27	Centrate EQ Tank	N/A	Unclassified	-	H

Notes:

1 NFPA 820 Tables 4.2.2, 5.2.2, and 6.2.2.

2 FAS – fire alarm system; FE – portable fire extinguisher; H – hydrant protection; NR – no requirement

2.5.7 Electrical Improvements

The process and building mechanical loads, and lighting panelboards at existing Building No. 10 are fed by MCC-6A and MCC-6B, both of which are in the building. Most of the process loads in Building No. 10 will be demolished except chlorine rapid mixers RM-1 and RM-2, which will be relocated to new Building No. 10.1.

An electrical room will be constructed in new Building No. 10.1 to support the new electrical system for the new dewatering equipment. Existing MCC-6A and MCC-6B will be replaced by new MCC-6, rated at 1,200 A, 480 V, three-phase, featuring a main-tie-main configuration and automatic source transfer; each main-tie breaker will have Kirk Key interlocks. The new MCC-6 will supply power to both existing and new process and building mechanical loads in the new Dewatering Building. The loads will be distributed equally between Bus A and Bus B of MCC-6 to enhance the reliability of plant operations. In addition, two new 240/120 V, single-phase lighting panels and one 480 V power panel will be supplied to replace lighting panels L6 and LP-6A and power panel P6A, supplying power to the new building's mechanical, lighting, and receptacle loads.

Upstream transformers T6 and T12 are rated for 500 kV, 12.47 kV-277/480 V, three-phase. Based on these ratings, these transformers don't have sufficient capacity to support the loads on new MCC-6 so will be replaced with new 1,500 kVA, 12.47 kV-277/480 V, three-phase. The one-line diagram on **Drawing E-4** provides details.

The new network, security, and PLC panels will be installed inside the new electrical room. The MCC-6 Electrical Room layout on **Drawing E-6** provides details.

2.6 Centrate Equalization

Influent samples are measured twice weekly at the primary clarifier splitter box. Influent samples currently include RDT filtrate, BFP filtrate, and washwater recycles. Sidestreams increase the flow and mass loadings to the biological process. Postdigestion sidestreams carry high concentrations of total inorganic nitrogen and orthophosphate (PO_4-P) and have major impacts on the performance of BNR.

EQ of postdigestion centrate would provide Middle Basin with the opportunity to bleed high-strength sidestreams to the BNR process and position the sidestream for future deammonification technologies that require a constant flow. A 16/7 centrifuge operation does not need multiple days of storage (although more storage benefits the overall plant process).

A new centrate EQ tank is recommended for EQ of centrate because of the 16/7 dewatering schedule. A 30,000 gal EQ tank will provide 8 hours of centrate EQ at maximum month conditions and 12 hours of centrate EQ at annual average conditions. This is based on daily centrate production normalized over a week for a 16/7 dewatering schedule.

Centrate will flow by gravity to a below ground concrete tank located next to the Building No. 10.1. Equalized centrate will be pumped to the primary clarifier splitter box. **Table 2-16** lists the recommended design criteria and **Drawing 10.1 M-2** shows a plan and section view of the proposed EQ tank. It is recommended to separate the centrifuge flushing water from the drain line at the machines to divert this washwater away from the centrate EQ system.

Table 2-16 Recommended Centrate EQ Design Criteria

Criteria	Value
EQ Tank	
Configuration	Square
Volume, gal	30,000
Side water depth, ft	10
Area, sqft	400
Average Storage Time, hrs	12
Minimum Storage Time, hrs	8
Mixing	Side entry submersible
Materials of Construction	concrete
Equalized Centrate Pumps	
Quantity	2 (1 Duty, 1 Standby)
Type	Submersible
Flow, gpm	60
Estimated Power, hp	15

2.6.1 Yard Piping

The following yard piping will be routed to and from the centrate EQ tank:

- One 8-inch centrate pipe from Building No. 10.1
- One 8-inch overflow pipe routed to the plant drain system
- One 4-inch equalized centrate pipe that will discharge to the primary clarifier splitter box

2.7 FOG Receiving

This section describes the overall FOG handling process at Middle Basin, the recommended improvements to maintain FOG handling operations, and the recommended implementation to execute the improvements described.

2.7.1 Overview

Middle Basin receives FOG from local food service facilities and disposes of it via anaerobic digestion. Currently, there are three 15,400 gal FOG storage tanks (13 ft in diameter and 17 ft tall), providing a combined storage of 46,200 gal. Two rotary lobe pumps, each rated for 300 gpm, offload FOG to the tanks. A grinder and rock box dedicated to each pump allow separation of large and heavy debris.

Existing heat exchangers heat the FOG prior to being transferred to the digesters. Each FOG tank is equipped with a dedicated mixing pump, which allows the mixing to be decoupled from the existing unloading pumps. Currently, JCW experiences issues due to grit from the FOG which can damage the equipment and foul the heat exchangers.

2.7.2 FOG Improvements

A new FOG receiving station was evaluated to help remove the grit from the FOG consisting of a receiving hopper, screen, washer and compactor, grit trap, and discharge chute. After review, it is recommended to keep the existing receiving process as the grit removal system is expensive, requires a large footprint that would not fit on-site, and could require additional maintenance. However, it is recommended to replace the fiberglass-reinforced plastic (FRP) tanks with dome bottoms instead of flat bottoms to allow grit to settle and be pumped out. Two separate pump suction lines are recommended for the new tanks: one for normal operation (mixing and digester feeding), and a lower one for pumping out the accumulated grit. Because of the dome bottom, the storage volume will be reduced slightly to 10,000 gal each. Additionally, it is recommended that all FOG equipment, including pumps, grinders, tanks, and heat exchangers, be replaced in kind in Building No. 15. **Table 2-17** and **Drawings 15-DM-1 and 15-M-1** provide additional details for the system.

Table 2-17 FOG System Design Criteria

Criteria	Value
FOG Tanks	
Configuration	Dome Bottom
Quantity	3
Volume, gal each	10,000
Diameter, ft	13
Straight Side Height, ft	10
Materials of Construction	FRP
FOG Transfer Pumps	
Quantity	2 (1 Duty, 1 Standby)
Flow, gpm	300
FOG Mixing Pumps	
Quantity	2 (1 Duty, 1 Standby)

Criteria	Value
Flow, gpm	300
Motor Power, hp	15
FOG Waste Feed Pumps	
Quantity	2 (1 Duty, 1 Standby)
Flow, gpm	30
Motor Power, hp	3
Heat Exchangers	
Quantity	3
Heat Transfer Required, Btu/hr	600,000
Type	Tube-in-Tube Style

2.8 Biogas Utilization

Biogas is continuously produced by the anaerobic digesters at Middle Basin. This section describes the proposed biogas utilization approach, which includes replacement of the CHP units.

2.8.1 Overview

CDM Smith evaluated biogas utilization as part of the 2023 FP and summarized the results in *Technical Memorandum No. 4 – Biogas Utilization Evaluation* (dated May 26, 2023). The average biogas production is 132 scfm, with peaks up to approximately 250 scfm. CDM Smith recommended sizing new gas utilization equipment for 200 scfm, which would allow for capturing most peaks in biogas production and/or increases in FOG loading. It is assumed FOG receiving will continue at Middle Basin and biogas production is not expected to change significantly.

As part of this evaluation, CDM Smith contacted Kansas ONEGas, the local natural gas (NG) supplier, for costs associated with an interconnection and metering station, which would be required for a renewable natural gas (RNG) system. Kansas ONEGas provided updated 2025 costs which are summarized below in **Table 2-18**. The 2025 costs have increased 64% from the costs provided in 2023. Because of the increased RNG costs related to the interconnection and the newly replaced NG-fueled boilers, replacement of the existing CHP system is the most feasible option.

Table 2-18 Kansas ONEGas 2025 Cost Estimate

Criteria	Value
5,075 ft of NG Pipe	$2,030,000
Metering Station	$2,000,000
TOTAL	**$4,030,000**

2.8.2 Combined Heat and Power

There are two existing 1,060 kW GE Jenbacher CHPs with space allocated for a third. The CHPs were installed in 2011 and can accept both biogas and NG as fuel sources. Based on the previous study *Middle Basin Digester Gas Utilization Evaluation Design Memorandum* (prepared by HDR, dated May 9, 2022) and lack of digester gas storage, the most cost-effective approach of operating these units is by NG.

Figure 2-6 shows the existing CHP units, which are west of the Sodium Hypochlorite Building. The CHP systems are currently not operational.

Figure 2-6 Existing GE Jenbacher Combined Heat and Power Units

As noted in the 2023 FP, the existing CHP system is oversized, preventing optimal use of biogas generated and heat recovery (especially in the summer months). The existing 1,060 kW engines can accept up to 257 scfm of biogas, which is significantly more than is currently produced or expected to be produced. Therefore, it is recommended that smaller 600 kW engines be installed. These smaller engines would be more appropriately sized to match biogas production and be better suited to match the digester heat demand.

Table 2-19 summarizes the difference between the existing and proposed CHP system sizes for biogas input and heat output in million British thermal units per hour (MMBtu/hr).

Table 2-19 CHP Sizing Considerations

CHP Sizing	Biogas Input	Maximum Heat Output	Minimum Heat Output (50% Turndown)
Existing 1,060 kW Unit	128–257 scfm	4.17 MMBtu/hr	2.08 MMBtu/hr
Proposed 600 kW Unit	90–162 scfm	2.02 MMBtu/hr	1.01 MMBtu/hr

The CHP system would serve the heat demand for the four primary digesters, which have an estimated heat demand of 2.3 MMBTU/hr in the winter and 1.1 MMBTU/hr in the summer. **Figure 2-7** shows the monthly heat demand compared to the heat output from the existing 1,060 kW engine and a 600 kW engine.

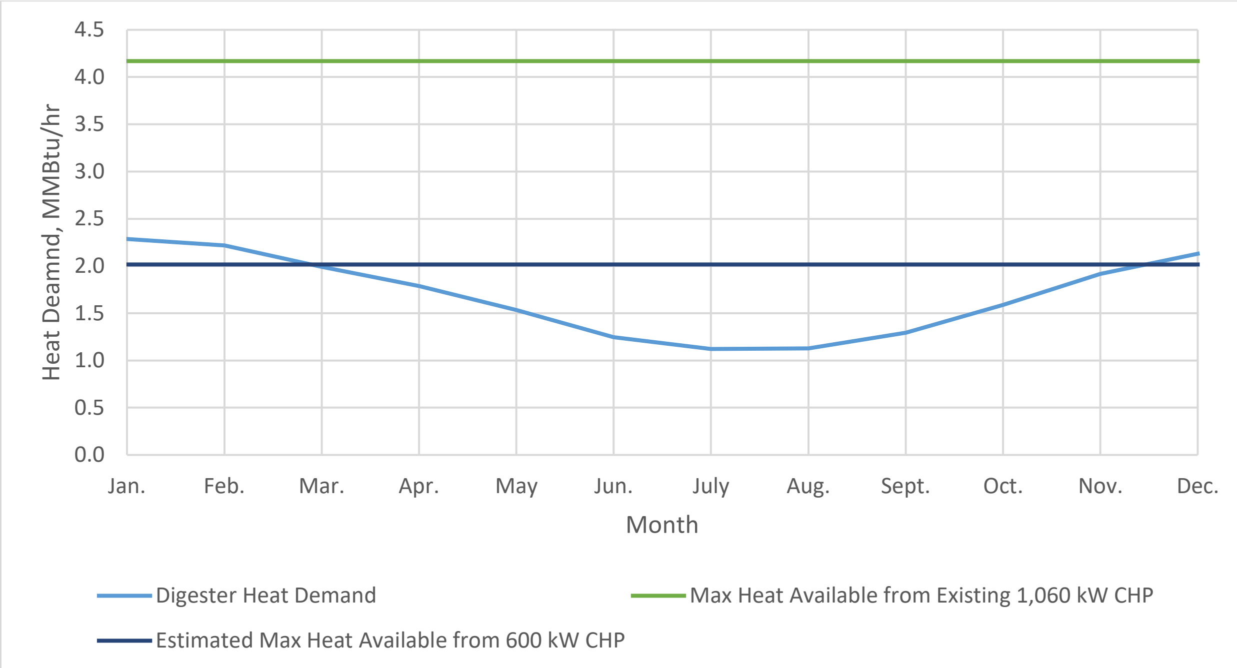


Figure 2-7 Heat Demand and Heat Available for Existing CHP

Overall, the 600 kW engine is better suited to match the digester heat demand and biogas production.

Table 2-20 lists the recommended CHP system design criteria. It is recommended that the system be designed in a dual-fuel arrangement to accept biogas, NG, or a blend of the two gases. The CHP system could be designed to run at 100% to maximize electrical output (on a blend of gases) or to minimize NG usage and run on biogas only. Biogas would need to be treated in the hydrogen sulfide, siloxane, and moisture removal system prior to being sent to the CHP system. Replacement of the biogas conditioning equipment in-kind is included in the OPCC.

Table 2-20 Recommended CHP System Design Criteria

Criteria	Value
Engine Size	600 kW
Quantity	2 (1 Duty / 1 Standby)
Fuel Source	Dual-Fuel (Biogas and NG)
Maximum Fuel Input, each	5.83 MMBtu/hr (162 scfm biogas)
Potential Manufacturers	Innio Jenbacher, Caterpillar
Heat Recovered	Hot Water, ~195 Degrees Fahrenheit
Minimum Efficiency	40% Electrical 44% Heat
Installation	Containerized Unit
Lead Time	12-months

2.9 Ferric Chloride System

As discussed in the 2023 FP, the ferric chloride chemical system within Building No. 2 is nearing the end of its useful life and needs to be replaced. This system doses the digestion feed and dewatering system. Originally, there was discussion to provide a new ferric chloride system in the dewatering building (MB 10.1) to feed these two process areas. However, after discussion with JCW, it was decided to replace the ferric chloride system within the RAS/WAS Chemical Building (Building No. 14). This system is also nearing the end of useful life and will eventually need to be replaced. During that project, a feed line would be added for the new dewatering building. **Table 2-21** and **Drawings 14-DM-1 and 14-M-01** summarize the ferric chloride system replacement scope.

Table 2-21 Ferric Chloride System Replacement Scope

Criteria	Value
Number of Tanks	2
Tank Volume, gal	8,000
Tank Type	High-Density Polyethylene
Number of Pumps	7
Pump Type	Peristaltic
Estimated Motor Power, hp	0.75 Each
Flow Ranges, gph (per pump)	MB-CMP 3003: 1.7–17 gph MB-CMP 3004 and 3005: 0.3–3.0 gph MB-CTP 8001 and 8002: 15 gph MB-CMP 3001 and 3002: 31–310 gph

Note: gph – gallons per hour

3.0 Opinion of Probable Construction Cost

The recommended improvements described in the 2023 FP include capital costs, presented as a Class V planning-level opinion of probable construction cost (OPCC). The cost estimates represent CDM Smith's best judgment as qualified professionals familiar with the construction industry and the scope of the proposed projects. The OPCCs presented represent CDM Smith's professional judgment and are provided for capital improvement planning purposes.[1]

3.1 Opinion of Probable Construction Cost Development

The OPCC includes both direct and indirect costs. Direct costs include:

- Major equipment, equipment skids, and tank purchase costs based on information obtained from selected equipment vendors and previous similar-sized treatment system costs
- Site work
- Allowances for process piping, electrical, sitework, and instrumentation
- Labor costs

Indirect costs, including contractor overhead and profit, engineering services, and contingency, are included as percentages of the construction costs. JCW provided guidance for determination of indirect costs in the "Simplified Version Facility Cost Estimating Template" Microsoft Excel file (dated September 6, 2024). **Table 3-1** summarizes the costs included in the OPCC and how they were calculated. Project costs are presented in July 2025 dollars and represent a Line Item 34 OPCC, which does not include engineering services or non-construction program administration fee (PAF) items. Costs do not include escalation. Costs associated with the CMAR fee (estimated as 10% of Line Item 34) are excluded from **Table 3-1** but included in the construction delivery estimates**;** refer to **Section 4.3** for discussion related to CMAR.

Table 3-1 OPCC Development Summary

Item No.	Cost Item	Description
26	**Construction Facility Subtotal (Rounded)**	**Sum of Direct Costs**
27	Mobilization and Demobilization	3% of Construction Facility Subtotal
28	Contractor Home Office Overhead	3% of Construction Facility Subtotal
29	General Conditions (Field Overhead)	10% of Construction Facility Subtotal
30	Contractor's Fee (Profit)	7.5% of Construction Facility Subtotal
31	**Construction Subtotal**	**Sum of Direct Costs with Contractor Overhead and Profit**
32	Design Contingency	40% of Construction Subtotal

[1] CDM Smith does not have control over the cost of labor, materials, equipment, or services furnished; schedules; contractor's methods of determining prices; or the competitive bidding market or negotiating conditions. CDM Smith does not guarantee that these opinions will not vary from actual cost or contractors' bids.

Item No.	Cost Item	Description
33	Contractors Bond and Insurance	2.5% of Construction Subtotal with Design Contingency
34	**OPCC**	**Construction Subtotal with Design Contingency and Contractor's Bonds and Insurance**
35	Construction Phase Services (CPS) – Engineering	10% of OPCC
36	**Subtotal OPCC plus CPS**	**OPCC with CPS**
37	CPS – Engineering Contingency	10% of CPS – Engineering
38	JCW Construction Contingency	2% of Subtotal OPCC plus CPS
39	**OPCC plus CPS and Contingency**	**OPCC with CPS, CPS Contingency, and JCW Construction Contingency**
40	PAF – Construction	1.75% of OPCC plus CPS and Contingency
41	**Construction Cost**	**Costs including OPCC, CPS, JCW Construction Contingency, and PAF**
42	Planning – Professional Engineering Services	3% of OPCC
43	Design – Professional Engineering Services	10% of OPCC
44	**Subtotal – Professional Engineering Services**	**Subtotal of Professional Engineering Services**
45	Planning and Design Services Contingency	10% of Subtotal – Professional Engineering Services
46	ROW/Utility/Easements – Easement	$0
47	**Subtotal – Planning and Design Engineering Services**	**Subtotal of Professional Engineering Services with Contingency and Easements**
48	PAF – Nonconstruction Items	1.75% of Subtotal – Planning and Design Engineering Services
49	**Subtotal – Planning and Design Engineering Services w/ PAF**	**Subtotal of Planning and Design Engineering Services with PAF**
50	**TOTAL PROJECT COSTS**	**Grand Total of Costs**

3.2 Project Costs

Costs for the nine project areas described in **Section 2.0** are summarized in **Table 3-2**. The costs are presented in July 2025 dollars and represent the OPCC (line item 34 from **Table 3-1**). Additional breakdown of project costs is included in **Section 4.5** where project prioritization is discussed. Overall, the total improvements for the project are $120M (line item 34). The total project cost (line item 50) associated with this construction cost is $143M.

Table 3-2 OPCC by Project

Project Scope	OPCC (July 2025 $)
PS Fermenter and Thickening	$8.85 million
Anaerobic Digester Rehabilitation	$25.2 million
New DSST and Support Bldg.	$28.2 million
New Dewatering Building	$36.4 million
Centrate EQ	$2.5 million
Building No. 2 Modifications	$2.05 million
FOG Receiving	$4.87 million
Biogas Utilization	$11.5 million
Ferric Chloride System	$0.98 million
TOTAL CONSTRUCTION COSTS	**$120 million**

With the impacts of tariffs over the last 6 months, CDM Smith has two projects that have gone to bid and are observing a 10% increase in projected construction costs. The OPCCs presented represent the cost estimate as of July 2025. Escalation of costs to align with the actual schedule is not included.

4.0 Implementation Plan and Schedule

This section describes the recommended MOPO and sequence of construction for the improvements related to the nine major process units:

- PS Fermenter and Thickening
- Anaerobic Digester Rehabilitation
- New DSST and Support Building
- New Dewatering Building (Building No. 10.1)
- Centrate EQ
- Building No. 2 Modifications
- FOG Receiving
- Biogas Utilization
- Ferric Chloride System

A summary of construction delivery alternatives is provided for each major process unit, along with a description of early work packages, project prioritization, and electrical considerations. Schedules for each delivery alternative are provided in **Appendix B**.

4.1 Maintenance of Plant Operations

Middle Basin is an active facility and must remain in service throughout construction. MOPO items include construction constraints (e.g., no more than one process unit can be removed from service at a time) and sequencing recommendations to help guide the contractor in the proper order to complete the work. These MOPO activities impact cost and schedule and can require temporary improvements to be put in place to complete the work and keep the facility operational. This section identifies these constraints and the resulting proposed construction sequence.

4.1.1 Primary Sludge Fermenter and Thickening

The process constraints listed below apply to the PS work related to the fermenter improvements, GT internal components replacement, and yard piping. It is recommended that fermenter improvement and GT internal equipment replacement be performed after the digester improvements.

- Improvements in the PS fermenter must be completed one cell at a time.
- All digesters (Nos. 1, 2, 3, 4, and DSST) must be in operation while the GT is taken out of service for repairs.
- The PS fermenters will need to be taken out of service when the GT is emptied. Process concerns and proposed JCW operational changes follow:
  - Without the fermenters in operation, total phosphorus (TP) goals may not be met. During this phase of work, the primary clarifiers will need to operate at a higher sludge blanket

depth to increase the PS solids concentration prior to digestion to limit feeding thin PS to the digesters. Middle Basin may experience a degradation in the percent removal of biological oxygen demand and TSS across the primaries, which will require more wasting than typical as a result of higher net solids yields.

  - The capacity of the PS pumps will need to be reviewed in reference to the increase in the solids content.
  - There are provisions to add ferric chloride to precipitate phosphorus in the mainstream process; however, this will increase the sludge yields and it is not recommended to dose ferric chloride when modifications to the solids handling systems are underway.

- The new fermenter pump house (Building No. 3.1) must be constructed prior to or during the demolition of the fermenter mixers and modifications to the fermenter and GT. The fermenter mixing and transfer pumps must be commissioned prior to the GT going online.
- Yard piping from the fermenter to the Building No. 3.1 fermenter pump house and GT can occur at any point; however, tie-ins to the fermenter must be coordinated with each fermenter cells' shutdown.

4.1.2 Anaerobic Digester Rehabilitation

The following process constraints apply to the digester improvements:

- Only one anaerobic digester tank (Nos. 1, 3, and 4) can be removed from service at a time after Digester No. 2 has been converted to a primary digester. Once repairs and cleaning are complete, each digester will need to be returned to service and allowed a period of 30 days for digester seeding and verification of full digester functionality prior to taking the next unit out of service.
- Existing digester feed lines from TPS, TWAS, scum, and FOG must be maintained until new feed lines are constructed and commissioned. In lieu of replacing the existing tie point at the inlet of the heat exchanger, an alternate digester feed line directly into the tanks may be considered.

4.1.3 New DSST and Support Building (Building No. 4.1)

The following process and electrical constraints apply to the new DSST and Building No. 4.1:

- Demolition of the existing biogas dome must occur prior to construction of the DSST and Building No. 4.1. Likewise, the DSST and Building No. 4.1 must be constructed and commissioned prior to taking Digester No. 2 (secondary digester) offline for conversion to a primary digester. Building No. 4.1 is also required to be completed to provide power to all digester equipment.
- The new centrifuge feed pumps, located in Building No. 4.1, will need to be routed to the existing BFPs until the centrifuges in Building No. 10.1 are ready to receive digested sludge.
- One boiler and corresponding recirculation loop must be kept online at all times.

4.1.4 Building No. 2 Modifications

The following constraints apply to Building No. 2 modifications:

- The new centrifuges must be operational prior to demolishing the existing dewatering BFPs.
- During demolition of the existing thickening dry polymer system and construction of the permanent emulsion system for WAS thickening, the temporary emulsion polymer system must remain in operation.
- The ferric chloride system located in Building No. 2 will be demolished after the ferric chloride system in the RAS/WAS chemical building (Building No. 14) is replaced.

4.1.5 New Dewatering Building (Building No. 10.1)

The following process and electrical constraint applies to the new dewatering building (Building No. 10.1):

- The existing equipment and controls that will remain at the MCC and PLC located in the existing sodium hypochlorite building (Building No. 10) must be temporarily relocated and fed prior to demolition of this existing building. These items include the chlorine rapid mixers and a PLC fiber loop, and the EQ basin equipment.
- The existing cogeneration system and existing Building No. 10 must be removed prior to beginning construction of Building No. 10.1.
- The new centrifuge feed pumps in Building 4.1 and the DSST must be operational prior to the commissioning of the centrifuges.

4.1.6 Centrate Equalization

The following constraint applies to the centrate EQ tank construction:

- It is recommended to construct the new centrate EQ tank prior to installing the new dewatering centrifuges so that centrate can be routed to the centrate EQ tank during centrifuge commissioning to bleed in concentrated slug loads of centrate returned to the head of the BNR process.

4.1.7 FOG Receiving

The constraints that apply to FOG handling improvements include maintaining the FOG systems online at all times and maintaining all existing FOG feed lines throughout construction, specifically:

- The FOG equipment and tank replacement must be installed sequentially, and FOG feed needs to continue to the online primary digesters.
- The existing FOG feeding lines are to be maintained throughout construction. When one digester is offline, FOG feed needs to continue to the two online primary digesters.

4.1.8 Biogas Utilization

The following process constraints apply to biogas equipment, including the CHP system:

- The existing CHP system (which is not in service) will be demolished during construction.
- Demolition of the existing CHP system is required prior to construction of Building No. 10.1. It is recommended that the new CHP system be installed after construction of the dewatering facility because of routing of the new centrifuge feed lines to Building No. 10.1.

4.1.9 Ferric Chemical System

The following process constraints apply to the ferric chloride system in Building No. 14:

- One ferric chloride system must be kept online at all times. Equipment installation and tank replacement must occur sequentially.
- The ferric chloride feed must be connected to the equipment in Building No. 10.1 prior to demolishing the ferric chloride feed in Building No. 2.

4.2 Sequence of Construction

A phased construction sequence is required to maintain continuous plant operations during construction. The proposed sequence listed herein may be altered by the general contractor (GC) after proposals are received. The initial proposal is summarized in this section.

4.2.1 Primary Sludge Fermenter and Thickening

4.2.1.1 Fermenters and Associated Pumps

1) Construct fermenter effluent pumps, mixing pumps, and associated piping. Test and commission with Fermenter No. 1 once brought back online.
2) Shutdown Fermenter No. 1, demolish the vertical shaft mixer, and provide new pipe penetrations for and make final connections to the effluent pumps and mixing pumps. Bring Fermenter No. 1 online and start up the pumping systems.
3) Shutdown Fermenter No. 2, demolish the vertical shaft mixer, and provide new pipe penetrations for and make final connections to the effluent pumps and mixing pumps. Bring Fermenter No. 2 online.

4.2.1.2 Gravity Thickener

1) Isolate the GT from operation and drain the tank. Replace the internal equipment and test the system. Once commissioned, bring the GT back online.

4.2.2 Anaerobic Digester Rehabilitation

4.2.2.1 Primary Digester Nos. 1, 2, 3 and 4 Improvements

1) After the DSST and Building No. 4.1 are operational, drain, purge, and clean Digester No. 2.
2) Perform the demolition work associated with the selected digester, including demolishing the piping, pumps, and cover.

3) Clean the selected digester.
    a) NOTE: Quantifying the digester contents to be removed is necessary for bidding purposes, due to the consolidated grit in the digesters and previous experiences at the Tomahawk and Nelson Plants.
4) For Digester No. 2, convert it to a primary digester.
5) Construct the new digester cover, piping, and equipment associated with the digester. Connect the digester to the existing gas piping. New equipment will receive power from MCCs in Building No. 4.1.
6) Reseed, start up, and commission the digester and related facilities (pumps, piping, and appurtenances). Use the existing digester gas piping and waste gas burner.
7) Perform similar procedures (steps 1 to 5) for the remaining digesters (No. 1, 3, or 4) sequentially (one at a time).

4.2.2.2 Waste Gas Burners and Digester Gas Piping

1) Construct a new waste gas burner header on the east side of the structure. The existing digester gas piping and waste gas burners will be used until new waste gas burners are constructed and ready to be commissioned.
2) Construct new waste gas burners sequentially (one at a time) by isolating one existing waste gas burner from the header piping. Provide at least two operational waste gas burners at all times.

4.2.2.3 Yard Piping

1) Construct the TPS, TWAS, and scum piping. Final connection to the digesters will occur during the digester tank shutdowns, as detailed in **Section 4.2.2.4**. Testing will occur once all digesters have new piping installed. Abandon the existing yard piping once testing is complete and the new piping is in operation.

4.2.2.4 Electrical Improvements

Replacing the existing loads from existing Building No. 4 to new Building No. 4.1 will follow a specific sequence to ensure the loads related to the DSST are installed and operational first.

1) After the DSST loads are commissioned and the DSST is online and operating, Digester No. 2 pumps can then be transferred.
2) The pump loads are being transferred from Building No. 4 to Building No. 4.1. Their equipment will also be replaced during this process. Each set of digester pumps will be replaced individually as follows:
    - Install the following new pumps and transfer loads for Digester No. 2 equipment: Digester Mixing Pump No. 2, Recirculation Pumps Nos. 2 and 3, and Plant Water Pump No. 2.
    - After Digester No. 2 is operational, the same steps will be followed for the next digester. This process continues until all digester equipment has been replaced and the power feed is moved to Building No. 4.1.

3) Boiler relocation can occur at any time after Building No. 4.1 is constructed.

4.2.3 New DSST and Support Building (Building No. 4.1)

1) Construct new digester gas piping from Building No. 16 (the existing low point for condensate collection) to the new waste gas burners. Piping will be routed overhead to allow for construction of the FOG road.
2) Construct a new road west of the FOG building so access is available for the plant to continue to receive FOG during construction.
3) Demolish the digester gas storage tank pad.
4) Construct the DSST, Building No. 4.1, and associated underground utilities including the DSST feed piping, DSST mixing piping, dewatering feed piping, hot water piping, and ductbanks. Provide connection from the new dewatering feed pumps to the existing BFP feed lines.
5) Install the electrical systems, including the new MCCs that feed all digester equipment. Work related to powering the new digester equipment can begin once the MCCs are ready.
6) Install the related DSST equipment and the remaining piping. Connect the digester gas piping to the tank cover. Test and commission the DSST and associated equipment.
7) Work related to boiler relocation may occur at any time once the building, electrical systems, and yard piping is constructed. Boilers will be sequenced one system at a time.

4.2.3.1 Electrical Improvements

1) The new ductbank will be constructed from the existing upstream 12 kV switchgear to the new transformers near the new electrical building prior to initiating construction of Building No. 4.1.
2) Construction of Building No. 4.1 must be completed before replacing MCC-5A and MCC-5B with MCC-5.
3) MCC-5 is to be installed and tested prior to transferring any existing loads from MCC-5A and MCC-5B.
4) The replacement of existing loads from existing Building No. 4 to new Building No. 4.1 will follow a specific sequence to ensure loads related to the DSST are installed and operational first. The following loads are included:
   - Digested sludge pumps (replace one at a time)
   - DSST mixing pumps (both may be installed simultaneously)
   - New HVAC equipment for Building No. 4.1
   - Dewatering feed pumps (both may be installed simultaneously)

4.2.4 Building No. 2 Modifications

1) Construct the Dewatering Building (Building No. 10.1) and install new equipment.
2) Construct the new ferric chloride tank and pumps in MB-14.
3) Demolish the BFPs and ferric chloride feed system in Building No. 2.

4) Start-up and commission the permanent WAS thickening emulsion polymer equipment.

4.2.5 New Dewatering Building (Building No. 10.1)

1) Provide temporary power for the existing equipment that is to remain in Building No. 10 (including the PLC connected to the fiber loop and chlorine rapid mixers). **Section 4.2.5.1** provides more information on electrical improvements.
2) Demolish the Sodium Hypochlorite Building (Building No. 10) and CHP system.
3) Construct the Dewatering Building (Building No. 10.1) and install new equipment.
4) Start-up and commission the equipment. Switch the centrifuge feed pumps from sending digested sludge to the BFPs to the centrifuges.

4.2.5.1 Electrical Improvements

1) The new ductbank will be constructed from the existing 12 kV switchgear to the new transformers near the new electrical building prior to initiating construction of Building No. 10.1.
2) Construction of Building No. 10.1 must be completed before replacing MCC-6A and MCC-6B with MCC-6.
3) MCC-6 is to be installed and tested prior to transferring any existing loads from MCC-6A and MCC-6B.
4) Existing loads must be transferred one at a time to MCC-6 to ensure uninterrupted plant operations.
5) Provide temporary power to the existing PLC connected to the fiber loop and chlorine rapid mixers.

4.2.6 Centrate Equalization

1) Demolish the Sodium Hypochlorite Building (Building No. 10) and CHP system.
2) Construct the new centrate EQ tank and install the new equipment.

4.2.7 Biogas Utilization

1) Remove the existing CHP system (currently not in use).
2) Install new CHPs following completion of the new Dewatering Building (Building No. 10.1).

4.2.8 FOG Receiving

Two FOG systems must be kept online at all times. Equipment and tank replacement must be installed sequentially.

1) Drain one FOG tank and perform the demolition work associated with the standby FOG equipment, including pumps, tank, inline grinders, and heat exchangers.
2) Construct the new FOG tank and equipment, including pumps, inline grinders, and heat exchangers. Connect the tank and equipment to the existing piping.

3) Start up and commission the new equipment and tank. Once in operation, begin similar work on the remaining FOG tanks and equipment.

4.2.9 Ferric Chemical System

1) Empty the ferric chloride tanks one at a time and perform the demolition work associated with the standby ferric chloride pumps.
2) Construct the new ferric chloride tank and pumps.
3) Start up and commission the new tank and pumps. Once in operation, begin similar work on the remaining ferric chloride tank and equipment.

4.3 Construction Delivery Alternatives

The contractual working relationship between the owner, contractor, and engineer defines the trajectory and success of a project. The project scope, construction complexity, and owner's capacity typically point to which delivery method is best suited. The project team coordinated with JCW to select three reasonable alternatives for comparison:

- Alternative 1 – One Design-Bid-Build (DBB) Project
- Alternative 2 – One Construction Manager at Risk (CMAR) Project
- Alternative 3 – Two Projects: Dewatering Improvements as DBB and Digester Improvements as CMAR

Regardless of the alternative selected, smaller projects could be implemented either inside or outside of the larger grouped packages to allow JCW to manage their cash flow and impacts to rates in the future, which are summarized at the end of this section.

4.3.1 Alternative 1 – One DBB Project

This alternative uses a DBB method for constructing all proposed improvements by one GC. DBB is the traditional method of construction where design is completed, the project is publicly bid and the -lowest price contractor is awarded the project, and the GC completes the work.

Competitive sealed proposals (CSPs) are similar to DBBs, but JCW would be allowed to score the proposals not only based on cost, but other factors such as qualifications, experience, the quality of the firm, and familiarity with the facility. JCW can tailor selection criteria to meet specific needs and goals. CSPs often create a more competitive bidding environment for smaller local contractors. While this method is not widely used in Kansas at this time, it is allowed by state procurement rules and was successfully implemented in Wichita to secure their GCs for projects over $100 million.

4.3.1.1 Schedule

The DBB schedule, included in **Appendix B**, is defined in the following phases that occur sequentially:

- Design and Permitting – 23 months
- Bidding – 6 months
- Construction – 3 years and 10 months

- Total Duration – 6 years and 4 months

All schedules in **Section 4.0** assume the same start date of January 2026 to maintain the same baseline for comparison. The final start dates for these projects should be set by JCW.

Alternative 1 accounts for a 6-month bidding period to get a contractor under contract. This assumes an 80-day advertisement and 60 days for contract review and award. Since this is a traditional approach, JCW will not be required to go through the phased approach to alternative delivery procurement. These requirements are further detailed below in **Section 4.3.2**.

4.3.1.2 Cost Impacts

The project cost for Alternative 1 is expected to be $120 million in 2025 dollars at the current estimate. Because of the size of the project, it may be difficult to obtain multiple bidders, which could inflate the costs received at the time of bid. The CSP methodology outlined herein may encourage additional support and is recommended to be considered since the project cost is over $50 million.

With traditional delivery projects, the CMAR fee and preconstruction services are not included in the overall cost of the project and are therefore lower at the time of bid. There is no guarantee of a maximum price, and with complicated rehabilitation projects, it would be anticipated that there could be higher-than-typical change orders because of unseen conditions in the field.

4.3.1.3 Advantages and Disadvantages

Table 4-1 provides the advantages and disadvantages of a traditional DBB delivery method.

Table 4-1 Advantages and Disadvantages of DBB Delivery Method

Advantages	Disadvantages
Proven and familiar (traditional roles)	No cost guarantee
Well-understood risk allocation	Likely to have the most change orders
Specifications based	Owner “owns” any performance issues
Predictable schedule	Longer schedule by approximately 6 months
Existing procurement process	No contractor input during design that may allow for additional value engineering reductions
Fewer indirect costs	Contractor selects equipment based on lowest cost
	Closed books to the project financials and selection of equipment and subcontractors

4.3.2 Alternative 2 – One CMAR Project

This alternative includes a CMAR delivery method for one project that encompasses all the recommended improvements.

CMAR involves the owner contracting with the engineer and CMAR separately. The CMAR acts as a consultant during the design phase (considered preconstruction services), where the CMAR maintains the cost model for the project, provides value engineering reviews and input throughout the design process, and builds the construction schedule. Once the design has progressed, typically as soon as 60% or as late as completed design, a guaranteed maximum price (GMP) is negotiated, and the CMAR completes procurement and begins work. A CMAR firm can self-perform work on projects, however, sometimes there are limitations to how much, and this is typically negotiated between the Owner and CMAR firm as the GMP is developed.

4.3.2.1 Schedule

A CMAR approach can expedite the project schedule through the collaboration of the engineer and the GC. The owners are provided the opportunity to choose preferred equipment without sole-sourcing by preselecting and/or pre-procuring equipment with long lead times, which is often performed with CMAR to reduce overall project duration. This approach is best suited for owners that want to achieve the maximum degree of budget control and complete transparency in the bidding process.

The CMAR schedule shown in **Appendix B** is defined in the following phases, where design, CMAR procurement, and preconstruction services occur in parallel, leading to construction services starting sooner:

- Design and permitting – 23 months
- CMAR procurement and preconstruction services – 1 year and 9 months
- Construction – 4 years
- Total duration – 5 years and 10 months

The State of Kansas requires two extra steps when procuring an alternative delivery method in comparison to traditional delivery. These steps have been accounted for in the Alternative 2 and Alternative 3 schedules using the durations provided by JCW. Time has been provided in the schedule to follow Kansas Statutes Annotated 12-1,118 and as presented in the two Board of County Commissioners (BOCC) presentations "Johnson County Committee of the Whole Meeting" and "Approval of Design and Request for Alternative Delivery." JCW typically works to complete the engineering request for proposal and then move directly into the request for alternative delivery. CDM Smith's schedule shows the design professional receiving the notice to proceed during the CMAR procurement phase, with the CMAR getting under contract at approximately the 30% design milestone, which is typical of CMAR projects.

4.3.2.2 Cost Impacts

The CMAR firm is required to deliver the project within a fixed, negotiated price provided no scope changes are negotiated with the owner. Because of the size of the project, it is likely that JCW would receive more proposals from contractors interested in delivering this project with a CMAR delivery over a hard-bid approach.

CMAR fees range from 7% to 10% and vary based on the size of the project. There is typically a preconstruction fee of roughly $0.5 to $1 million that covers the CMAR's involvement through the design phase. The subcontracting tasks are competitively bid and may result in cost savings. Open-book competitive bidding is a strength of CMAR; however, bidding everything can be labor-intensive for the owner and engineer in terms of reviews.

A CMAR engaged early could procure long-lead-time equipment early and lock in pricing earlier in the project, reducing escalation impacts to project costs and resulting in an overall less costly project.

Careful comparison of general conditions is necessary though, as starting early does not necessarily guarantee an early completion based on the nature of the project and construction requirements.

Overall, the project cost for Alternative 2 is estimated to be 10% higher than the cost for Alternative 1 to account for CMAR fees, for a total of $132 million (2025 dollars at the current estimate). However, this does not consider the additional change orders that would be associated with the DBB process and would be added to the costs throughout construction.

4.3.2.3 Advantages and Disadvantages

Table 4-2 provides the advantages and disadvantages of the CMAR alternative delivery method.

Table 4-2 Advantages and Disadvantages of CMAR Delivery Method

Advantages	Disadvantages
Performance issues/challenges can be mitigated early	Untraditional timing (may involve preselection and/or pre-procurement)
Early contractor involvement helps manage risk and provides value engineering input during design	Multiple procurement packages, which requires more owner involvement
Specification-based with GC input	Multiple contracts
Accelerated schedule as a result of concurrent procurement	Coordinated deliverables
Similar to progressive design-build (PDB) but not as aggressive (i.e., familiar approach but with more collaboration)	CMAR fee and preconstruction fee
GMP should reduce the risk of change orders	
Can leverage early procurement packages to reduce escalation/inflation cost impacts and/or schedule to the project	
Open books to allow owner more understanding of project costs	

4.3.2.4 Progressive Design-Build

A PDB approach potentially has the fastest delivery, since design progresses concurrently with construction. The procurement for a PDB team would move the engineering contract into a team with the GC and no longer with the owner.

This approach is advantageous when a fast turnaround is needed, attributed to construction starting early. A single contract with the PDB team leaves a single source of responsibility. The cost of the project is developed utilizing open-book estimating which enhances cost certainty through transparency of approach and assumption documentation. The cost is progressively developed as the project design advances, where a guaranteed maximum price is developed at a predetermined contract milestone. In this method, risk is shared among the owner and design-builder compared to a construction manager assuming risk in CMAR. PDB projects can also have high complexity due to continuous collaboration between contractor, owner and engineer. Some projects, such as the digester rehabilitation scope or the FOG receiving upgrades include retrofitting equipment that impact the capacity (e.g., less digestion capacity during construction will require a longer dewatering schedule). JCW prefers to provide input during the design, especially with complicated MOPO. The complexity of such projects will require extensive coordination between the owner, engineer, and contractor during preliminary design.

At the time of evaluation, this was not a preferred method for further consideration by JCW on this project.

4.3.3 Alternative 3 – Two Projects (Digester CMAR and Dewatering DBB)

Alternative 3 assumes all of the digester R&R projects will be delivered under CMAR and the new dewatering building (Building No. 10.1) and other solids improvements will be packaged together in a separate project and delivered as DBB. **Table 4-3** shows the division of projects based on this delivery approach. The digester improvements and upgrades have inherently more difficult MOPO when compared to the new dewatering building, which is essentially a greenfield project for this reason, splitting projects and providing an alternative delivery method for the digester improvements can be advantageous for JCW in terms of risk management. When the projects are divided, the concerns with being too large for hard bid is reduced.

During development of the 2023 FP, the facility planning team laid out future improvements over multiple years. JCW later evaluated individual improvements and grouped them together into projects for incorporation into the capital improvement program (CIP). This approach allows JCW additional schedule flexibility that may be preferred in the future.

Table 4-3 Alternative 3 Delivery Approach per Solids Improvement Project Identified

CMAR	DBB
Anaerobic Digestion Rehabilitation	PS Handling
Secondary Digester Conversion	FOG Receiving
DSST	Solid Building (Building No. 2) Modifications
DSST Support Building (Building No. 4.1)	New Dewatering Building (Building No. 10.1)
	Ferric Chloride Chemical System
	Biogas Utilization
	Site Work and Yard Piping

4.3.3.1 Schedule

The schedule for Alternative 3 assumes two delivery methods: CMAR for the digester improvements and DBB for all other solids projects. As discussed in **Section 4.2.1**, the CMAR approach can expedite the project schedule through the collaboration of the engineer and the GC, which has added benefits for complex projects. It is recommended to begin the dewatering building project first utilizing a traditional delivery method, with the digester project delayed approximately 1 year.

The Alternative 3 schedule, included in **Appendix B**, is defined in the following phases where the traditional approach for the dewatering building and other solids improvements occurs first, with design, bidding, and construction occurring sequentially:

- Design and Permitting – 24 months
- Bidding – 6 months
- Construction – 2 years and 5 months

The digester improvements project is shown starting 1 year after the DBB project with design, CMAR procurement (accounting for the two additional BOCC steps required per JCW documented in **Section 4.2.1**), and preconstruction services occurring in parallel, followed by construction services:

- Design and Permitting – 21 months
- CMAR Procurement and Preconstruction Services – 1 year and 6 months
- CMAR Construction – 3 years and 7 months

The total project duration is anticipated to be 5 years and 10 months, making this project schedule comparable to Alternative 2, as detailed in **Section 4.2**.

4.3.3.2 Cost Impacts

Cost impacts for this method are complicated to quantify. There is likely a certain amount of double-counting in General Conditions by involving two General Contractors versus one in terms of staff, and performing work over longer periods could also result in a minor increase. However, these small increases may be offset based on JCW's financial model and rate impacts.

Costs for Alternative 3 are estimated to be $56.4 million for the Digester CMAR project (which accounts for the work related to the digesters and DSST plus a 10% CMAR fee) and $68.7 million for the remaining work under a DBB project. The total cost of these two projects is $125.1 million (2025 dollars at the current estimate). DBB projects do not account for change orders that could impact the schedule and cost of the DBB delivery.

4.3.3.3 Advantages and Disadvantages

Table 4-4 provides the advantages and disadvantages of Alternative 3. The main advantage of this alternative is the tailored approach that uses the delivery method that best benefits the project.

Table 4-4 Advantages and Disadvantages for Alternative 3

Advantages	Disadvantages
Tailored delivery approach per project	Multiple procurement packages
Ensures collaboration with the DB team and owner on identified projects that require collaboration	CMAR fee and a preconstruction fee for the digester project only
Obtains CMAR GMP and input on the riskiest portion of the work associated with the rehabilitation of the digesters	There is a tie-in between the two projects that will need to be carefully coordinated between both projects
Allows opportunities for multiple bidders and potentially more interest depending on the market	More shop drawings and construction administration activities when split across two projects and less standardized equipment between the two (e.g., Eaton VFDs are supplied for digesters and Square VFDs could be supplied for the Dewatering Building)
Will likely gain more interested contractors for the DBB Dewatering Building because of the smaller size and more straightforward scope	More Owner involvement and administration
Allows JCW to tailor the cash flow of the projects better for rate impacts	

A summary of the different delivery options including 2025 OPCCs is provided below in **Table 4-5**. A table summarizing the recommended delivery options is provided in **Section 5.0**.

Table 4-5 Delivery Alternatives Summary

Alternative	Description	Total Project Duration	2025 OPCC
Alternative 1	One Design-Bid-Build (DBB) Project	6.4 years	$120 million
Alternative 2	One Construction Manager at Risk (CMAR) Project	5.8 years	$132 million
Alternative 3	CMAR (Digester & DSST) and DBB (Dewatering & Other)	5.8 years	$125 million

4.4 Early Work Packages

The primary goal of an early work package is to reduce the overall construction sequence for the larger improvement projects. Early work packages include work that does not require significant equipment procurement or commencing purchasing of long-lead-time items. A disadvantage of early work packages is that they require additional JCW project management time and would need to be balanced with other CIP priorities. The following early work packages could be considered for any of the alternatives presented in **Sections 4.1-4.3**:

- **Demolition of Building No. 10 and CHPs** – This allows for 3 to 6 months less construction time. If bid as a stand-alone project, this could also remove this scope from the CMAR fee markups.
- **Demolition of the Gas Storage Tank Pad** – This allows for a 3 to 6 month less construction time. If bid as a stand-alone project, this could also remove this scope from the CMAR fee markups.
- **Early Procurement of the Centrifuges during Design** – This locks in price, allows design specific to unit-reducing design costs, and allows tailoring the design of the new facility to the units in question, and could receive equipment earlier in construction.
- **Procurement of the DSST** – This is typically a tank specific to specialized fabricators (e.g., DN Tanks). Procuring this as a stand-alone project would remove GC markups on a large, subcontracted item if JCW is willing to take on additional administration and coordination items.

4.5 Project Prioritization

After discussion with JCW, it was determined that each project would need to be prioritized based on facility need and construction sequence, and then compared to the funds available. This exercise will help determine projects to prioritize and projects that can be delayed. **Table 4-6** summarizes the prioritization for the specific items within each project's scope. The line items were grouped in the following categories: High priority, Medium-High priority, Medium priority, Medium-Low priority, and Low priority. From these categories, a priority rank was given to each item. The highest-priority item is given a value of 1 and each subsequent prioritized item is given the next sequential number.

OPCCs associated with the project scope and each line item were developed and are included in **Table 4-6**. Line items are listed in order of priority ranking, with highest-priority items at the top. The subtotal column in **Table 4-6** represents the cost of the projects (i.e., all items up to that priority rank). This will help JCW determine which projects can be completed with the current budget and help determine which items can be delayed.

Table 4-6 Prioritization Rankings and Cost Breakdown of Improvements

Project Scope	Item Description	Priority Group	Rank[1]	2025 OPCC[2]	2025 Cumulative OPCC[2]	Priority Group OPCC[2]
Anaerobic Digester Rehab	Digester gas piping to flares	High	1	$891,000	$0.89M	
New DSST and Support Bldg.	New road to FOG Building	High	2	$108,000	$1.0M	
New DSST and Support Bldg.	Demolition of gas membrane pad, DSST Tank and Support Building, associated piping and equipment, boiler relocation	High	3	$24,900,000	$25.9M	
New DSST and Support Bldg.	Converting Digester No. 2 to a primary digester and Digester No. 2 cover replacement and cleaning	High	4	$2,590,000	$28.5M	$38.6M
Anaerobic Digester Rehab	All digester equipment – pumps and heat exchangers	High	5	$4,280,000	$32.8M	
Anaerobic Digester Rehab	Digester gas safety equipment	High	6	$629,000	$33.4M	
Anaerobic Digester Rehab	Digester No. 1 and 3 cover replacement and cleaning	High	7	$5,170,000	$38.6M	
Anaerobic Digester Rehab	Replace piping in Building No. 4	Medium-High	8	$7,780,000	$46.3M	
Anaerobic Digester Rehab	Dedicated digester feed lines for TPS, Scum, and TWAS	Medium-High	9	$2,340,000	$48.7M	$12.7M
Anaerobic Digester Rehab	Digester No. 4 cover replacement and cleaning	Medium-High	10	$2,590,000	$51.3M	
New DSST and Support Bldg.	Truck staging area for dewatered cake and fog hauling	Medium	11	$558,000	$51.8M	
New Dewatering Building	Demolition of CHPs	Medium	12	$81,000	$51.9M	
New Dewatering Building	Demolition of Building 10 and temporary electrical power	Medium	13	$566,000	$52.5M	
New Dewatering Building	Dewatering building including equipment, piping, and access roads. (Does not include centrate EQ tank and pump station)	Medium	14	$35,700,000	$88.2M	$39.9M
Centrate EQ	Centrate EQ tank and pump station	Medium	15	$2,470,000	$90.7M	
Building No. 2 Modifications	Demolition of BFPs	Medium	16	$284,000	$90.9M	
Primary Sludge Handling	Digester feed pump replacement	Medium	17	$246,000	$91.2M	
Primary Sludge Handling	Fermenter improvements and gravity thickener rehab	Medium-Low	18	$8,600,000	$99.8M	
Building No. 2 Modifications	Thickening polymer system	Medium-Low	19	$1,770,000	$101.6M	$11.9M
Anaerobic Digester Rehab	Demolition and new waste gas burners	Medium-Low	20	$1,490,000	$103.0M	
FOG Receiving	FOG equipment replacement	Low	21	$4,870,000	$107.9M	
Ferric Chloride System	Ferric tanks and pumps	Low	22	$966,000	$108.9M	$17.3M
Biogas Utilization	New CHPs and associated piping	Low	23	$11,500,000	$120.4M	

Notes:

1. The rank presented is a combination of facility priorities and construction sequencing.
2. The costs presented represent the OPCC and do not include engineering or nonconstruction program administration fees.

It was determined that the digestion and DSST projects should be given the highest priority due to the need for increased digester capacity. However, implementing these projects would render the existing road to the FOG Building inaccessible during construction. To address this, a new FOG access road must be constructed first. This secondary road to the FOG Building is planned to run west of Digester No. 1. Before construction of this road, the elevation of the digester gas piping to the waste gas burners will need to be increased to allow for truck traffic. Therefore, new digester gas piping and FOG road were given priority rank 1 and 2, respectively.

A minimum of three primary digesters must remain operational at all times due to current digester loading while maintaining FOG addition. Therefore, work related to the DSST, Building No. 4.1, and Digester No. 2 is necessary prior to proceeding with the rest of the digestion work. Once these facilities are commissioned, work associated with digester equipment, as well as the cover replacement and cleaning for Digesters No. 1 and 3, can proceed. Cover replacement and cleaning for Digester No. 4 may be delayed due to its more recent construction in 2011. Expanding digester capacity has been identified as the highest priority followed by replacing digester piping and digester feed lines, which has been identified as Medium-High priority.

Work related to the new Dewatering Building was ranked as medium priority. Construction sequencing requires demolition work to be completed first, followed by the construction of Building No. 10.1. Following this work, the centrate EQ tank and demolition of the existing BFPs were given the subsequent rankings. The last item in the medium priority group is replacement of the thickened primary sludge digester feed pumps. These current pumps are oversized and a more appropriately sized pump is recommended.

Medium-Low priority scope includes the fermenter, gravity thickener, thickening polymer, and waste gas burners. The new headworks screens are expected to resolve fermenter ragging issues, and the gravity thickener mechanism was upgraded to stainless steel in 2006, so CDM Smith and JCW agreed that both can be postponed. The thickening polymer has a functional temporary system, which also places its replacement at lower priority. The replacement of the waste gas burners can be delayed, as those were installed in 2011.

The FOG equipment replacement, ferric equipment replacement, and CHP work were assigned the lowest priority. The FOG equipment is typically replaced as needed, the ferric equipment and tanks function adequately, so its replacement work can postponed. The work related to CHP and biogas cleaning equipment replacement is not required by the facility or any permitting agency.

5.0 Summary of Recommendations

Through coordination with JCW, the Solids Treatment Improvement Project has been categorized into four alternatives. These options reflect two different scope breaks and two distinct delivery methods. The project scope is determined by the priorities outlined in **Table 4-6** and the available budget. The four project options are summarized in **Table 5-1**, which also details the advantages and disadvantages of each construction delivery method. Only the High, Medium-High, and Medium projects listed in **Table 4-6** are anticipated to be included in the upcoming Solids Treatment Improvements Project. The four alternatives are:

- Alternative A1 – DBB of High and Medium-High Projects
- Alternative A2 – CMAR of High and Medium-High Projects
- Alternative B1 – DBB of High, Medium-High, and Medium Projects
- Alternative B2 – CMAR of High, Medium-High, and Medium Projects

The 2025 OPCC for these options ranges from $51.3M (Alternative A1) to $100M (Alternative B2). If only the High and Medium High projects are pursued, both DBB and CMAR delivery methods are feasible (Alternatives A1 and A2). However, if the Medium projects are added, selecting a CMAR (Alternative B2) is recommended due to limited contractor interest in DBB at the $90-100M range. The DBB method requires a precise construction sequence for maintaining plant operations and sets qualification criteria for choosing the lowest responsible bidder. Prequalifying bidders is preferred if Purchasing agrees; otherwise, CMAR is recommended for both scopes described below.

Table 5-1 Recommended Project Summary and Construction Delivery Method

	DBB of High & Medium High Projects	CMAR of High & Medium-High Projects	DBB of High, Medium-High, and Medium Projects	CMAR of High, Medium-High, and Medium Projects
Alternative	A1	A2	B1	B2
2025 OPCC	$51.3M	$56.4M	$91.2M	$100M
Scope	▪ Replace digester gas piping to flares + construct new FOG road ▪ DSST Tank and Support Building ▪ Conversion of Digester 2 to a primary digester ▪ Replacement of digester equipment ▪ Digester cover + cleaning (No. 1-4) ▪ Replace digester piping and digester feed lines		Same as Alternative A plus: ▪ Truck staging area ▪ Dewatering Building (Building No. 10.1) ▪ Centrate EQ ▪ Demolish BFPs ▪ Replace TPS Digester Feed Pumps	
Advantages	▪ Specification based ▪ Fewer indirect costs ▪ Low price selection ▪ High level of interest from potential GCs ▪ No preconstruction services cost ▪ Less administrative time by JCW ▪ *Construction cost risk is equivalent but managed differently* ▪ More interest from potential contractors compared to Alternative B1 Project[1]	▪ Contractors involved in MOPO during development stages, allowing for costs to be captured and sequencing to be prioritized during early phases ▪ GC can help manage risk and provide VE input ▪ GC review of design during development ▪ Accelerated schedule compared to DBB ▪ *Construction cost risk is equivalent but managed differently* ▪ Can leverage early procurement packages to reduce escalation ▪ Open books on project costs ▪ Lower cost compared to Alternative B2 Project[2]	Same as Alternative A1 plus: ▪ More scope	Same as Alternative A2 plus: ▪ More scope ▪ More interest from potential contractors compared to Alternative A2 Project
Disadvantages	▪ Complicated bid form with many alternates ▪ Constructive cost tracked by Engineer and not GC ▪ Limited GC VE ideas during design ▪ Equipment selected by lowest cost ▪ Closed books on project financials ▪ Early procurement required to accelerate schedule	▪ Multiple procurement packages could require more Owner input ▪ Potential for multiple GMPs ▪ Extended design time due to Contractor ROM estimates ▪ CMAR fee and preconstruction fee adds cost ▪ Reduced level of interest for some subcontractors to work on CMARs compared to DBB ▪ More cost compared to DBB ▪ Less interest from potential contractors compared to Alternative B2 Project[2]	Same as Alternative A1 plus: ▪ Less interest from potential contractors to Alternative A1 Project	Same as Alternative A2 plus: ▪ Highest Cost

Notes:

[1] Only applies to Alternative A1 Project

[2] Only applies to Alternative A2 Project

Appendix A Conceptual Drawings

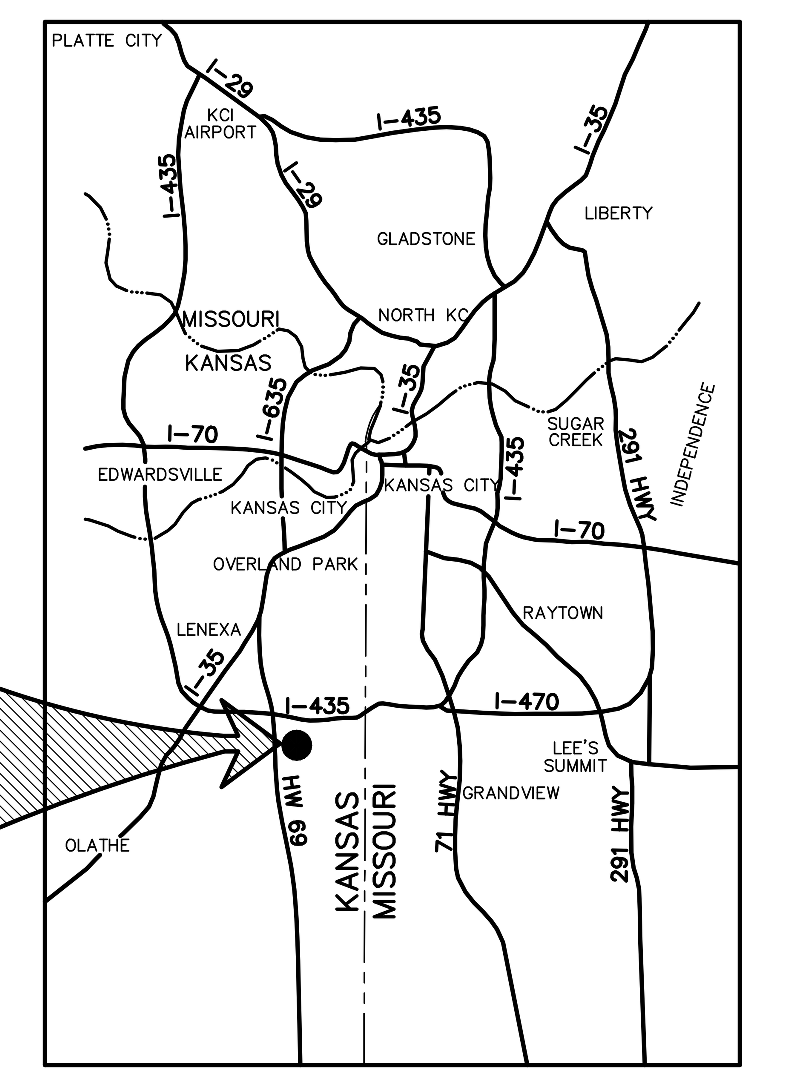
JOHNSON COUNTY KANSAS

Wastewater

DOUGLAS L. SMITH MIDDLE BASIN WWTF SOLIDS TREATMENT CONCEPTUAL PLAN

JCW CONTRACT IMB1-CDM-21-04
OCTOBER 2025
CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

LOCATION MAP



VICINITY MAP

NOT TO SCALE

SHEET INDEX

ONE CALL KANSAS

DIG SAFE

CALL 1-800-DIG-SAFE

CALL 2 (TWO) BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES

CDM Smith

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KS COA: E-346

NOT FOR CONSTRUCTION

PREPARED AND SUBMITTED BY:
CDM SMITH, INC.
8080 WARD PARKWAY, SUITE 100
KANSAS CITY, MO 64114

APPROVED BY:

CHIEF ENGINEER DATE

REV. NO.	DATE	DRWN	CHKD	REMARKS

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CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

EXISTING AND DEMOLITION SOLIDS PROCESS FLOW DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: G002DGDI.DWG
SHEET NO. G-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: L. SCHAICH
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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

SOLIDS
PROCESS FLOW DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: G003DGDI.DWG
SHEET NO.
G-3

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REV. NO.	DATE	DRWN	CHKD	REMARKS

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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

PRIMARY SLUDGE AND WASTE ACTIVATED SLUDGE PROCESS FLOW DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: G004SLDI.DWG
SHEET NO.
G-4

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

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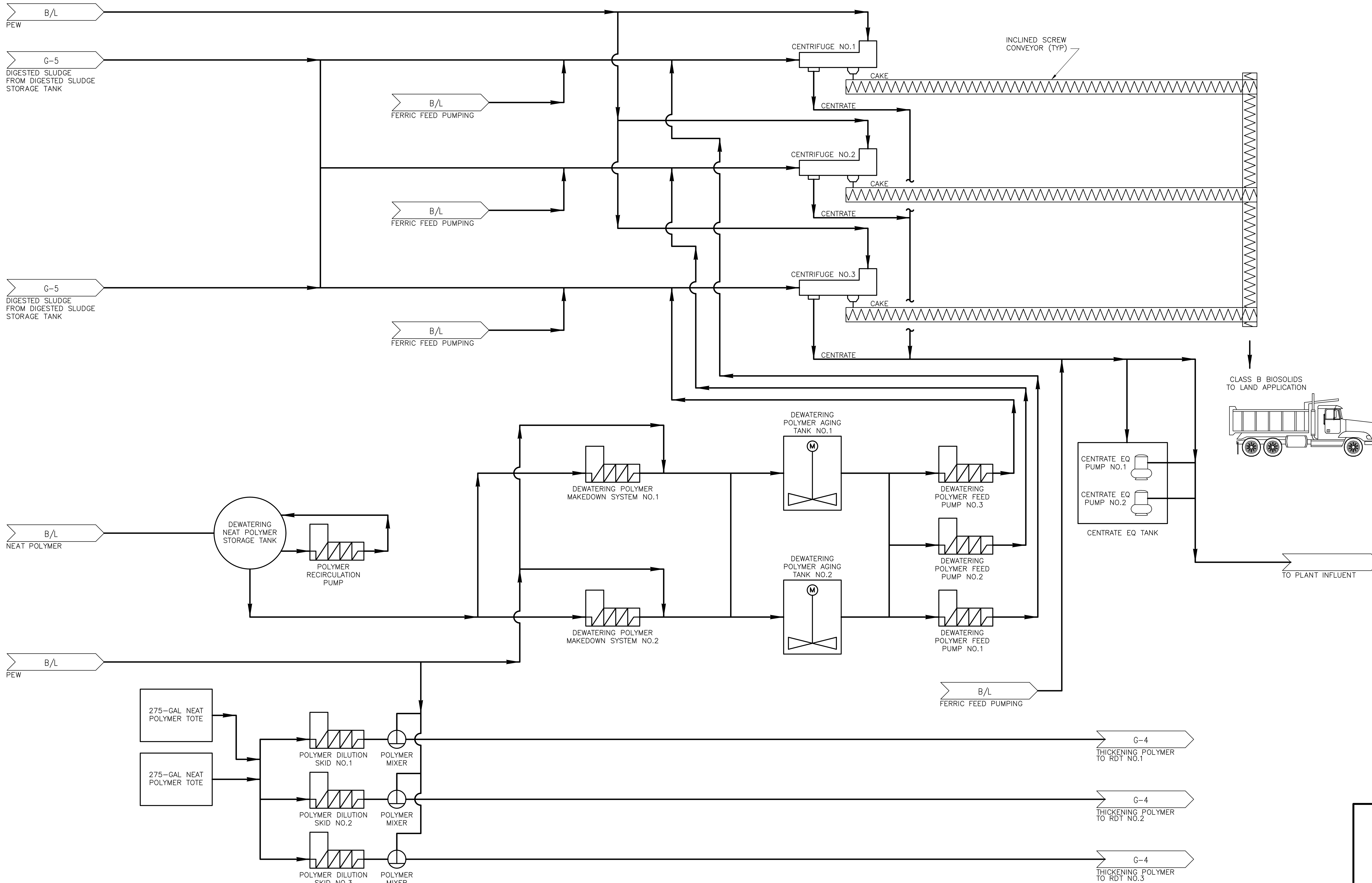
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ANAEROBIC DIGESTION
PROCESS FLOW DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: G005DGDI.DWG
SHEET NO.
G-5

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



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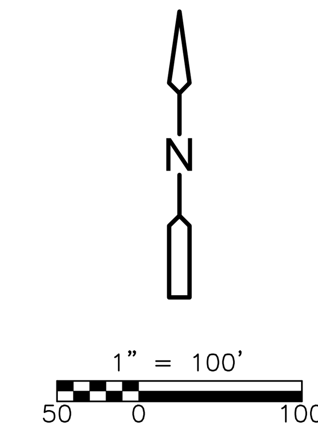
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DEWATERING AND POLYMER PROCESS FLOW DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: G006DWDI.DWG
SHEET NO.
G-6

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



TAG	PROCESS AREA DESCRIPTION	SUB-AREA	HAZARD CLASSIFICATION	NFPA 820 2024 REFERENCE	ROOM VENTILATION REQUIREMENTS	ROOM/PROCESS ACTUAL VENTILATION	EXTENT OF CLASSIFIED AREA	FIRE PROTECTION MEASURES (FPM) (SEE NOTE 3)
1	FERMENTER	PUMP HOUSE	UNCLASSIFIED	TABLE 6.2.2 ROW 9b	CONTINUOUSLY VENTILATED AT 6 AIR CHANGES PER HOUR	6 ACH	ENTIRE ROOM	H AND FE
2		FERMENTER TANKS	CLASS I DIV I	TABLE 6.2.2 ROW 10a	ENCLOSED	< 12 ACH	ENTIRE TANK	NR
3	GRAVITY THICKENER	GRAVITY THICKENER	CLASS I DIV 2	TABLE 6.2.2 ROW 8a	CONTINUOUSLY VENTILATED AT 12 AIR CHANGES PER HOUR	> 12 ACH	ENTIRE TANK	H AND FE
4	EXISTING SOLIDS BUILDING	LOWER LEVEL - POLYMER AREA	UNCLASSIFIED	TABLE 6.2.2 ROW 9b	CONTINUOUSLY VENTILATED AT 6 AIR CHANGES PER HOUR	6 ACH	ENTIRE ROOM	H AND FE
5	DIGESTER CONTROL BUILDING	PROCESS ROOM WITHIN 5-FT OF DIGESTER WALL	CLASS I DIV 1	TABLE 6.2.2 ROW 16c	NO VENTILATION OR VENTILATED LESS THAN 12 AIR CHANGES PER HOUR	< 12 ACH	ENVELOPE 5 FT FROM ANY WAL OF DIGESTER TANK	H, FE, AND CGC
6		PROCESS ROOM BEYOND 5 FT OF DIGESTER WALL	CLASS I DIV 2	TABLE 6.2.2 ROW 16c	NO VENTILATION OR VENTILATED LESS THAN 12 AIR CHANGES PER HOUR	< 12 ACH	ENVELOPE 5 FT BEYOND CLASS I DIVISION 1 SPACE	H, FE, AND CGC
7	DIGESTERS	DIGESTER	CLASS I DIV 1 CLASS I DIV 2	TABLE 6.2.2 ROW 16a AND 16b	NOT VENTILATED	NR	ENTIRE TANK	H AND FE
8	WASTE GAS BURNER	WASTE GAS BURNER	CLASS I DIV 1 CLASS I DIV 2	TABLE 6.2.2 ROW 20a AND 20b	OPEN TO ATMOSPHERE	NR	CLASS I DIVISION 1: WITHIN 10 FT ENVELOPE OF ALL FIXTURES, APPURTENANCES, AND HOUSING CLASS I DIVISION 2: ENVELOPE 15 FT ABOVE DIVISION 1 ENVELOPE AND 5 FT ON ALL SIDES AND 3 FT ENVELOPE AROUND PILOT GAS PIPING, FIXTURES, APPURTENANCES, AND HOUSING	NR
9	DIGESTED SLUDGE STORAGE TANK (DSST)	DSST	CLASS I DIV 1	TABLE 6.2.2 ROW 10A	NO VENTILATION OR VENTILATED LESS THAN 12 AIR CHANGES PER HOUR	NR	ENTIRE TANK	NR
10	DSST SUPPORT BUILDING	BASEMENT LEVEL - PUMPING ROOM	UNCLASSIFIED	TABLE 6.2.2 ROW 9b	CONTINUOUSLY VENTILATED AT 6 AIR CHANGES PER HOUR	6 ACH	ENTIRE ROOM	H AND FE
11		ELECTRICAL ROOM	UNCLASSIFIED	NA	NA	NR	ENTIRE ROOM	NR
12		BOILER ROOM	UNCLASSIFIED	NA	NA	NR	ENTIRE ROOM	NR
13	DEWATERING BUILDING	LOWER LEVEL - PROCESS AREA	UNCLASSIFIED	TABLE 6.2.2 ROW 12a	CONTINUOUSLY VENTILATED AT 6 AIR CHANGES PER HOUR	6 ACH	ENTIRE ROOM	H, FE, AND FAS
14		LOWER LEVEL - ELECTRICAL ROOM	UNCLASSIFIED	NA	NA	NR	ENTIRE ROOM	NR
15		UPPER LEVEL - CENTRIFUGE ROOM	UNCLASSIFIED	TABLE 6.2.2 ROW 12a	CONTINUOUSLY VENTILATED AT 6 AIR CHANGES PER HOUR	6 ACH	ENTIRE ROOM	H, FE, AND FAS
16		UPPER LEVEL - LAB/CONTROL/MECHANICAL ROOM	UNCLASSIFIED	NA	NA	NR	ENTIRE ROOM	NR
17	CENTRATE EQ TANK	CENTRATE EQ TANK	UNCLASSIFIED	TABLE 6.2.2 ROW 27	NOT VENTILATED	NR	N/A	H
18	CHP SYSTEM	CHP SYSTEM	UNCLASSIFIED	EXEMPT PER NFPA 820 3.3.17.1 and A.3.3.17.1	OPEN TO ATMOSPHERE	NR	N/A	NR

NOTES:

1. AREA CLASSIFICATIONS DEFINED IN TABLE ARE AT THE CONCLUSION OF IMPROVEMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR ACCESSING EXISTING CONDITIONS OF AREAS DURING CONSTRUCTION ACTIVITIES.
2. NFPA 820 (2024 EDITION) TABLES 5.2.2 AND 6.2.2 DO NOT EXPLICITLY PROVIDE GUIDANCE FOR VENTS, HATCHES, AND PRESSURE RELIEF VALVES. GUIDANCE PROVIDED IN ANNEX A OF NFPA 820 (2024 EDITION) USED FOR CLASSIFICATION OF AREAS AROUND VENTS, HATCHES, AND PRESSURE RELIEF VALVES.
3. *FIRE PROTECTION MEASURES (FPM): COMBUSTIBLE GAS DETECTION (CGD), FIRE ALARM SYSTEM (FAS), PORTABLE FIRE EXTINGUISHER (FE), HYDRANT PROTECTION PER NFPA 820 7.2.4 (H), NO REQUIREMENT (NR).

REV. NO.	DATE	DRWN	CHKD	REMARKS

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DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

AREA CLASSIFICATION PLAN

PROJECT NO. 10936-302237
FILE NAME: G007ACPL.DWG
SHEET NO.
G-7

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

N

1" = 100'
50 0 100

LEGEND:
100–YR FLOODPLAIN BOUNDARY

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
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SOLIDS TREATMENT CONCEPTUAL PLAN

DEMOLITION SITE PLAN

PROJECT NO. 10936–302237
FILE NAME: C001STPL.DWG
SHEET NO.
C-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

N

1" = 100'
50 0 100

LEGEND:

100–YR FLOODPLAIN BOUNDARY

REV. NO.	DATE	DRWN	CHKD	REMARKS

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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

PROPOSED SITE PLAN

PROJECT NO. 10936–302237
FILE NAME: C002STPL.DWG
SHEET NO.
C-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

NOTES:

1. FOR CLARITY, DRAWING IS ONLY SHOWING NEW SITE PIPING. EXISTING PIPING TO BE COORDINATED DURING DETAILED DESIGN.

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REV. NO.	DATE	DRWN	CHKD	REMARKS

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CROSS CHK'D BY:
APPROVED BY:
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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ENLARGED SITE PLAN

PROJECT NO. 10936-302237
FILE NAME: C003STPL.DWG
SHEET NO.
C-3

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

NOTES:

1. THE EXISTING UTILITIES TO BE RELOCATED AND EVALUATED DURING DETAILED DESIGN.
2. CLEANOUTS AND ARVS TO BE PROVIDED FOR SCUM AND SLUDGE PIPING.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
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CROSS CHK'D BY:
APPROVED BY:
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KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

YARD PIPING PLAN

PROJECT NO. 10936-302237
FILE NAME: C004STPL.DWG
SHEET NO.
C-4

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

XREFs: [CDMS_2234, C100STPL, C200STPL, MWP001FMP] Images: []
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LOWER LEVEL

PLAN

1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

BUILDING NO.2
LOWER LEVEL DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 02-DM-1
SHEET NO.
02-DM-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

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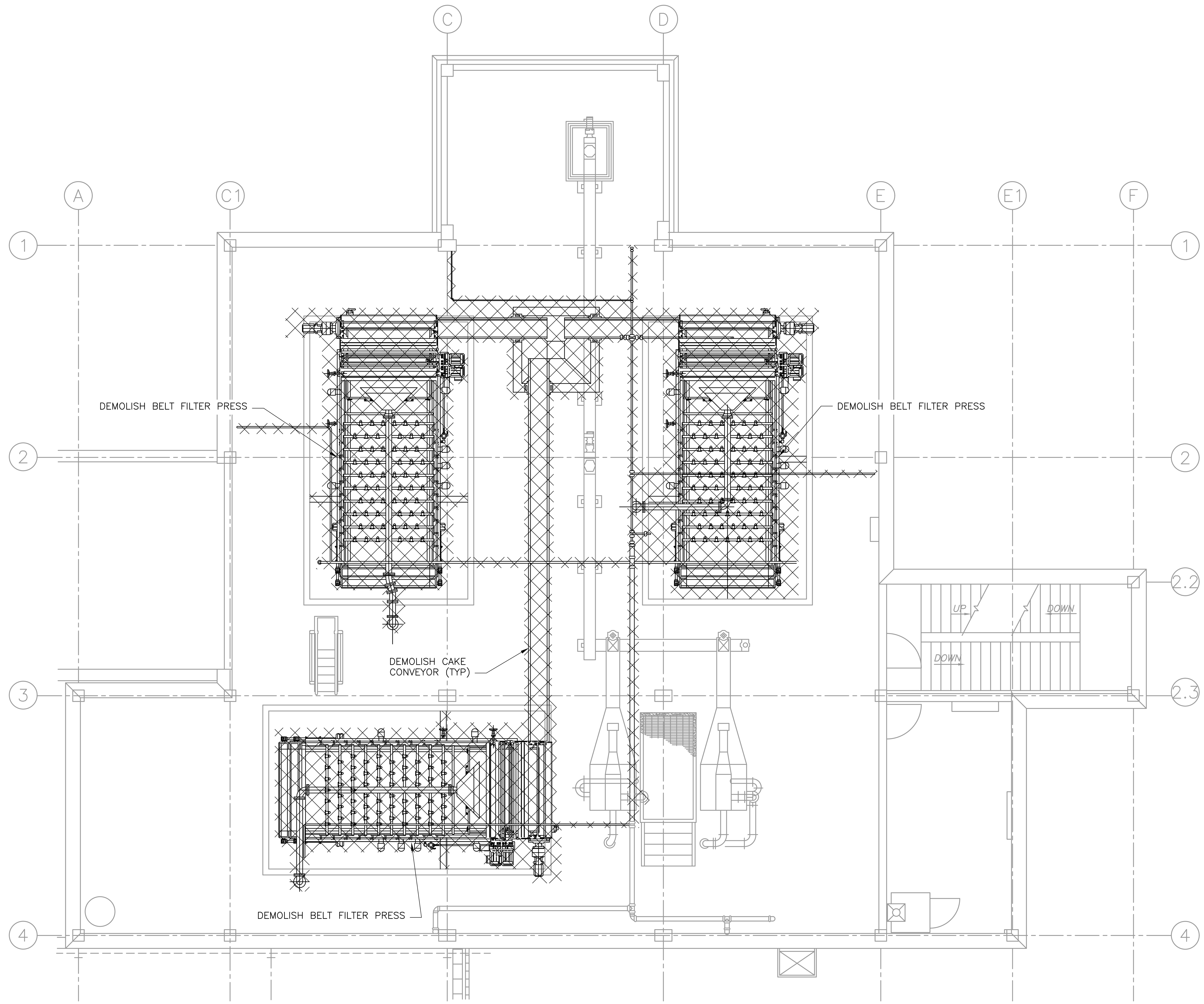

N
3/16" = 1'- 0"

UPPER LEVEL
PLAN
3/16"= 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

BUILDING NO.2
UPPER LEVEL DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 02-DM-2
SHEET NO.
02-DM-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

LOWER LEVEL

PLAN

1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
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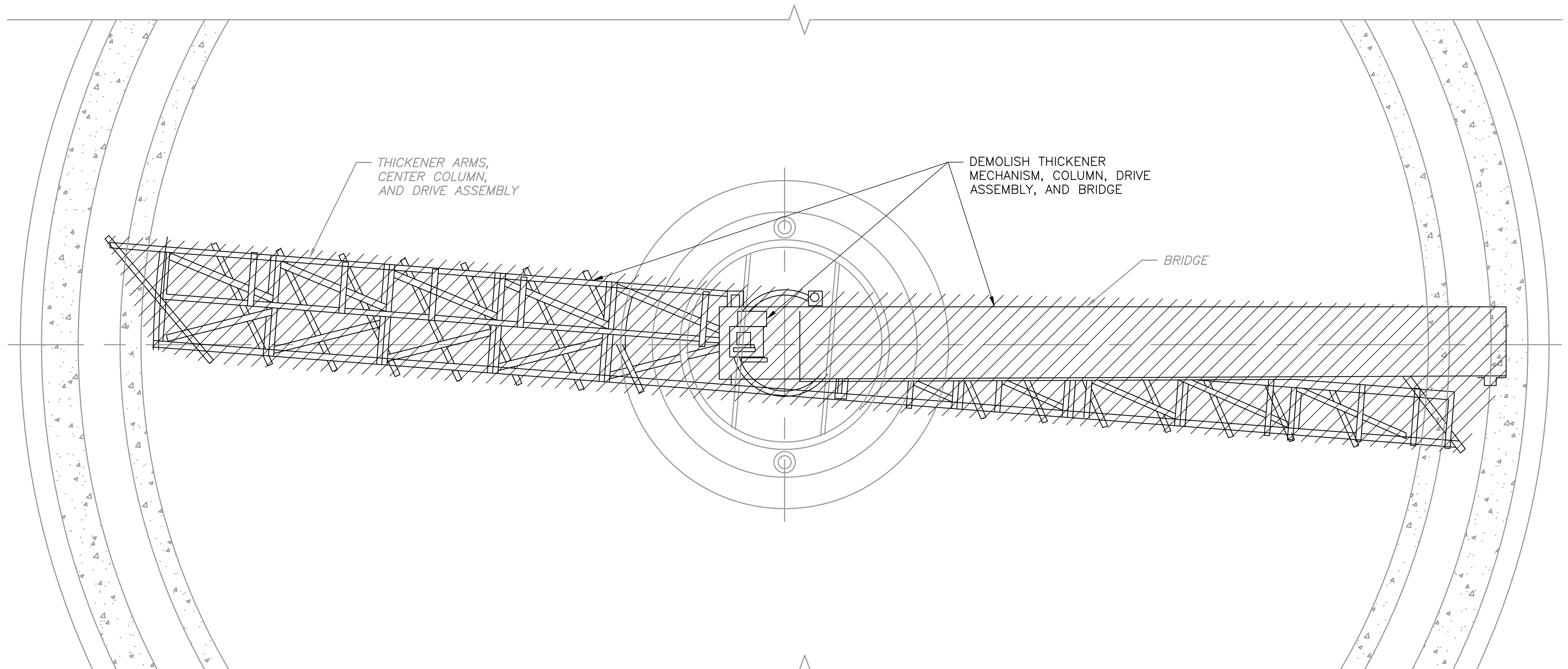
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

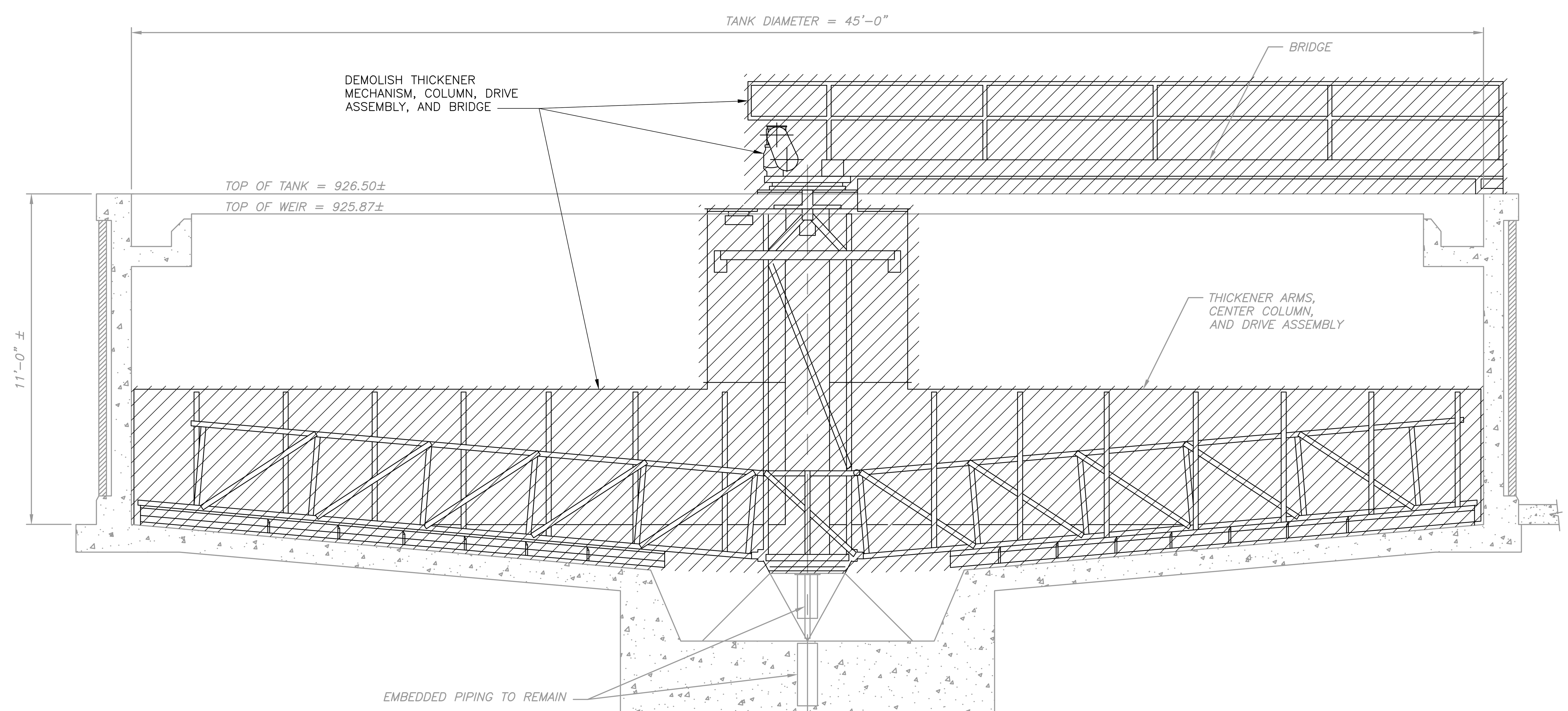
BUILDING NO.2
LOWER LEVEL PLAN

PROJECT NO. 10936-302237
FILE NAME: 02-M-1
SHEET NO.
02-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN
3/8" = 1'-0"



SECTION 1 / –
3/8" = 1'-0"

3/8" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
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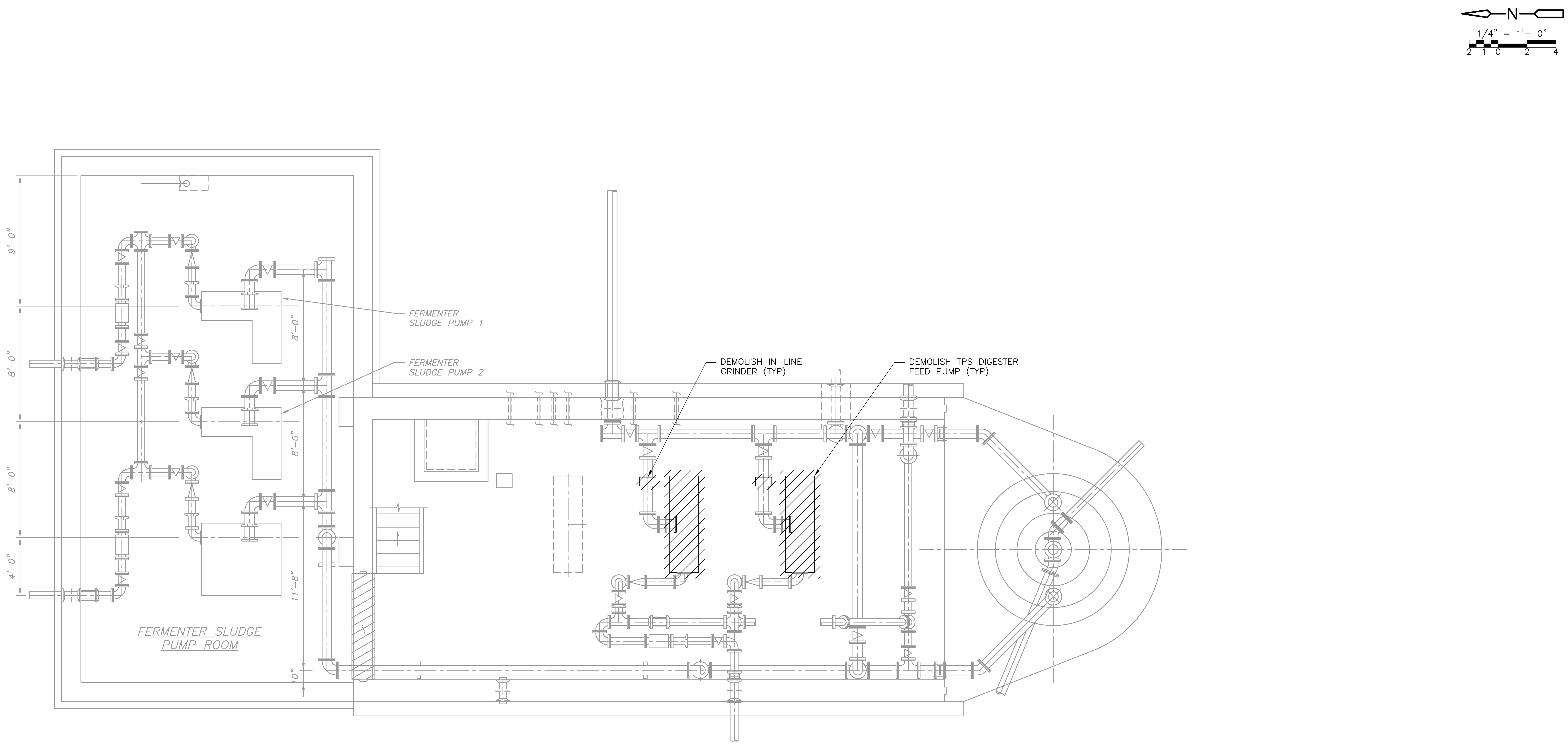
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

GRAVITY THICKENER DEMOLITION PLAN AND SECTION

PROJECT NO. 10936-302237
FILE NAME: 03-DM-1.dwg
SHEET NO.
03-DM-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



GRAVITY THICKENER PUMPING STATION BASEMENT

PLAN

3/8" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: M. MILLER
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

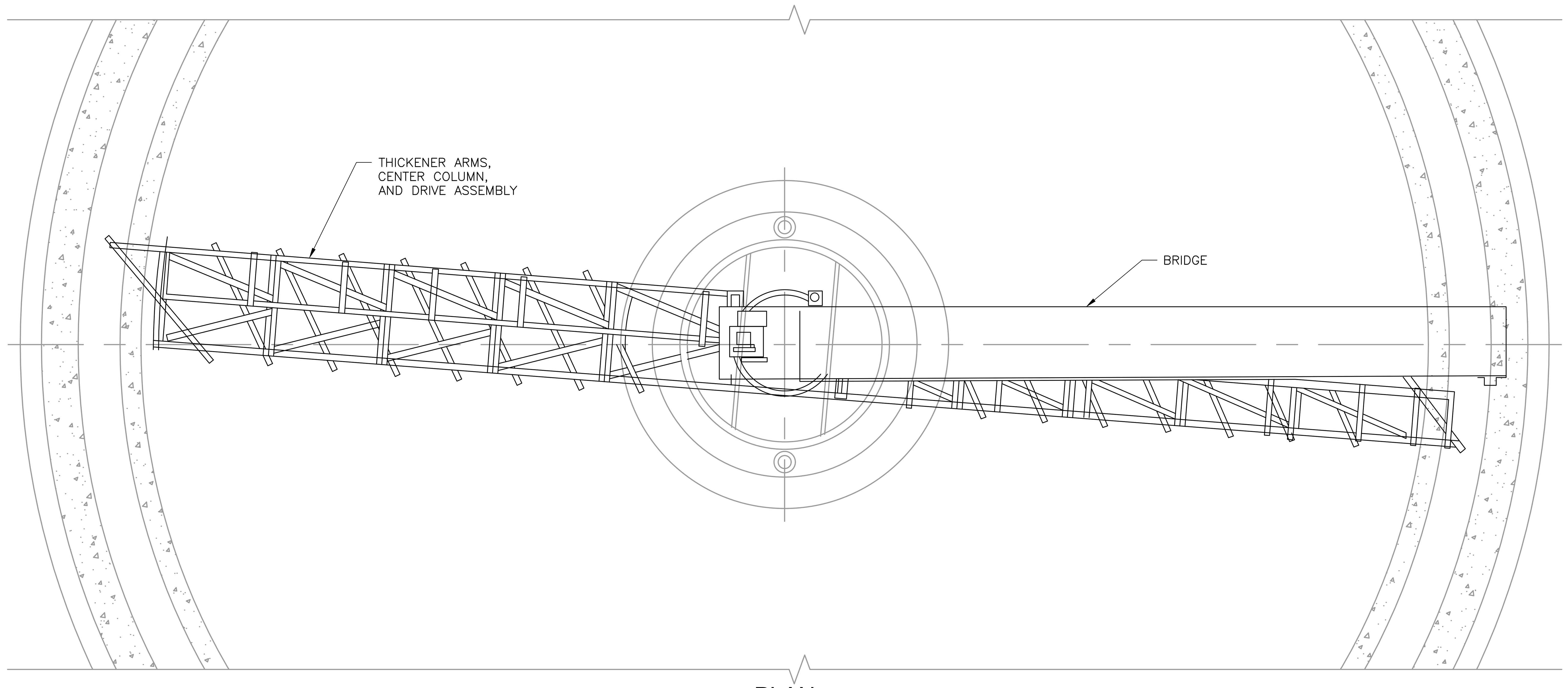
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

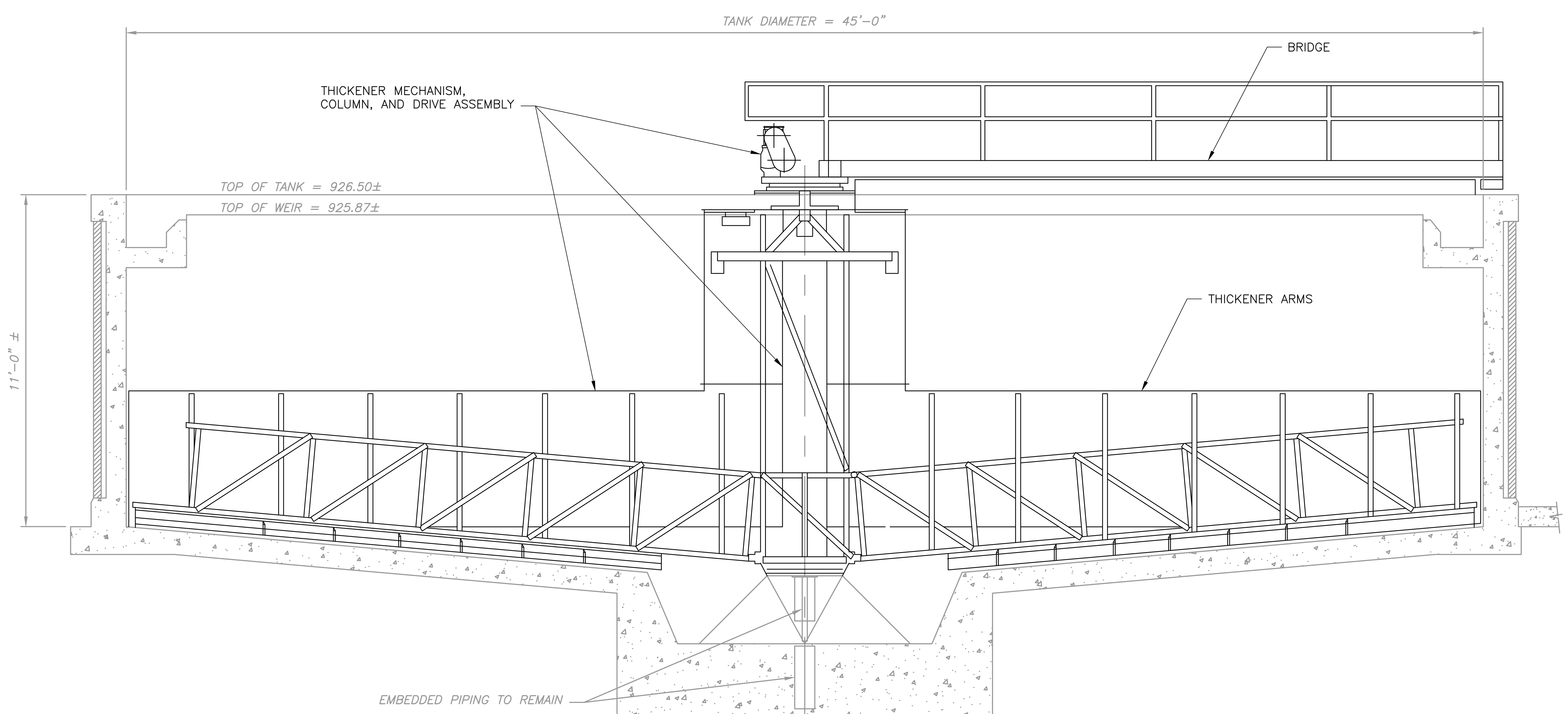
GRAVITY THICKENER PUMPING STATION
BASEMENT DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 03-DM-2.dwg
SHEET NO.
03-DM-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN
3/8" = 1'-0"



SECTION 1
3/8" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

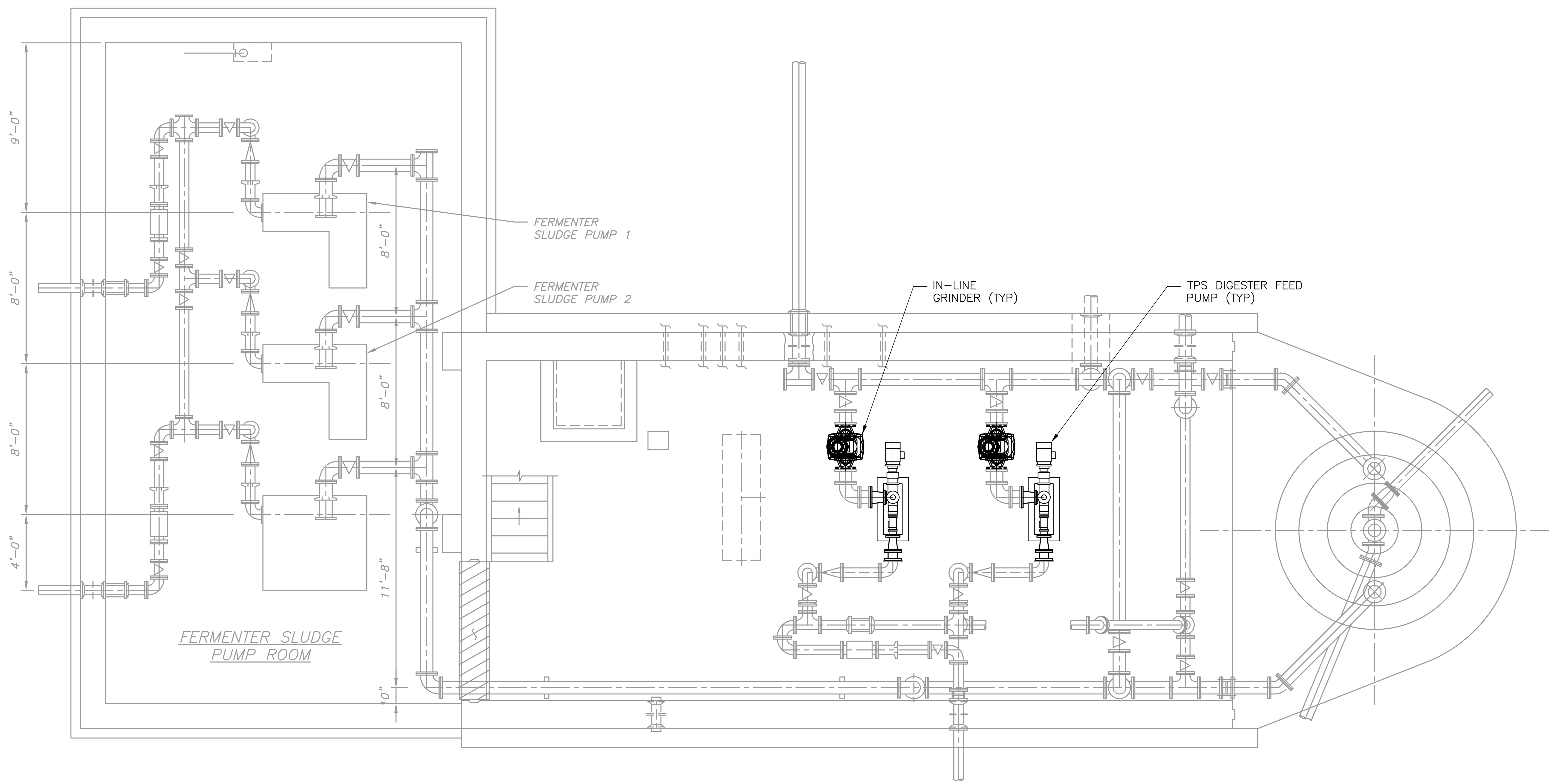
CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

GRAVITY THICKENER PLAN AND SECTION

PROJECT NO. 10936-302237
FILE NAME: 03-M-1.dwg
SHEET NO. 03-M-1

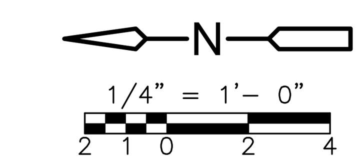
CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



GRAVITY THICKENER PUMPING STATION BASEMENT

PLAN

3/8" = 1'-0"



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: M. MILLER
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

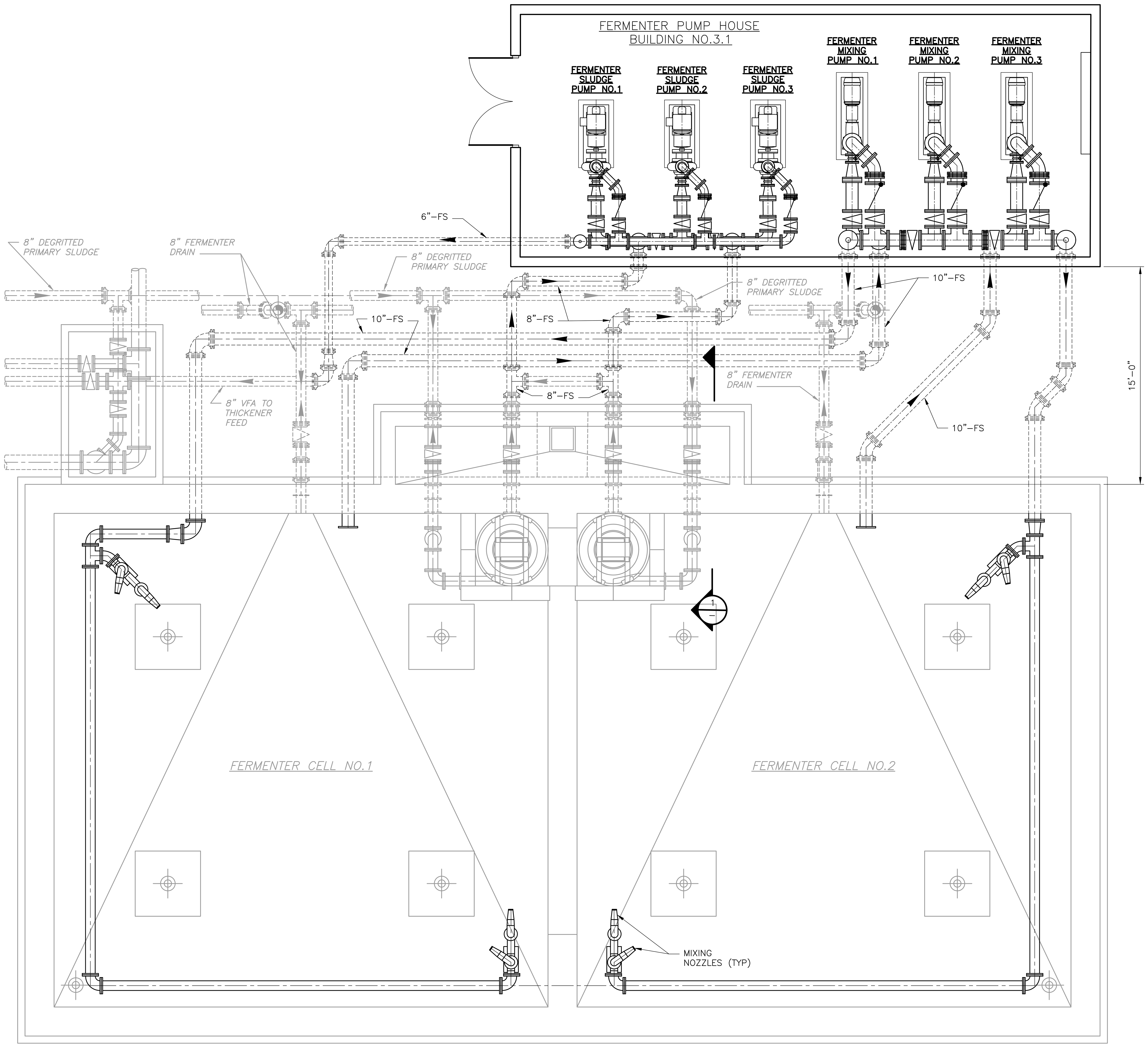
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

GRAVITY THICKENER PUMPING STATION
BASEMENT PLAN

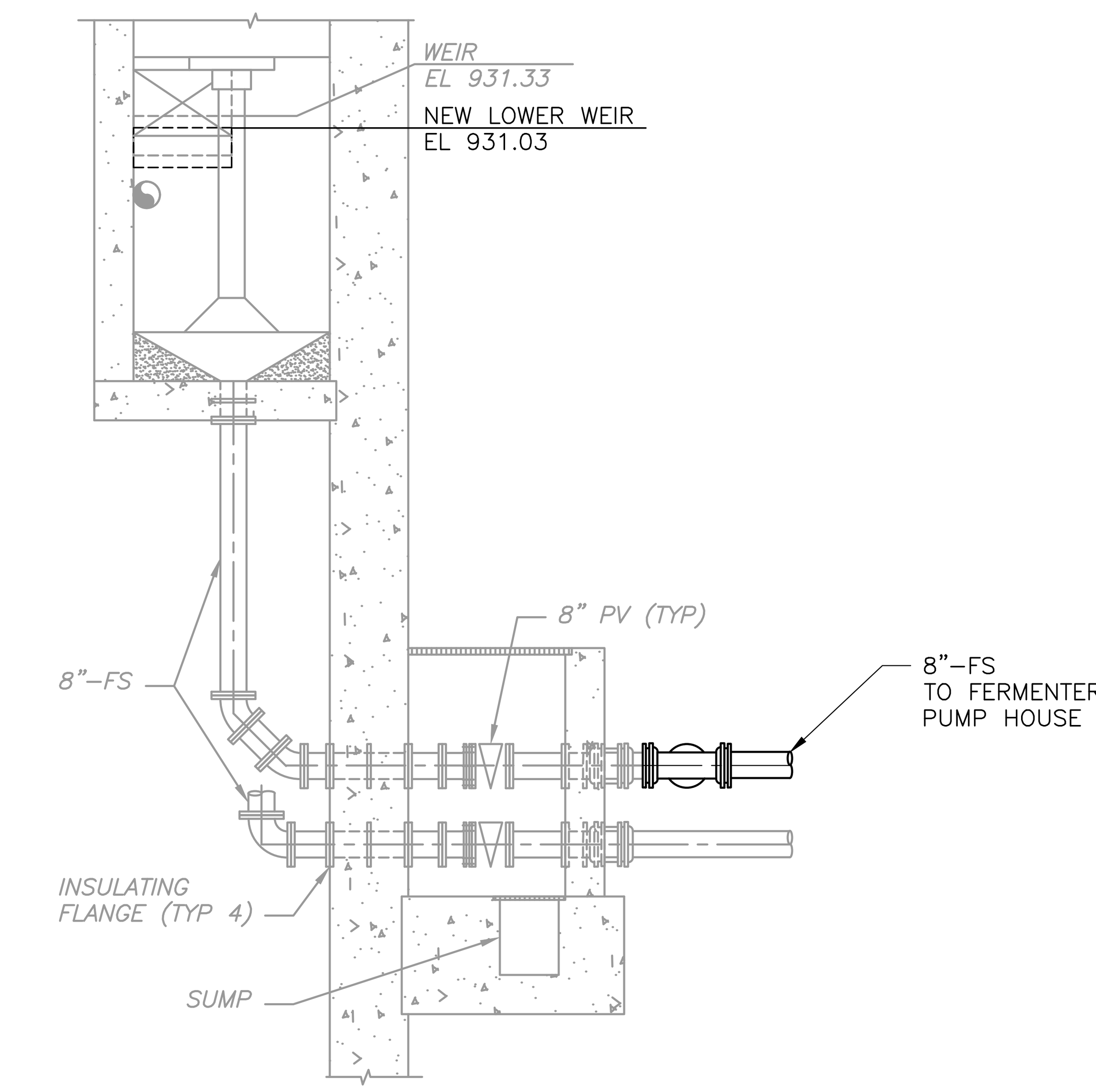
PROJECT NO. 10936-302237
FILE NAME: 03-M-2.dwg

SHEET NO.
03-M-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN
1/4 = 1'-0"



SECTION 1
1/4" = 1'-0"

N
1/4" = 1'-0"
2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

FERMENTER IMPROVEMENTS PLAN AND SECTION

PROJECT NO. 10936-302237
FILE NAME: 03.1-M-1.dwg
SHEET NO.
03.1-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

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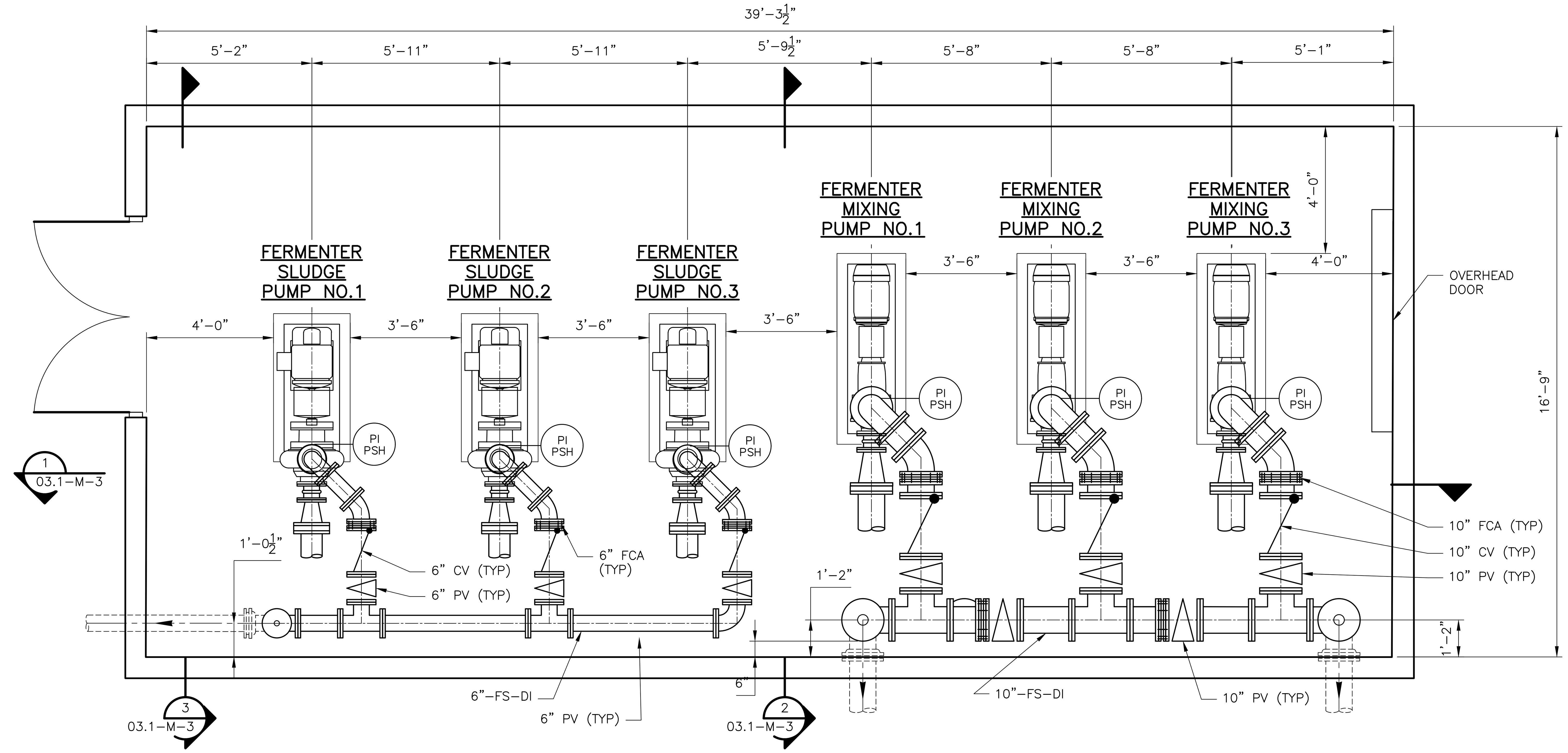
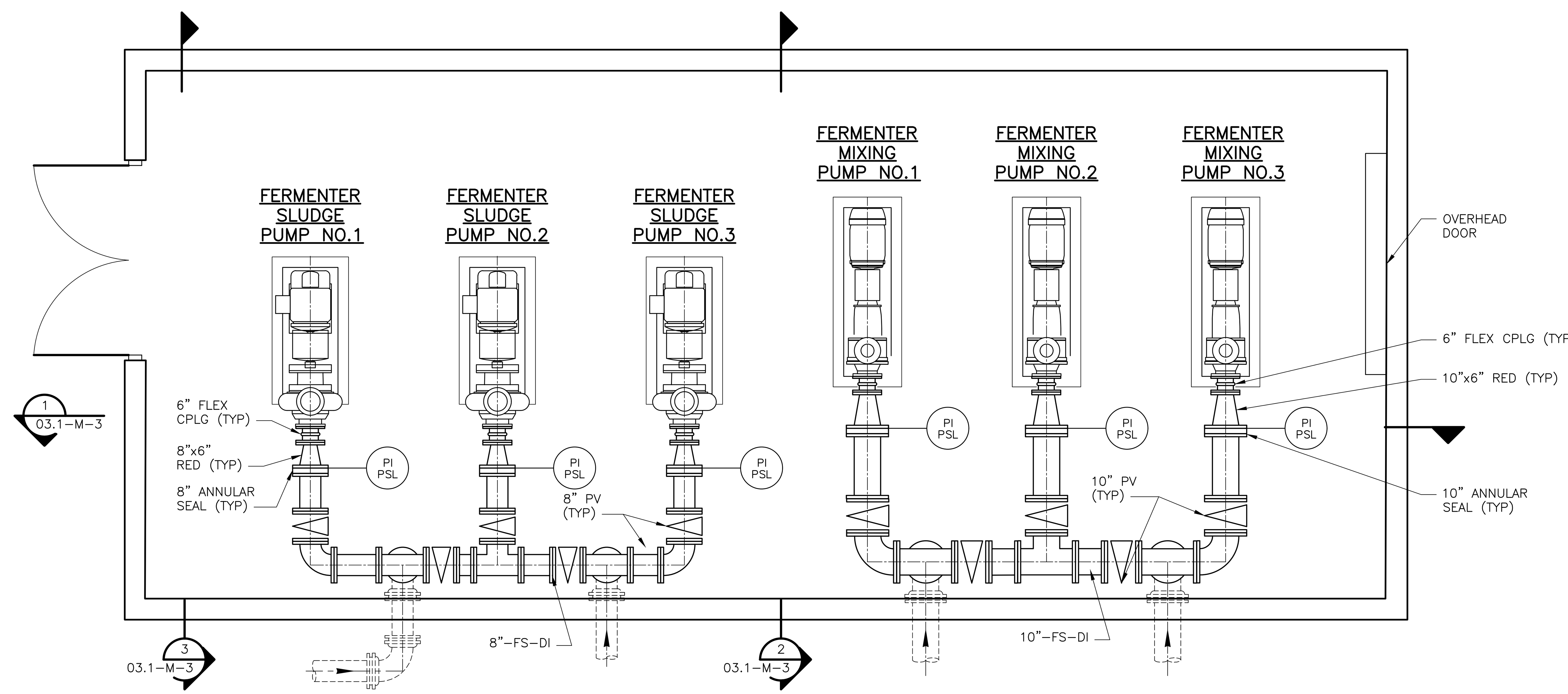
N
3/8" = 1'- 0"



UPPER PIPING PLAN
3/8 = 1'-0"



LOWER PIPING PLAN
3/8 = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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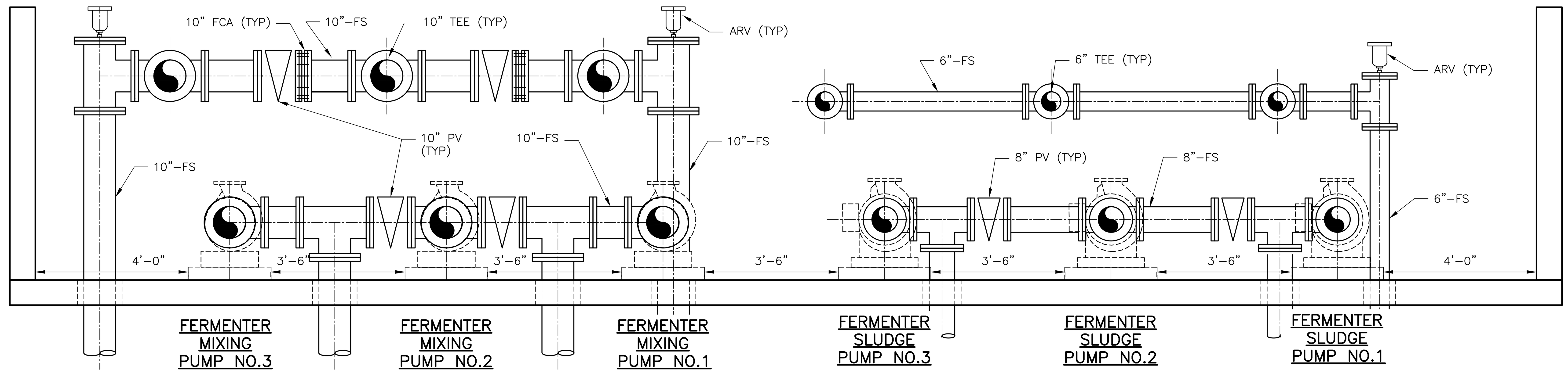
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

FERMENTER PUMP HOUSE PLANS

PROJECT NO. 10936-302237
FILE NAME: 03.1-M-2.dwg
SHEET NO.
03.1-M-2

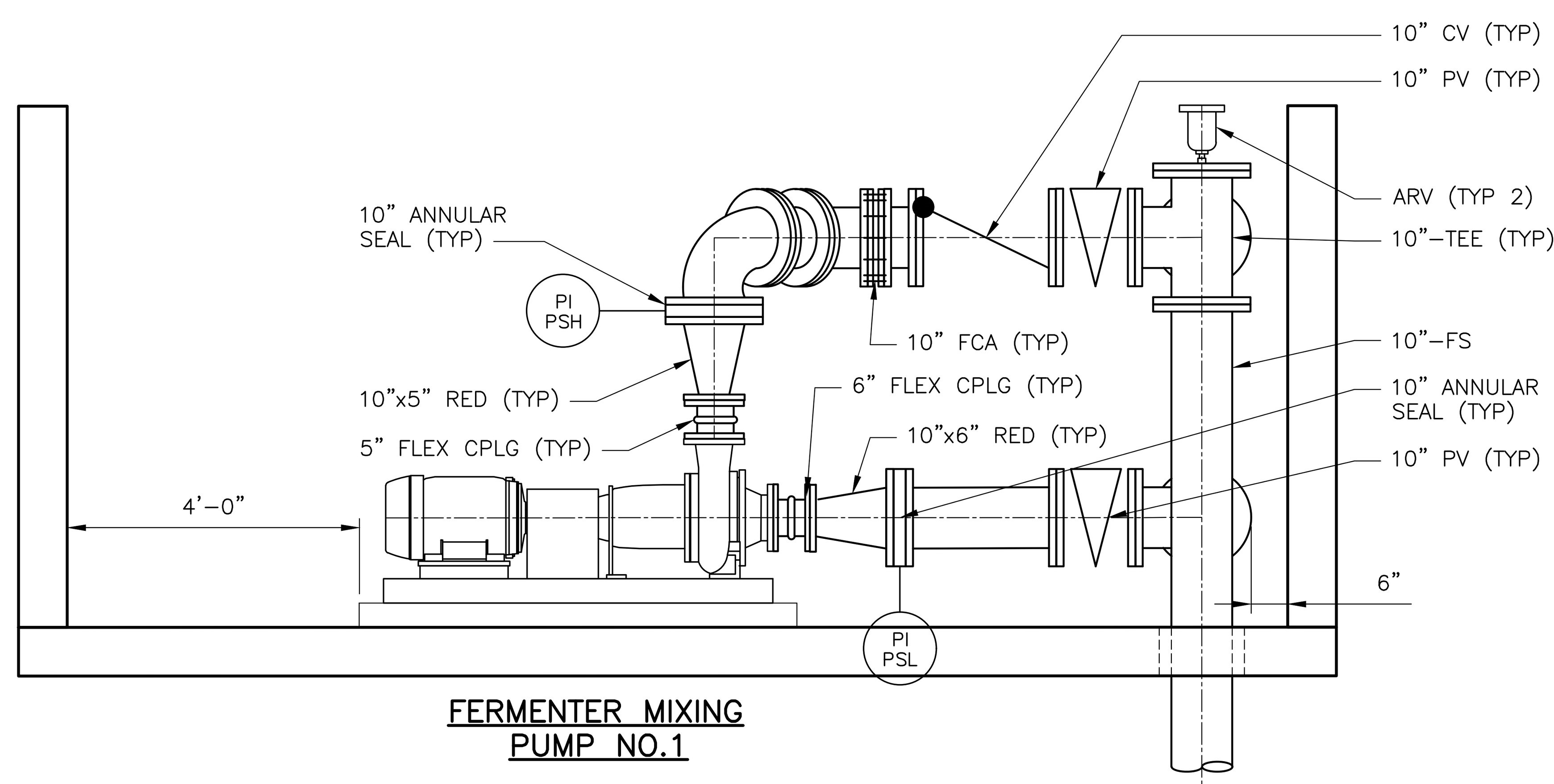
CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

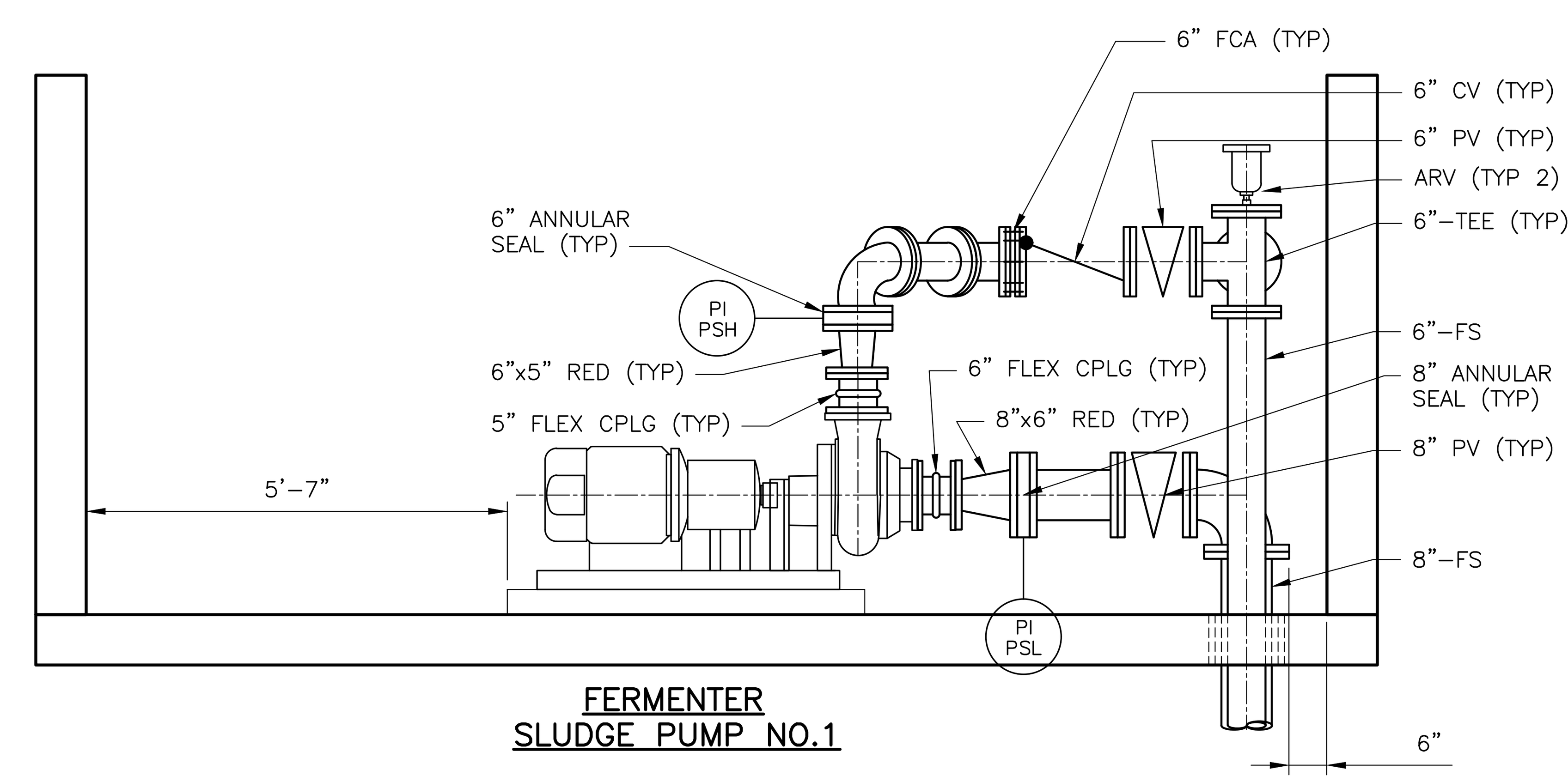
1/2" = 1'- 0"



FERMENTER PUMP HOUSE

SECTION 1
1/2" = 1'-0" 03.1-M-2





FERMENTER MIXING PUMPS

SECTION 2
1/2" = 1'-0" 03.1-M-2

FERMENTER SLUDGE PUMPS

SECTION 3
1/2" = 1'-0" 03.1-M-2

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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Kansas City, MO 64114
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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

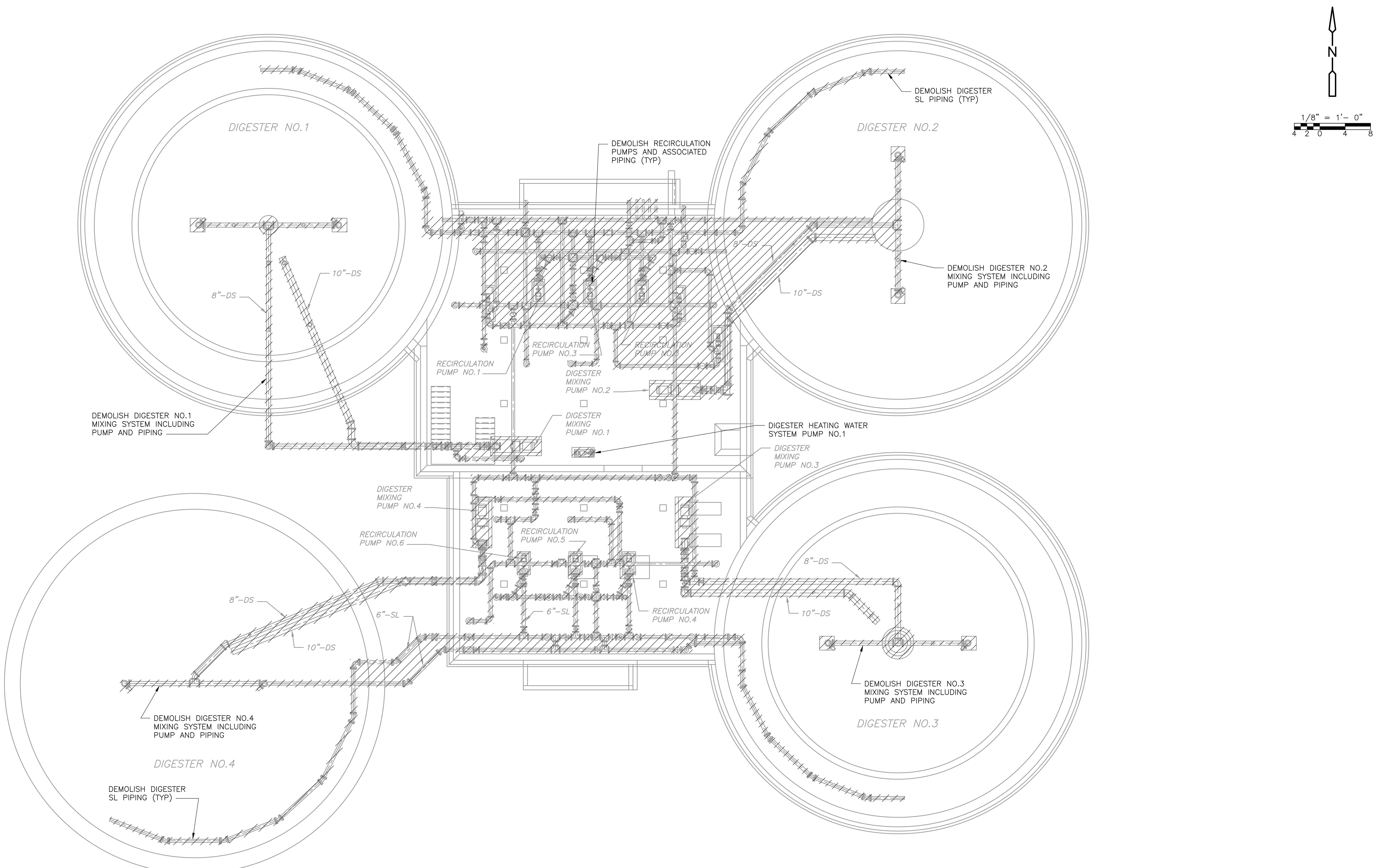
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

FERMENTER PUMP HOUSE SECTIONS

PROJECT NO. 10936-302237
FILE NAME: 03.1-M-3.dwg

SHEET NO.
03.1-M-3

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



LOWER LEVEL

PLAN

1/8 = 1'–0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

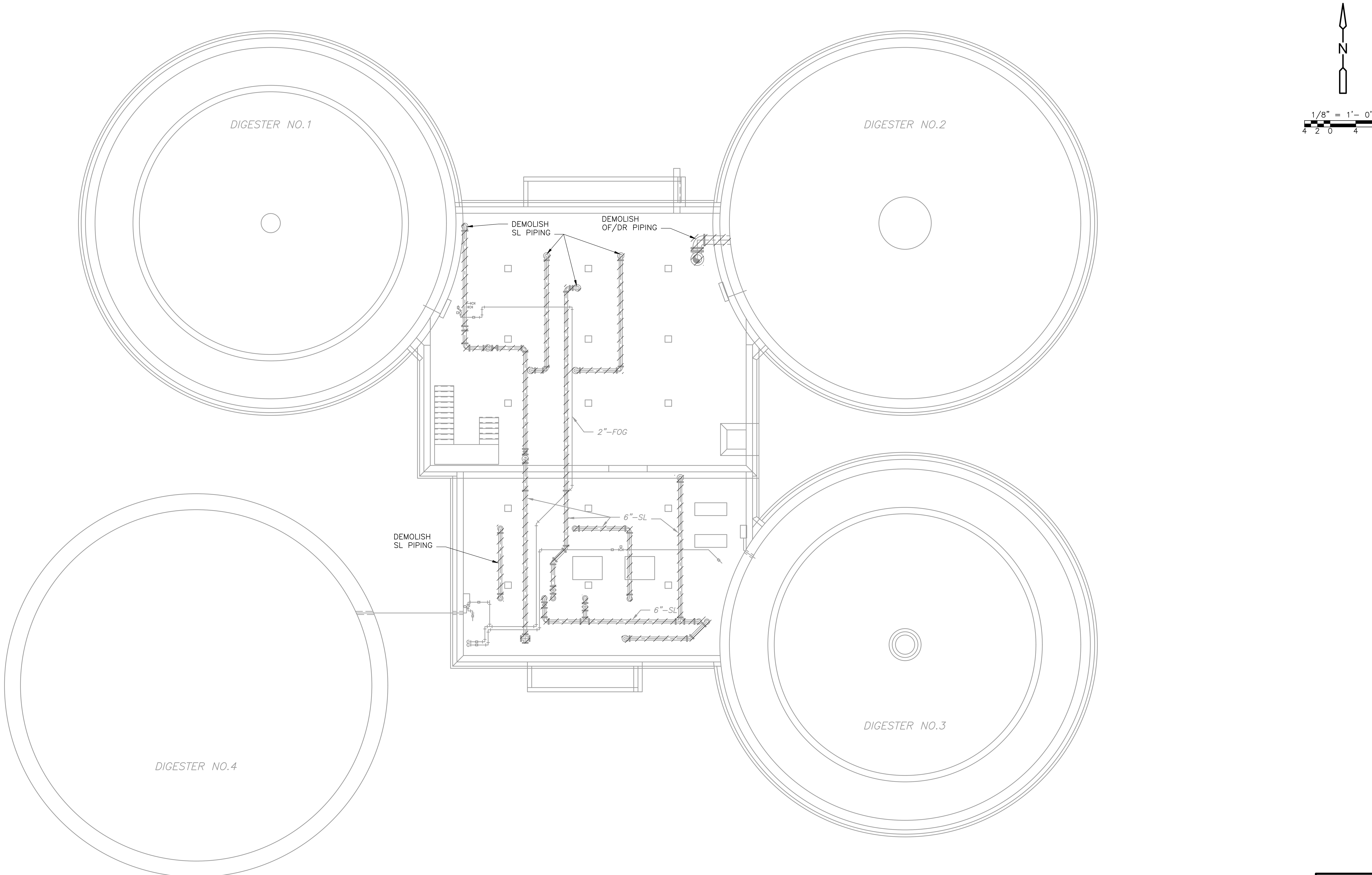
CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING OVERALL LOWER LEVEL LOWER PIPING DEMOLITION PLAN

PROJECT NO. 10936–302237
FILE NAME: 04–DM–1.dwg
SHEET NO.
04-DM-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



LOWER LEVEL
PLAN
1/8 = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
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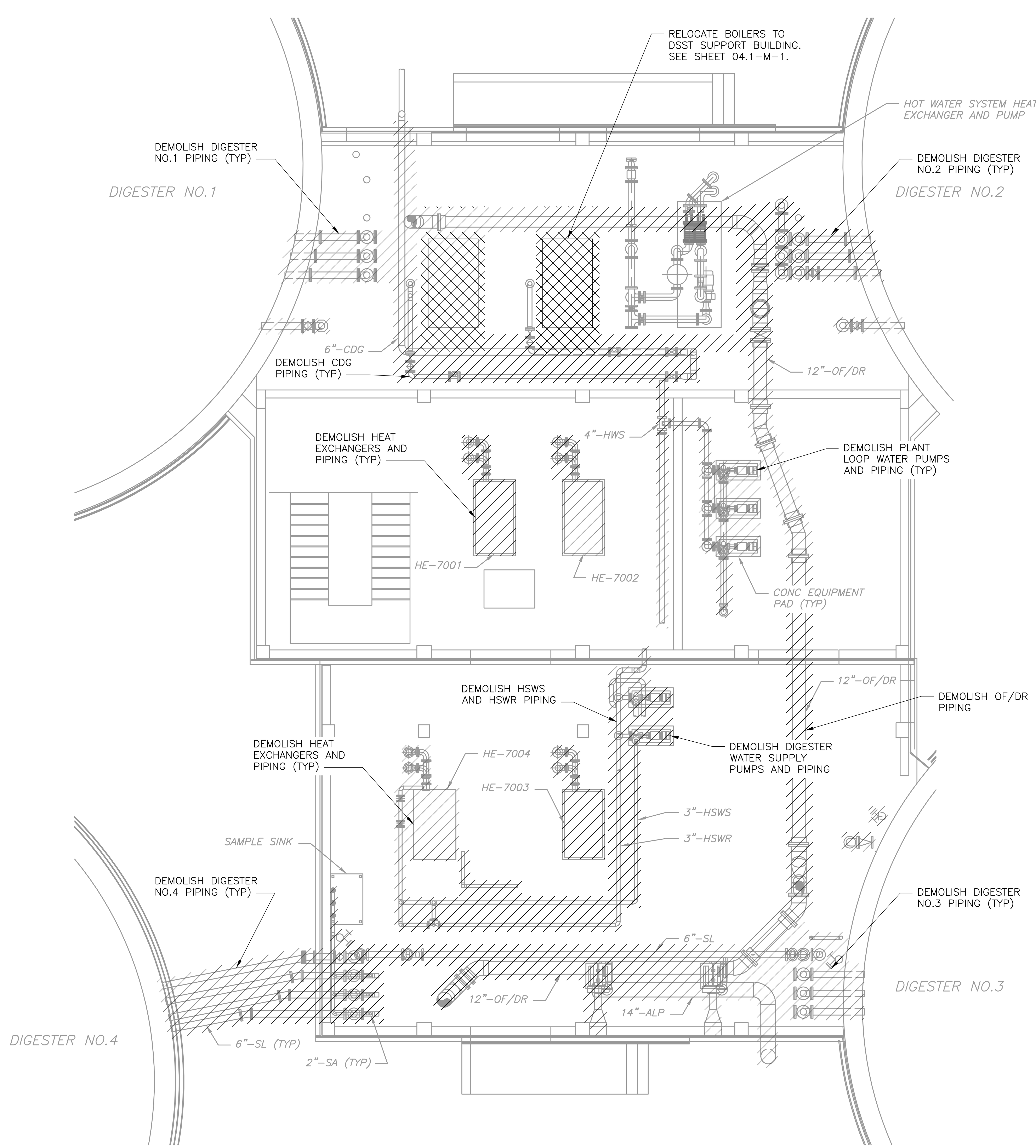
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING
OVERALL LOWER LEVEL UPPER PIPING
DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-DM-2.dwg
SHEET NO.
04-DM-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



N

3/16" = 1'- 0"

OPERATIONS LEVEL

PLAN

3/16" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

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JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING
OPERATIONS LEVEL
DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-DM-3.dwg
SHEET NO.
04-DM-3

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

XREFs: [CDMS_2234, SEP100DGPL, MEP100DGPL, MWP100DGPL] Images: []
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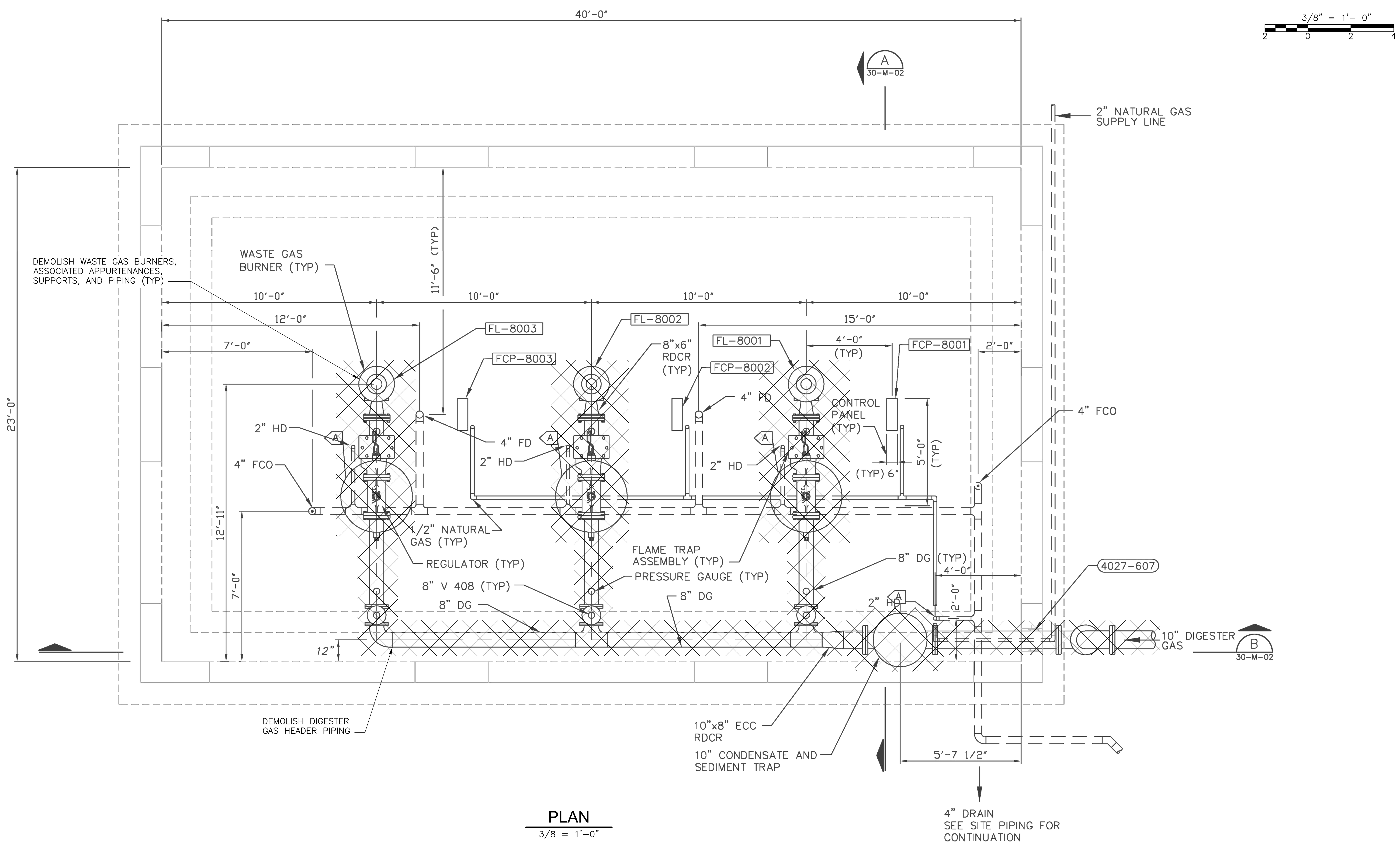

PLAN
3/8 = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
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Kansas City, MO 64114
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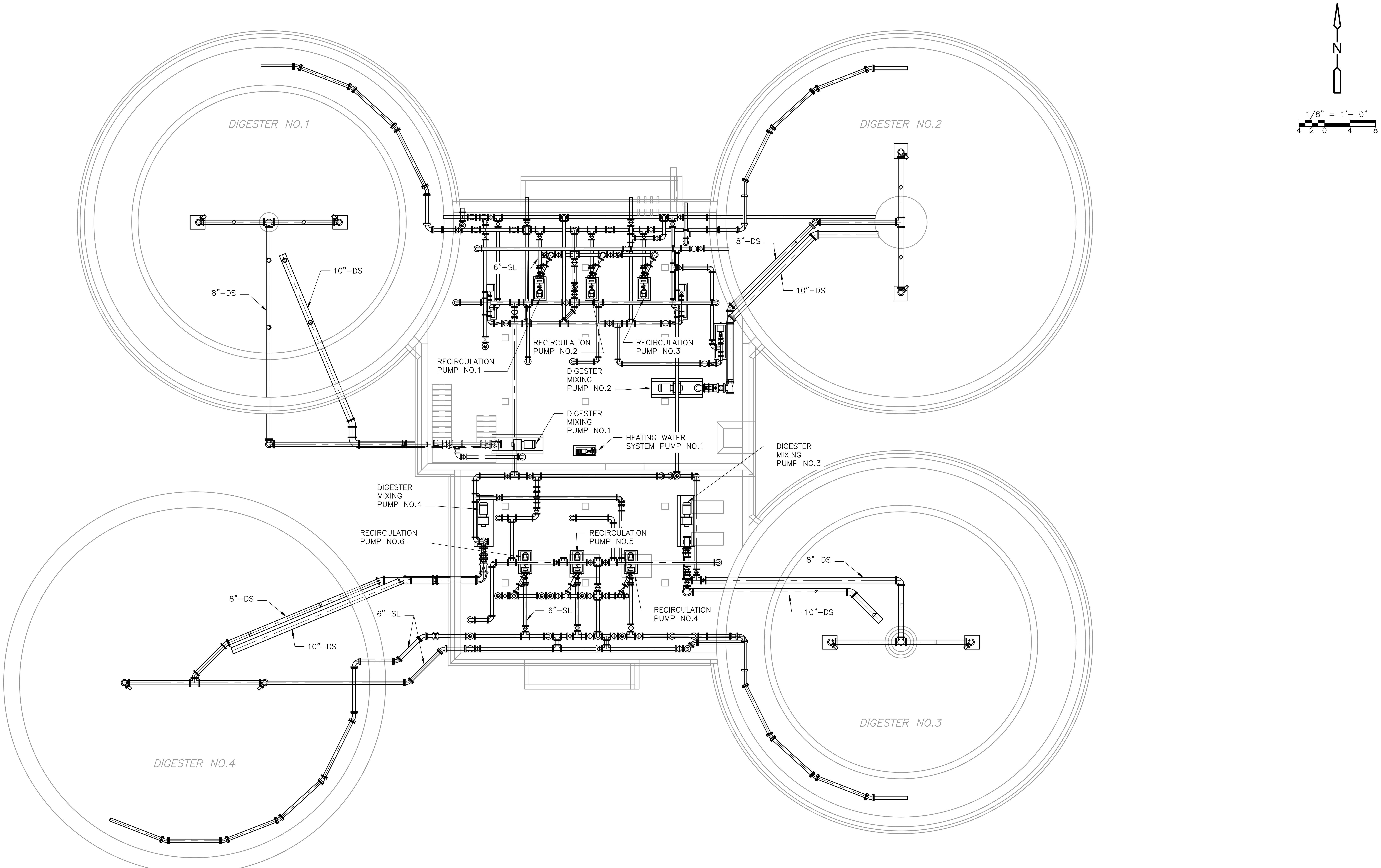
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

WASTE GAS FLARES DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-DM-4.dwg
SHEET NO.
04-DM-4

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



LOWER LEVEL

PLAN

1/8 = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

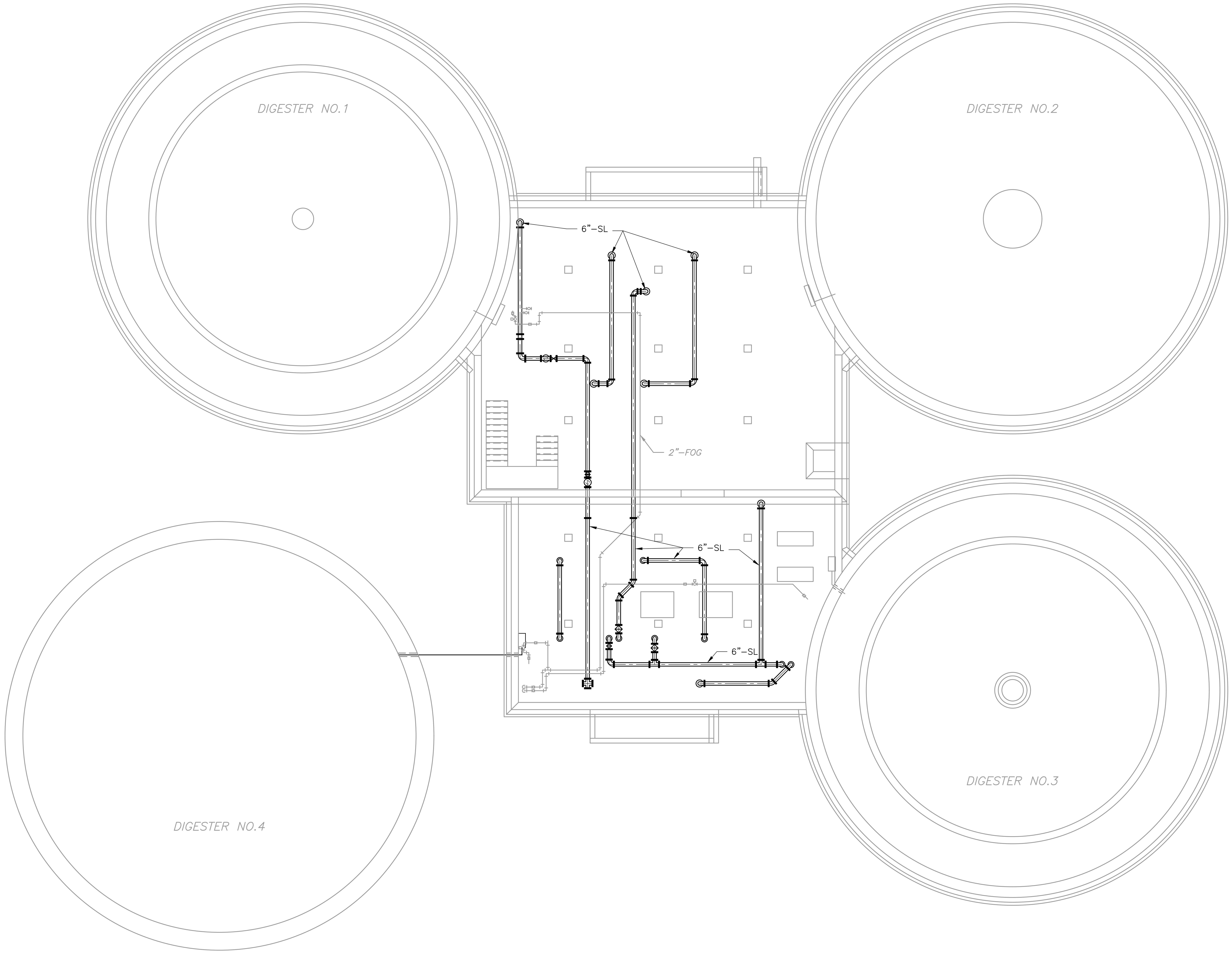
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

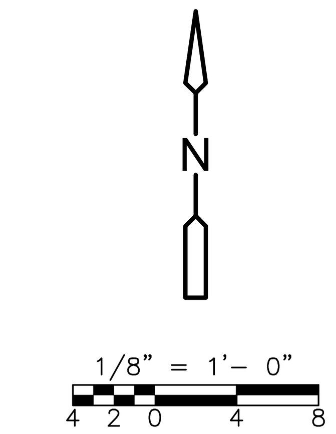
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING
OVERALL LOWER LEVEL LOWER PIPING PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-M-1.dwg
SHEET NO.
04-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION





LOWER LEVEL

PLAN

1/8 = 1'–0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
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Kansas City, MO 64114
Tel: (816) 444-8270
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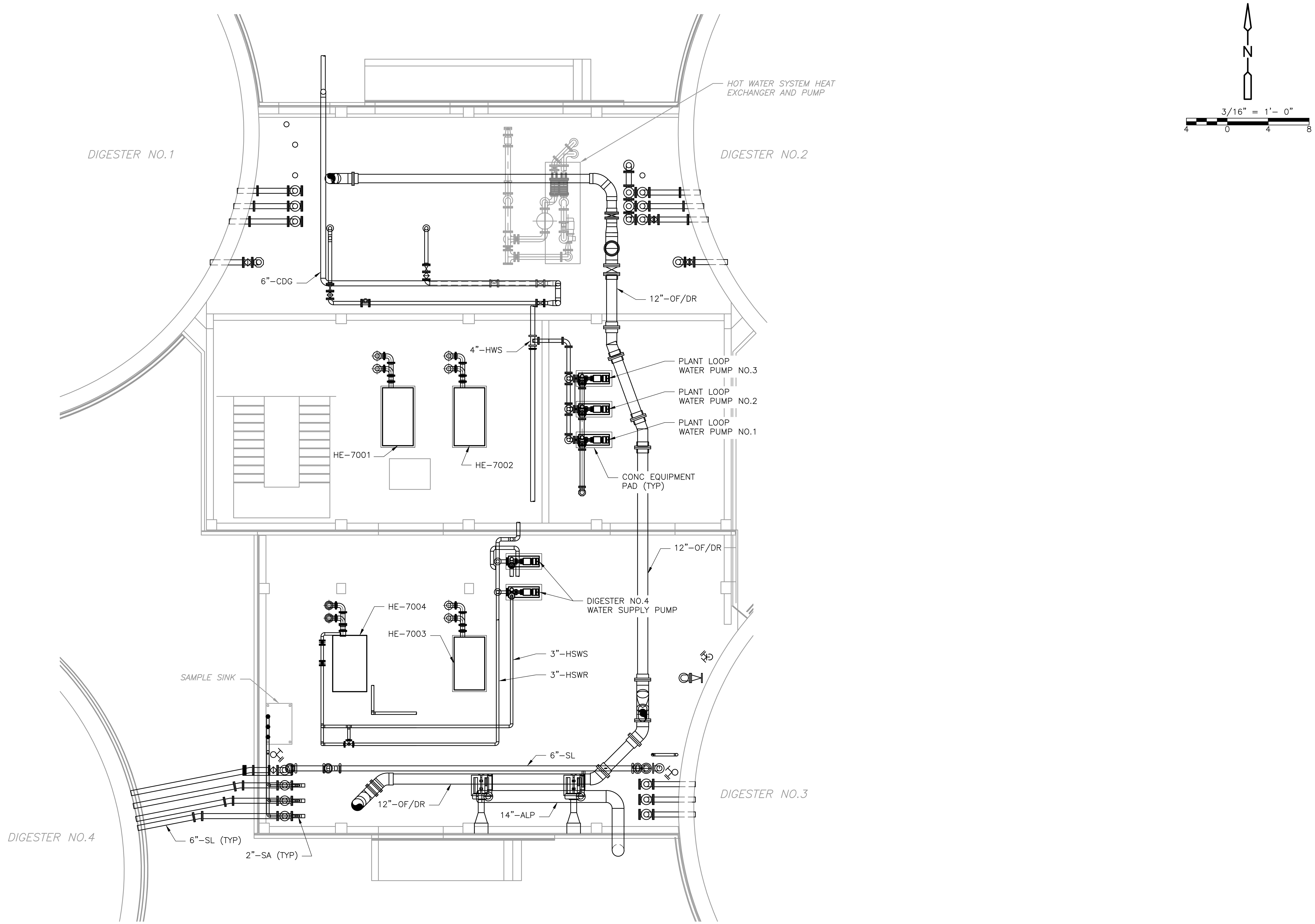
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING
OVERALL LOWER LEVEL UPPER PIPING PLAN

PROJECT NO. 10936–302237
FILE NAME: 04–M–2.dwg
SHEET NO.
04-M-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



OPERATIONS LEVEL

PLAN

3/16" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
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DATE: OCTOBER 2025

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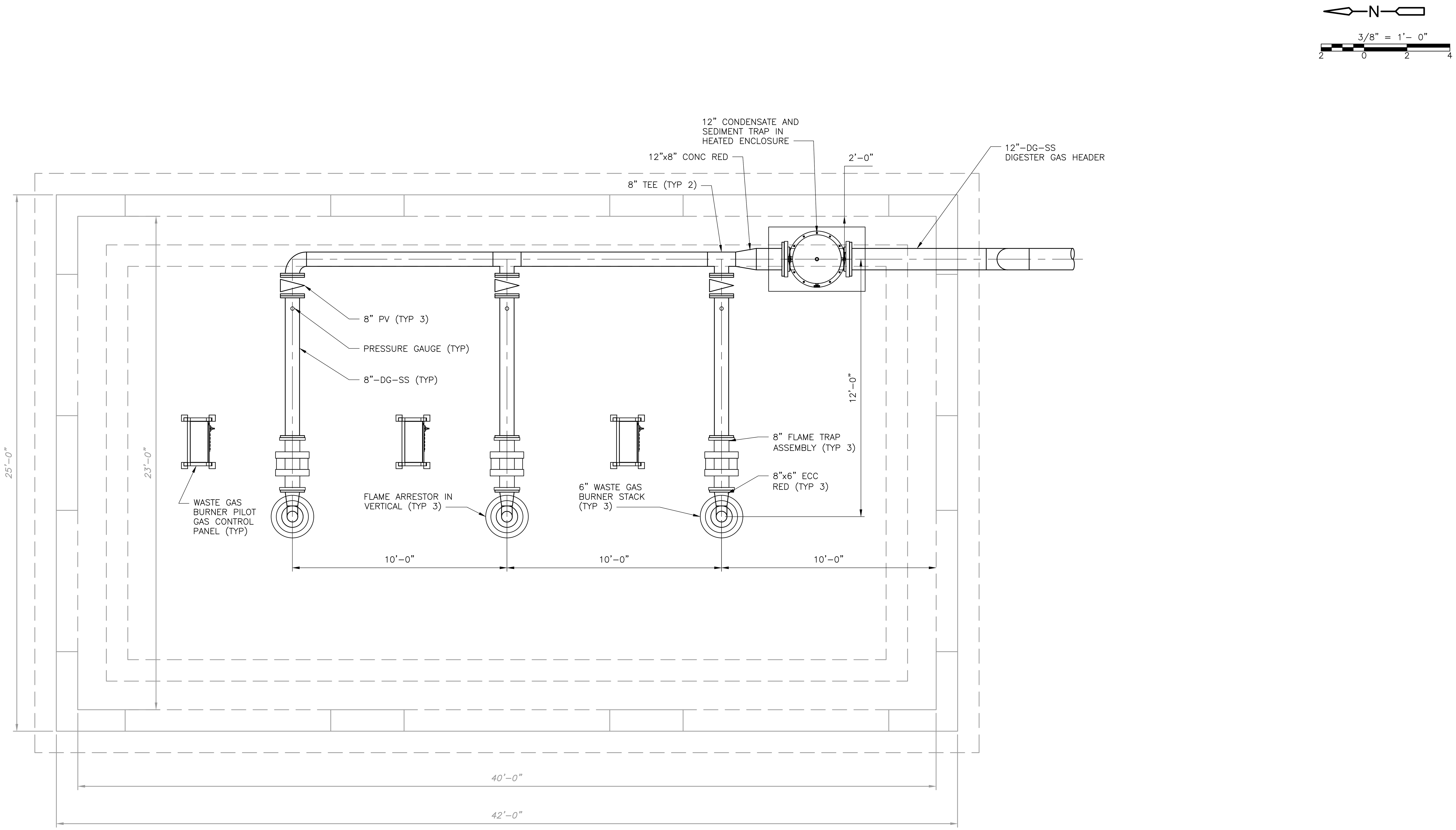
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

DIGESTER BUILDING
OPERATIONS LEVEL PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-M-3.dwg
SHEET NO.
04-M-3

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN

3/8 = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
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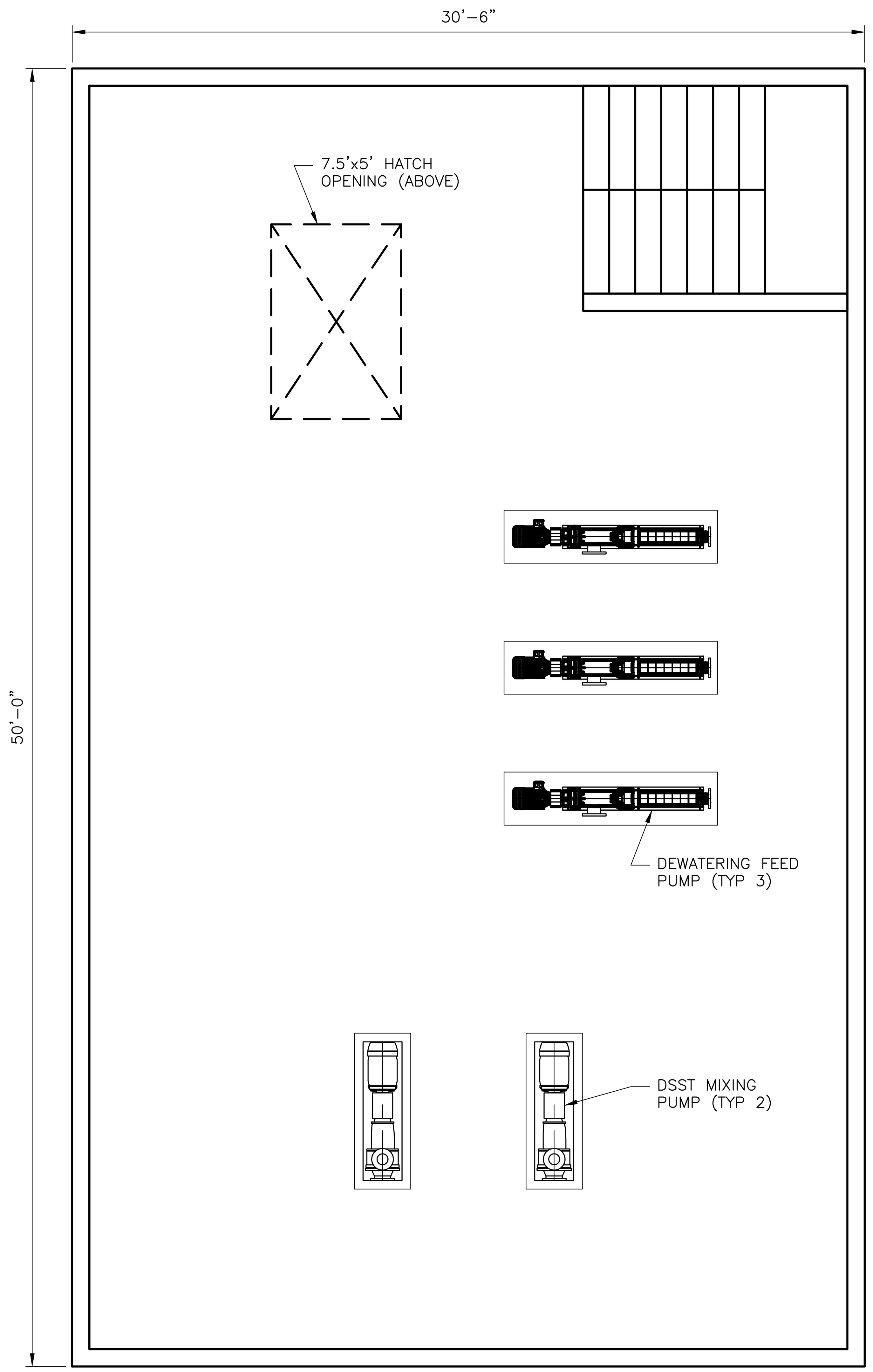
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

WASTE GAS FLARES PLAN

PROJECT NO. 10936-302237
FILE NAME: 04-M-4.dwg
SHEET NO.
04-M-4

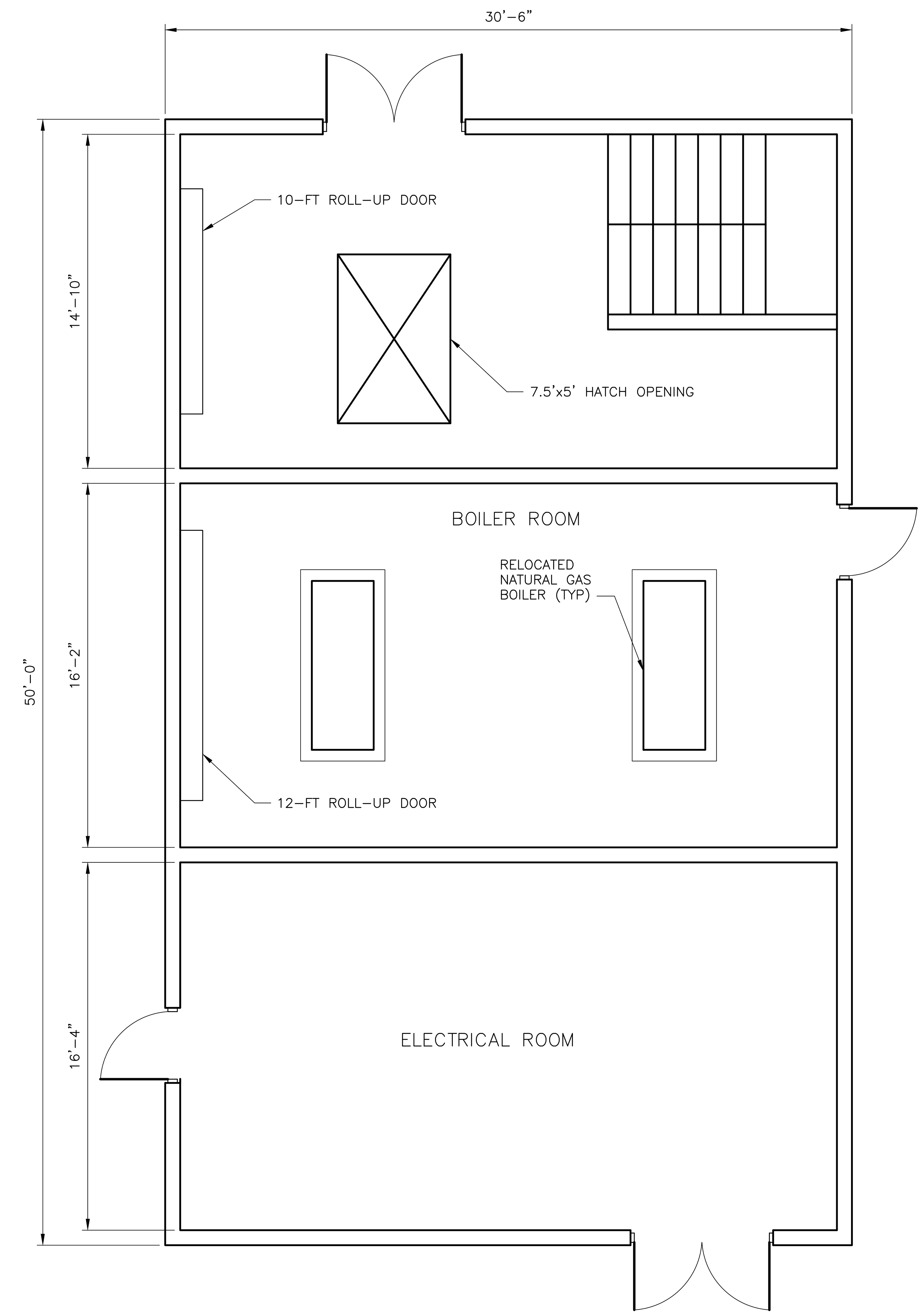
CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



BASEMENT PUMP ROOM

PLAN

1/4" = 1'-0"



GROUND FLOOR

PLAN

1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

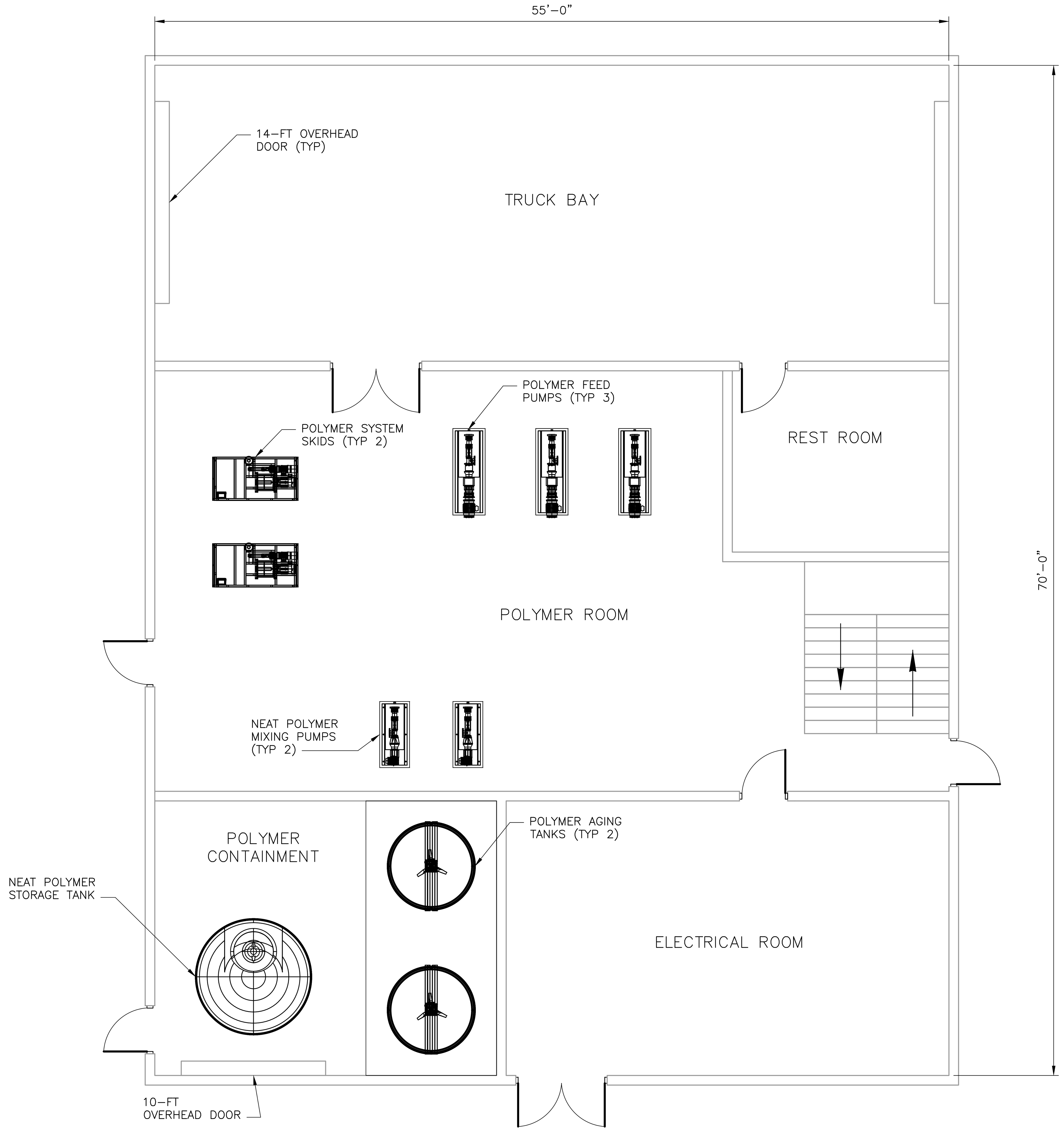
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

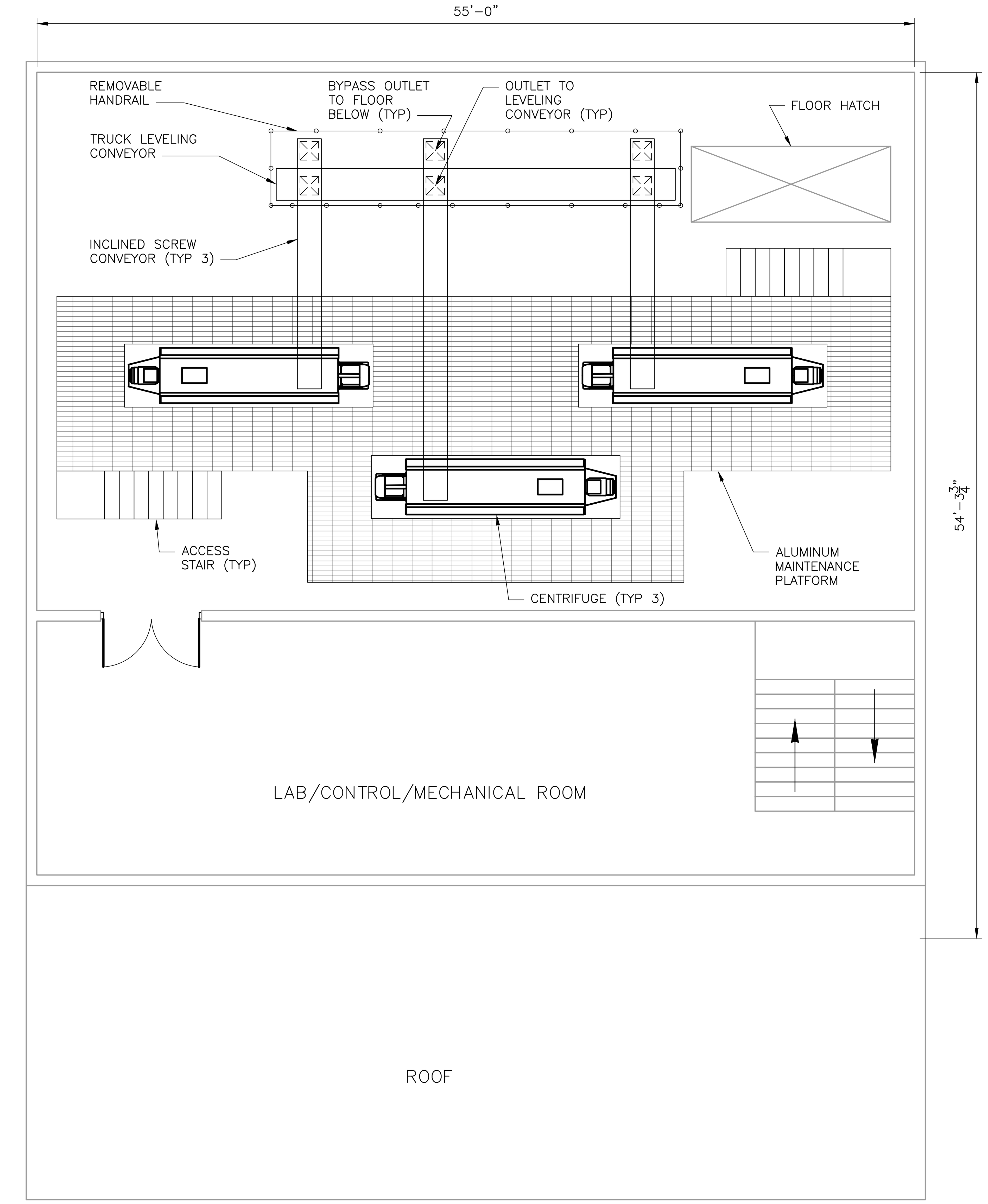
BUILDING NO.4.1
LOWER AND UPPER PLAN

PROJECT NO. 10936-302237
FILE NAME: 04.1-M-1.dwg
SHEET NO.
04.1-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



LOWER LEVEL
PLAN
3/16" = 1'-0"



UPPER LEVEL
PLAN
3/16" = 1'-0"

N
3/16" = 1'- 0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

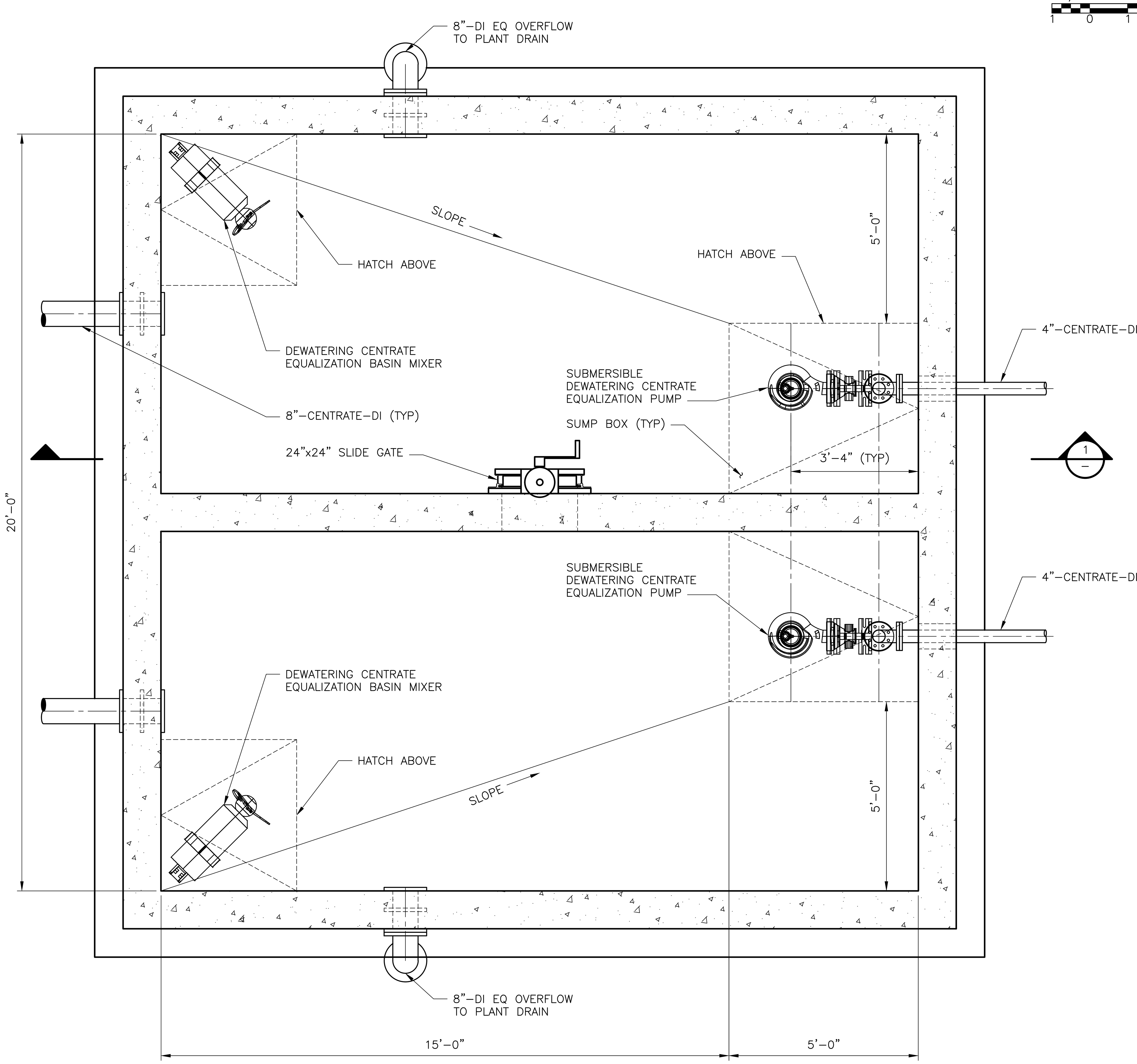
BULIDNG NO.10.1
LOWER AND UPPER PLAN

PROJECT NO. 10936-302237
FILE NAME: 10.1-M-1.dwg
SHEET NO.
10.1-M-1

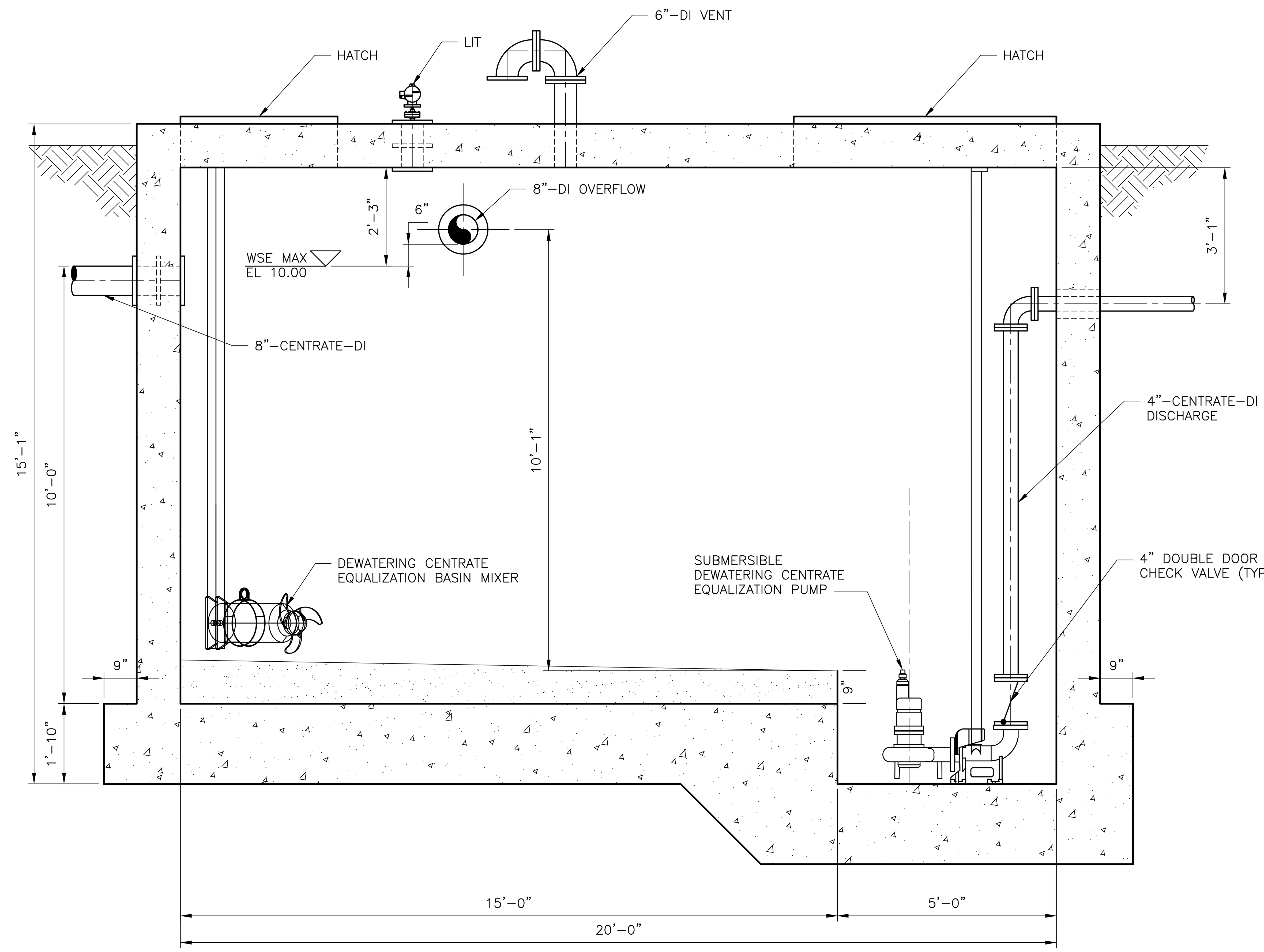
CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

NOTES:

1. PROVIDE CONNECTION FOR ODOR CONTROL DUCT.



PLAN
1/2" = 1'-0"



SECTION 1 / –
1/2" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: T. KOPPER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

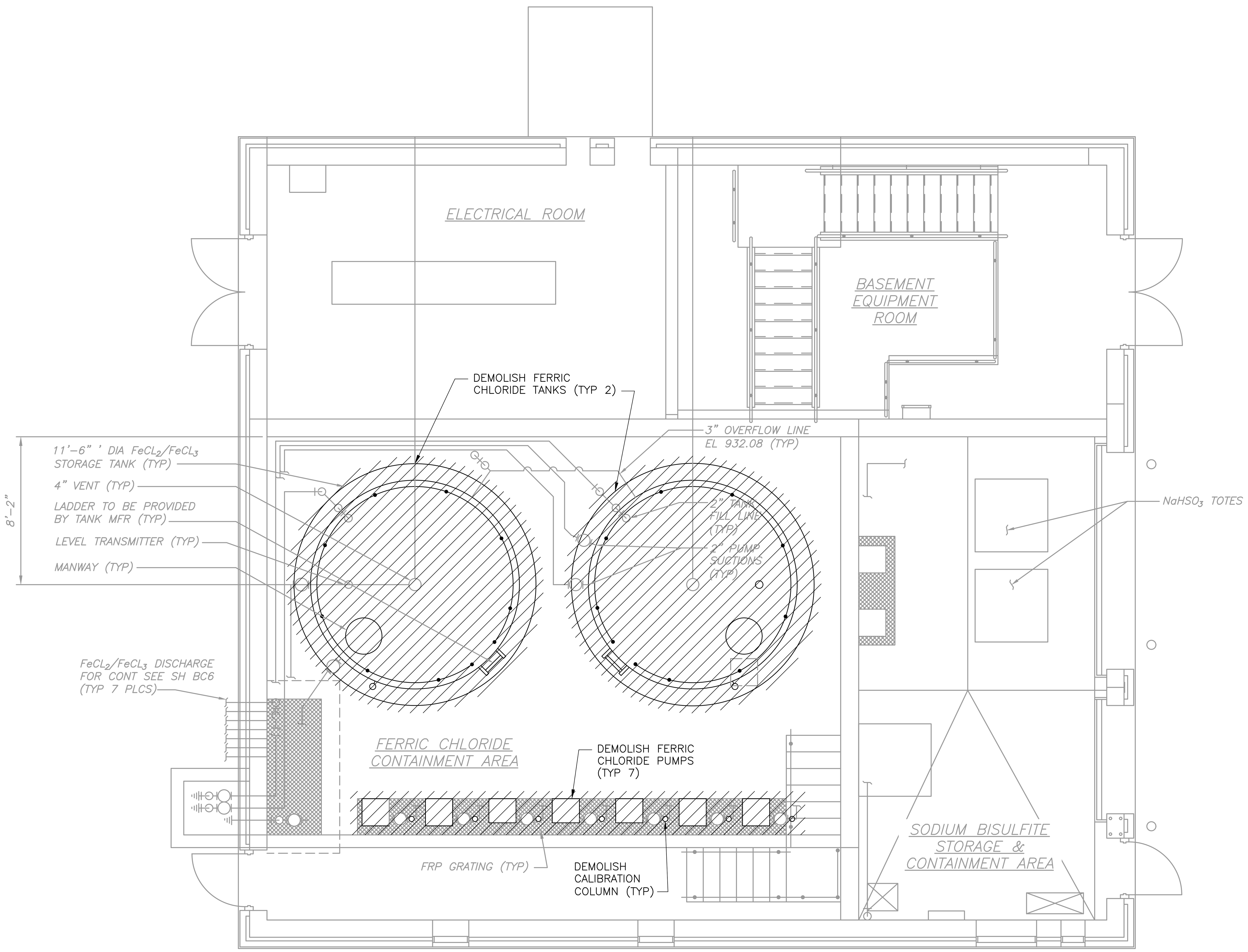
CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

CENTRATE EQUALIZATION TANK
PLAN AND SECTION

PROJECT NO. 10936-302237
FILE NAME: 10.1-M-2.dwg
SHEET NO.
10.1-M-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN
1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

CHEMICAL FEED BUILDING DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 14-DM-1.dwg
SHEET NO.
14-DM-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

XREFs: [CDMS_2234, MEP00CFPL] Images: []
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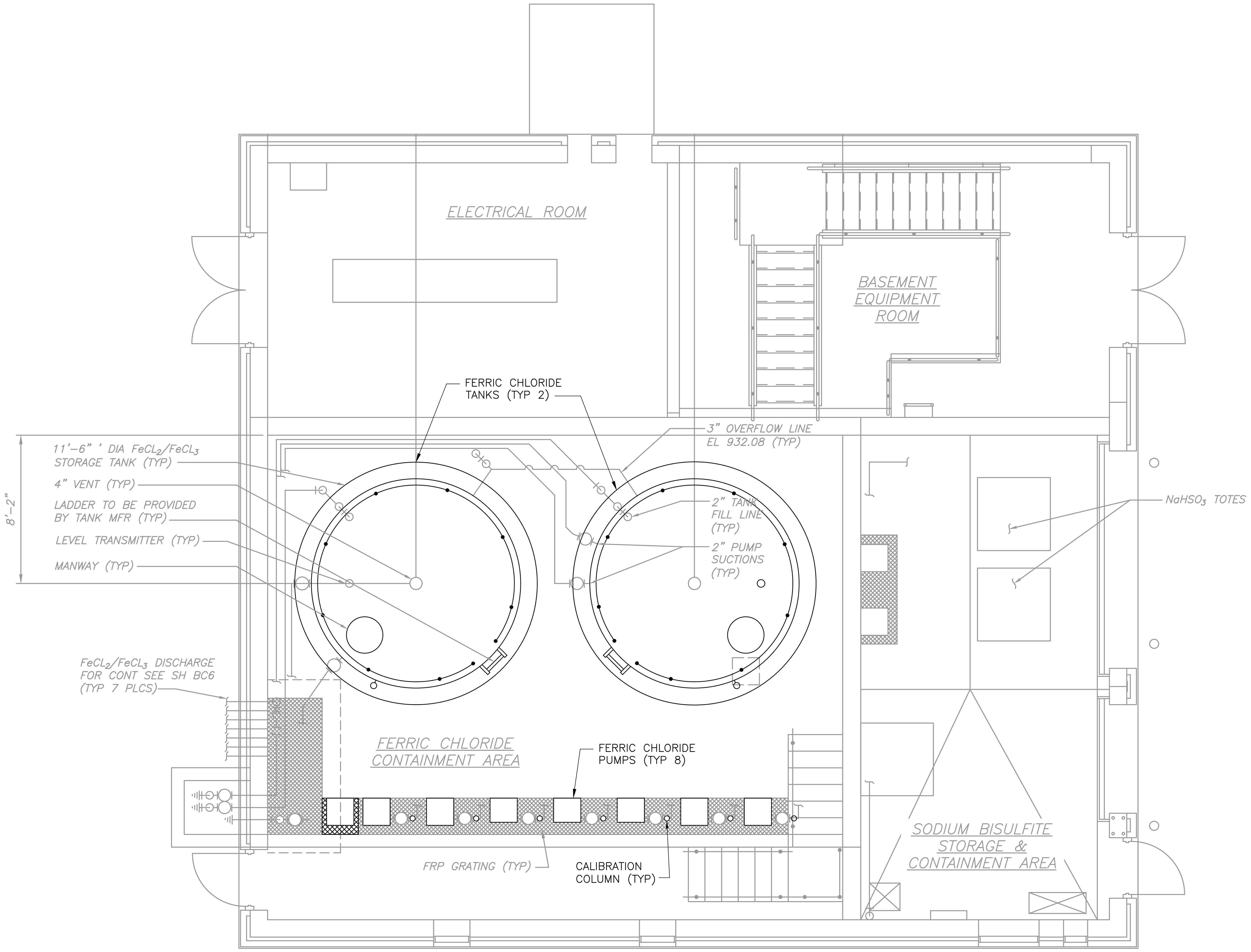
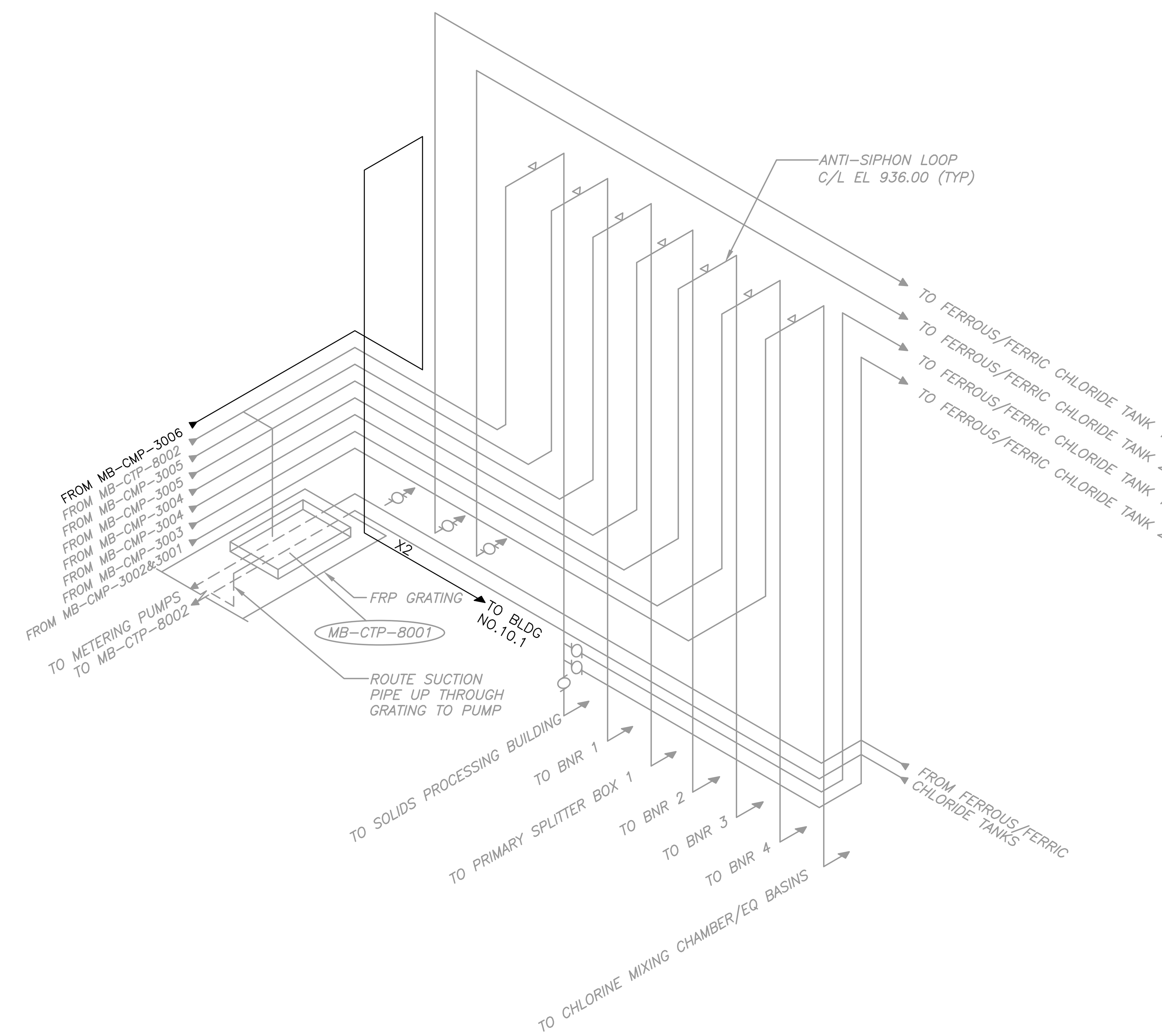


PLAN
1/4" = 1'-0"



FERROUS/FERRIC CHLORIDE PIPING SCHEMATIC
PARTIAL ISOMETRIC VIEW
NO SCALE

N
1/4" = 1'- 0"
2 1 0 2 4

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

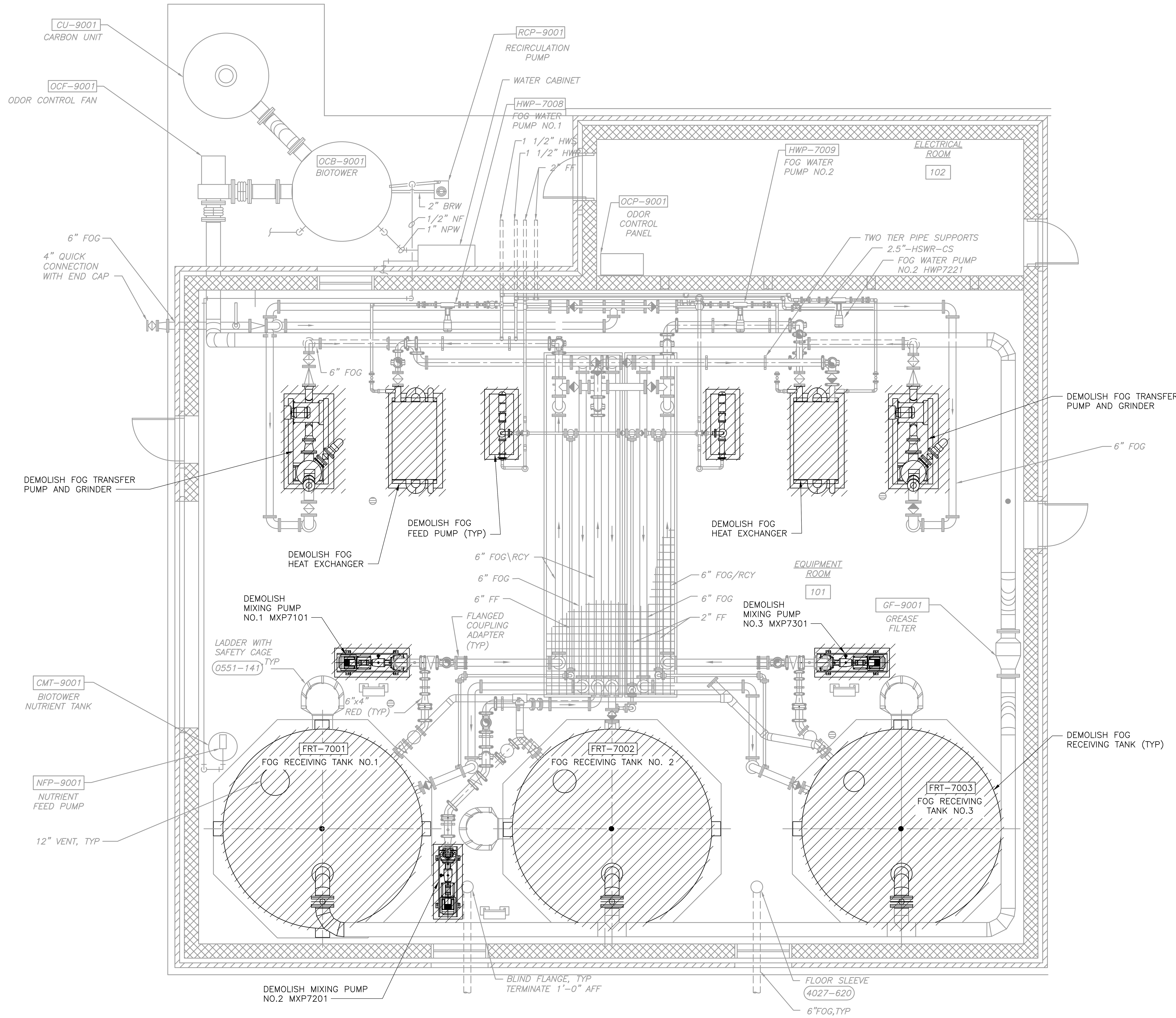
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

CHEMICAL FEED BUILDING PLAN

PROJECT NO. 10936-302237
FILE NAME: 14-M-1.dwg
SHEET NO.
14-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



N

1/4" = 1'- 0"

2 1 0 2 4

FOG BUILDING

LOWER PLAN

1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

FOG BUILDING
DEMOLITION PLAN

PROJECT NO. 10936-302237
FILE NAME: 15-DM-1.dwg
SHEET NO.
15-DM-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

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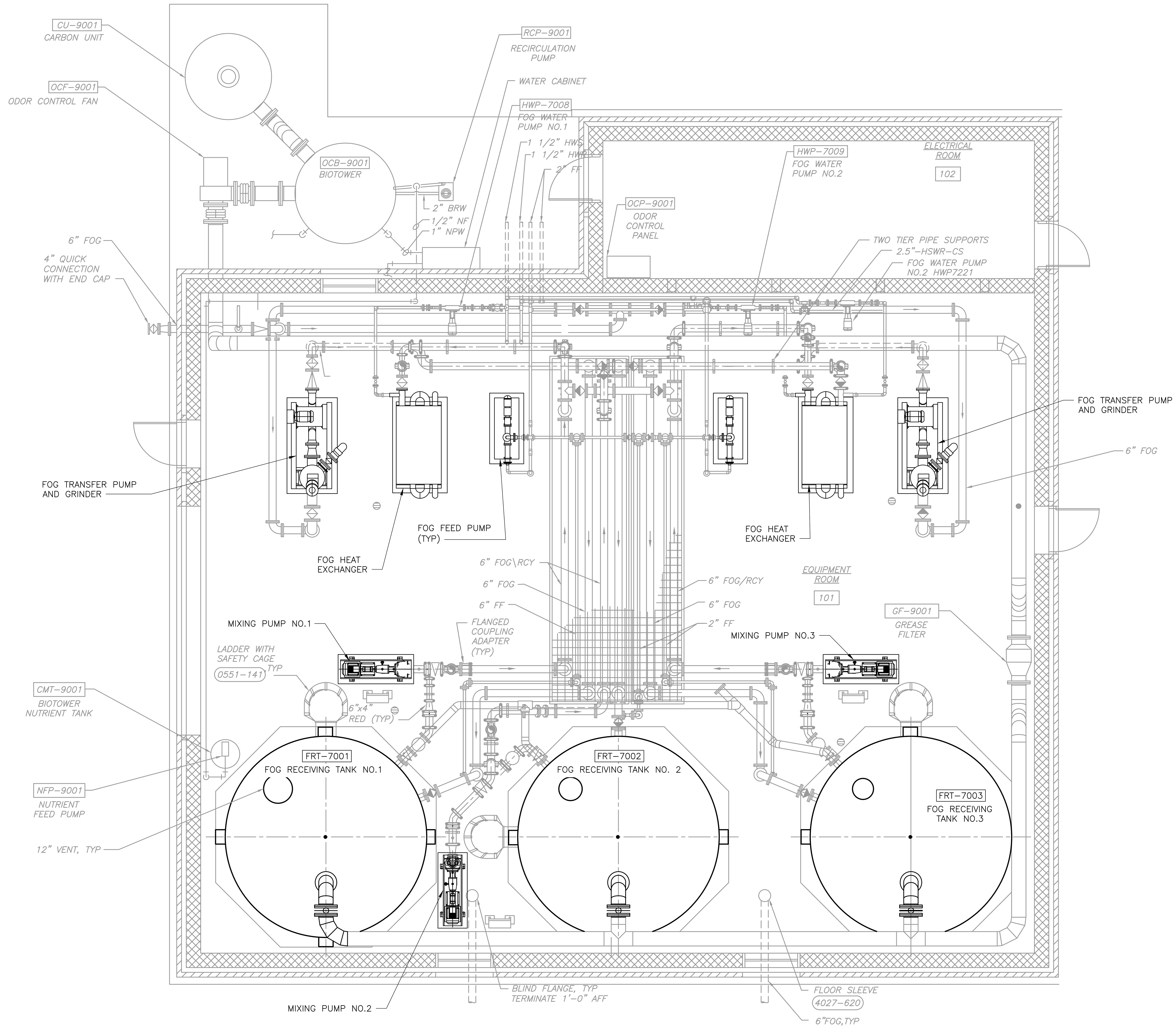


N

1/4" = 1'- 0"

FOG BUILDING

LOWER PLAN

1/4" = 1'-0"

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: M. MILLER
DRAWN BY: K. REESE
SHEET CHK'D BY: L. SCHAICH
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

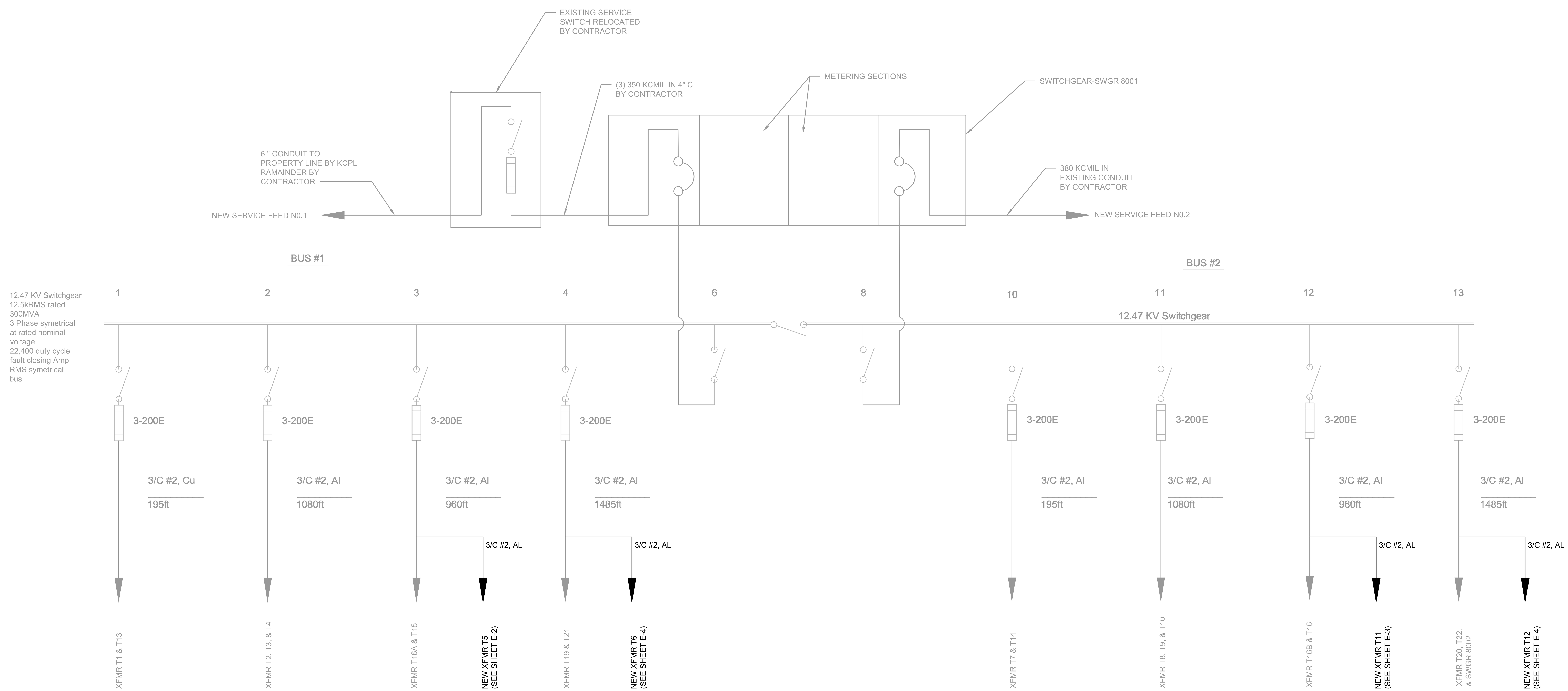
CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

FOG BUILDING PLAN

PROJECT NO. 10936-302237
FILE NAME: 15-M-1.dwg
SHEET NO.
15-M-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ELECTRICAL EXISTING MEDIUM VOLTAGE ONE LINE DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: E001NFOL.DWG
SHEET NO. E-1

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

KEY NOTES:

1. SIZE BY MCC MANUFACTURER.
2. MCP AMP RATTING TO BE DETERMINED BY MANUFACTURER.
3. FUSE TYPE AND AMPERAGE SHALL BE AS RECOMMENDED BY THE EQUIPMENT MFR.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ELECTRICAL
MCC-5 ONE LINE DIAGRAM 1

PROJECT NO. 10936-302237
FILE NAME: E002NFOL.DWG
SHEET NO.
E-2

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

KEY NOTES:

1. SIZE BY MCC MANUFACTURER.
2. MCP AMP RATTING TO BE DETERMINED BY MANUFACTURER.
3. FUSE TYPE AND AMPERAGE SHALL BE AS RECOMMENDED BY THE EQUIPMENT MFR.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

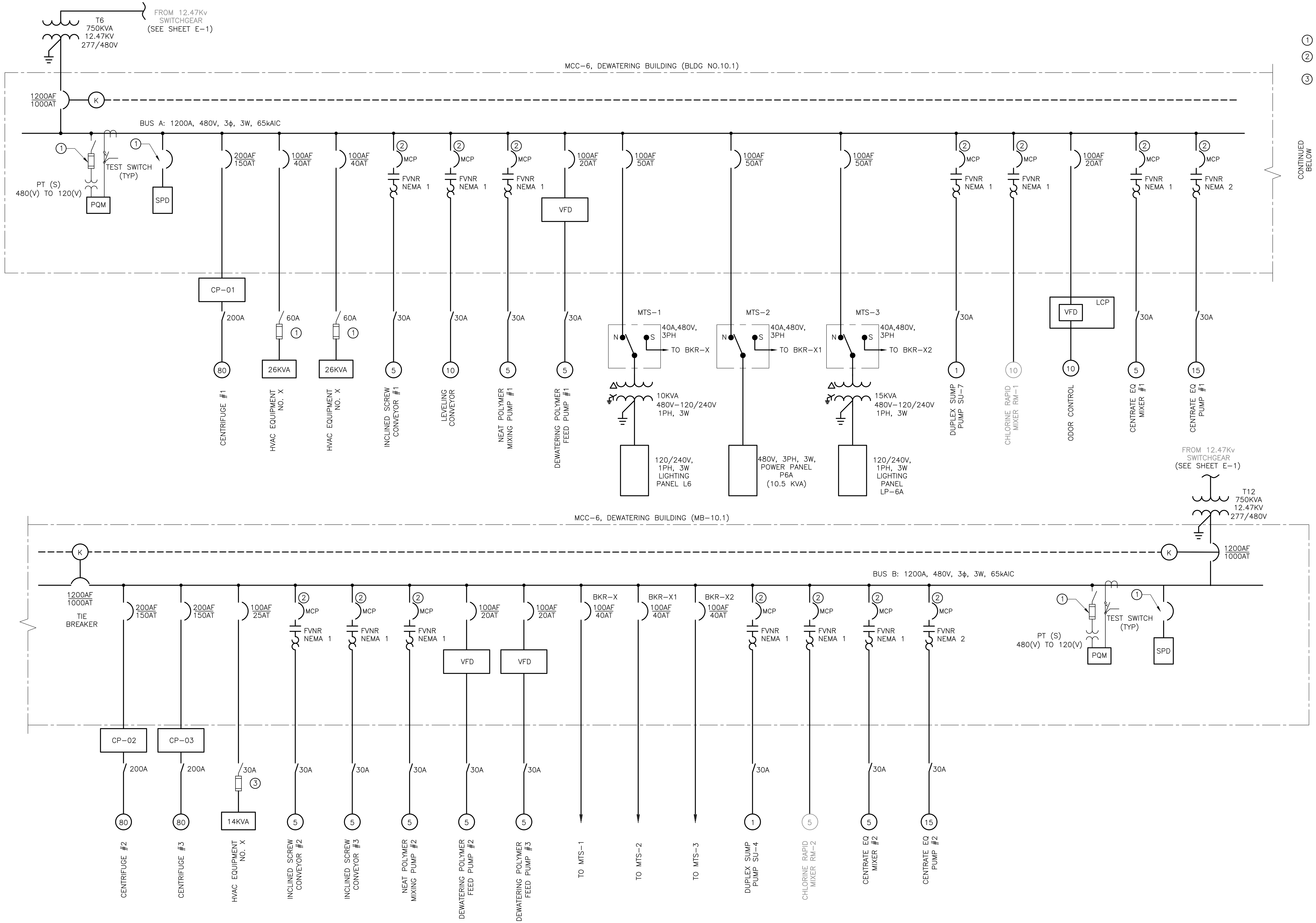
ELECTRICAL
MCC-5 ONE LINE DIAGRAM 2

PROJECT NO. 10936-302237
FILE NAME: E003NFOL.DWG
SHEET NO.
E-3

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

KEY NOTES:

1. SIZE BY MCC MANUFACTURER.
2. MCP AMP RATTING TO BE DETERMINED BY MANUFACTURER.
3. FUSE TYPE AND AMPERAGE SHALL BE AS RECOMMENDED BY THE EQUIPMENT MFR.



REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

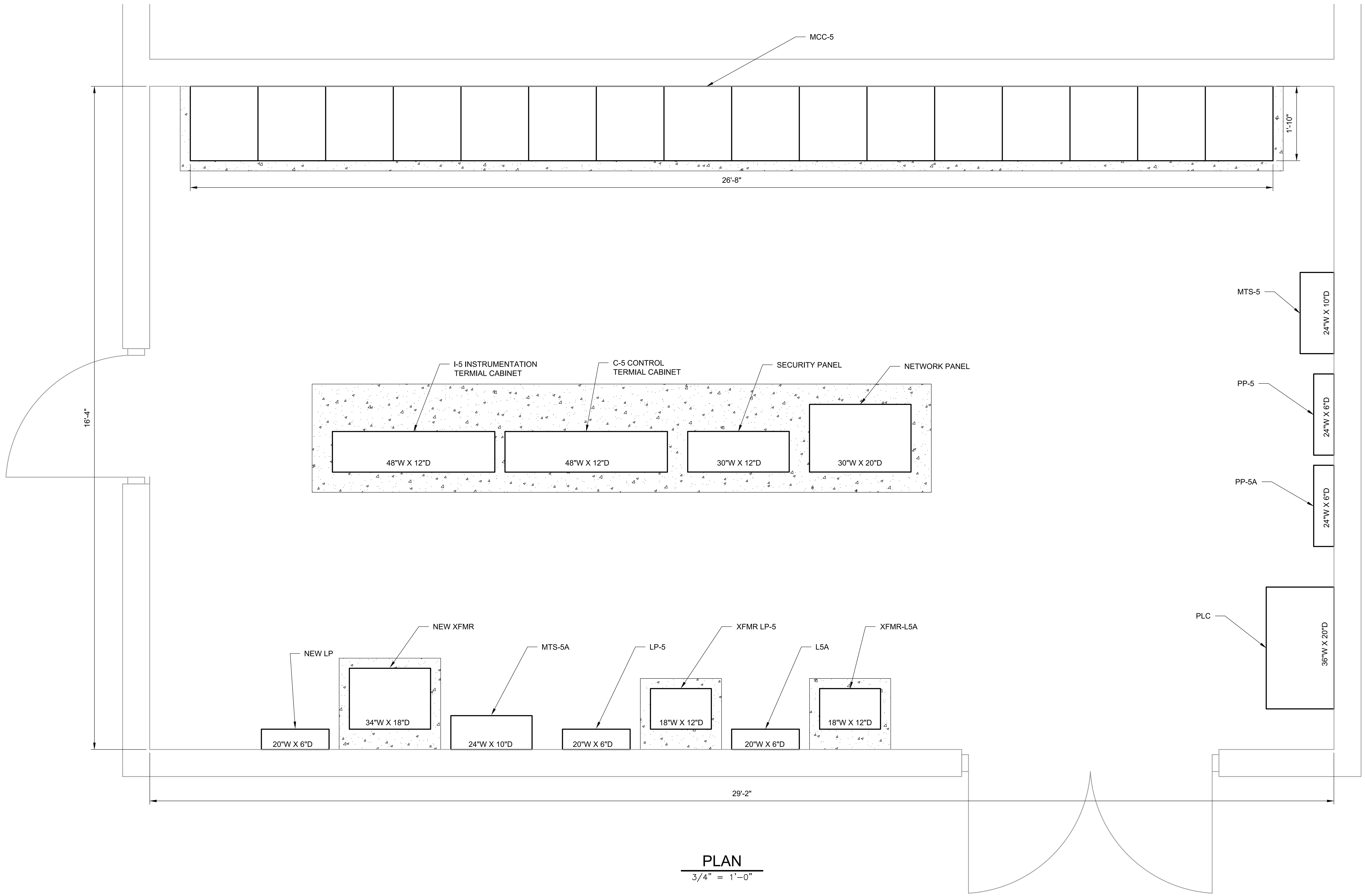
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ELECTRICAL
MCC-6 ONE LINE DIAGRAM

PROJECT NO. 10936-302237
FILE NAME: E004NFOL.DWG
SHEET NO.
E-4

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN

3/4" = 1'-0"

N

3/4" = 1'- 0"

GENERAL NOTES:

1. IF ADDITIONAL VFDS AND MOTOR STARTERS NEED TO BE INSTALLED IN THIS ROOM, ELECTRICAL RECOMMENDS INCREASING THE SIZE OF THE ELECTRICAL ROOM.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

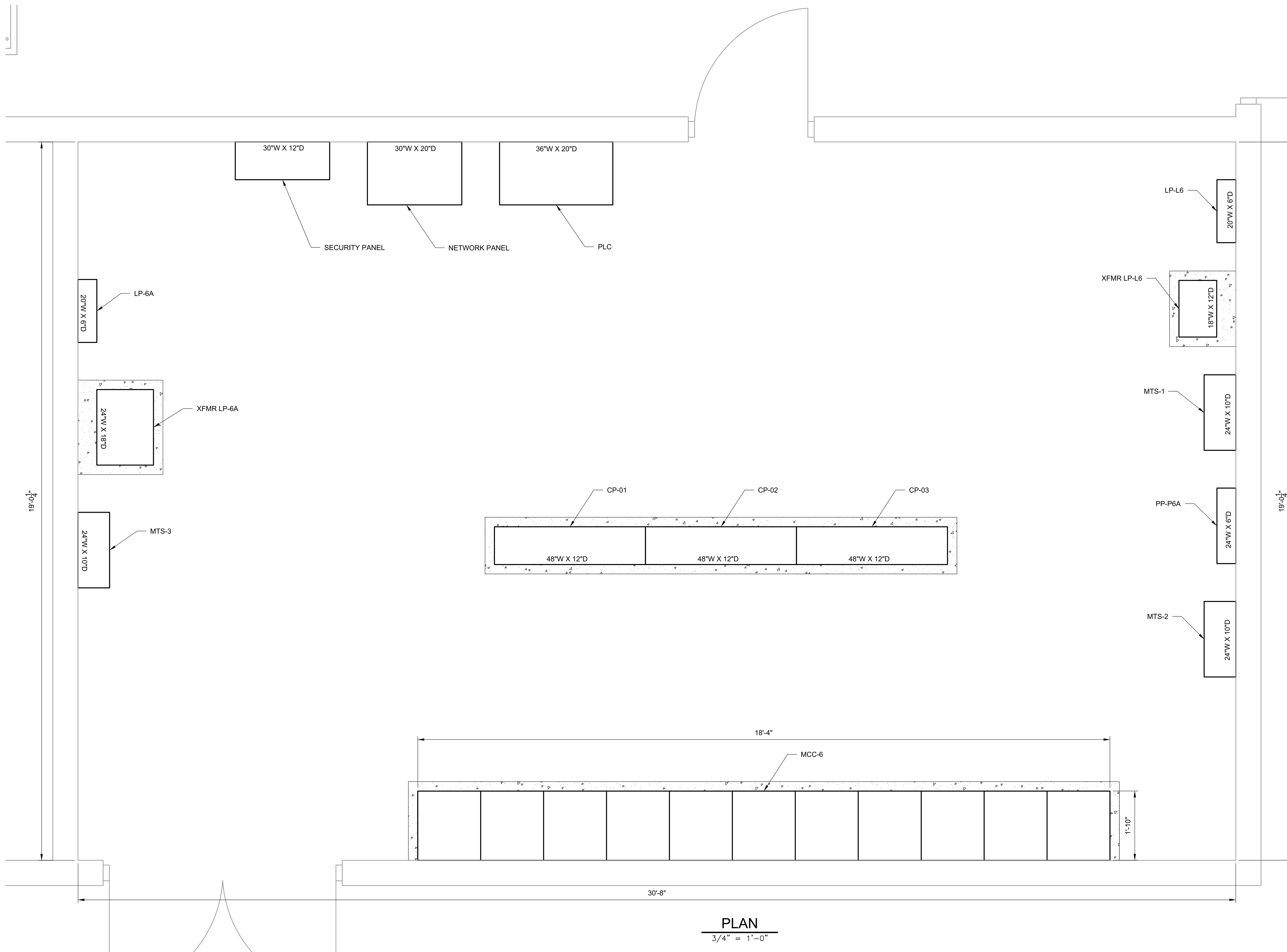
JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034

DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

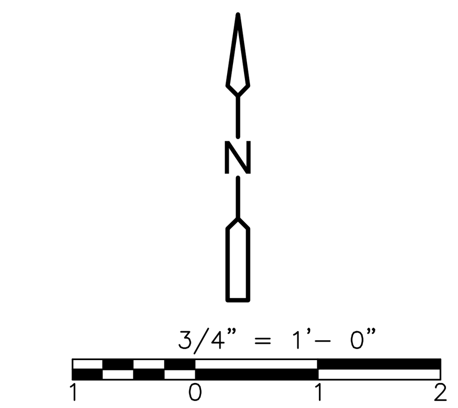
ELECTRICAL
BUILDING NO.4.1
ELECTRICAL ROOM LAYOUT

PROJECT NO. 10936-302237
FILE NAME: E005ELPL.DWG
SHEET NO.
E-5

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION



PLAN
3/4" = 1'-0"



GENERAL NOTES:

1. IF ADDITIONAL VFDS AND MOTOR STARTERS NEED TO BE INSTALLED IN THIS ROOM, ELECTRICAL RECOMMENDS INCREASING THE SIZE OF THE ELECTRICAL ROOM.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. MEMARZADEH
DRAWN BY: P. LONG
SHEET CHK'D BY: T. KLOBA
CROSS CHK'D BY:
APPROVED BY:
DATE: OCTOBER 2025

CDM Smith
8080 Ward Parkway, Suite 100
Kansas City, MO 64114
Tel: (816) 444-8270
KS COA: E-346

JOHNSON COUNTY WASTEWATER
JCW CONTRACT IMB1-C034
DOUGLAS L. SMITH MIDDLE BASIN WWTF
SOLIDS TREATMENT CONCEPTUAL PLAN

ELECTRICAL
BUILDING NO.10.1
ELECTRICAL ROOM LAYOUT

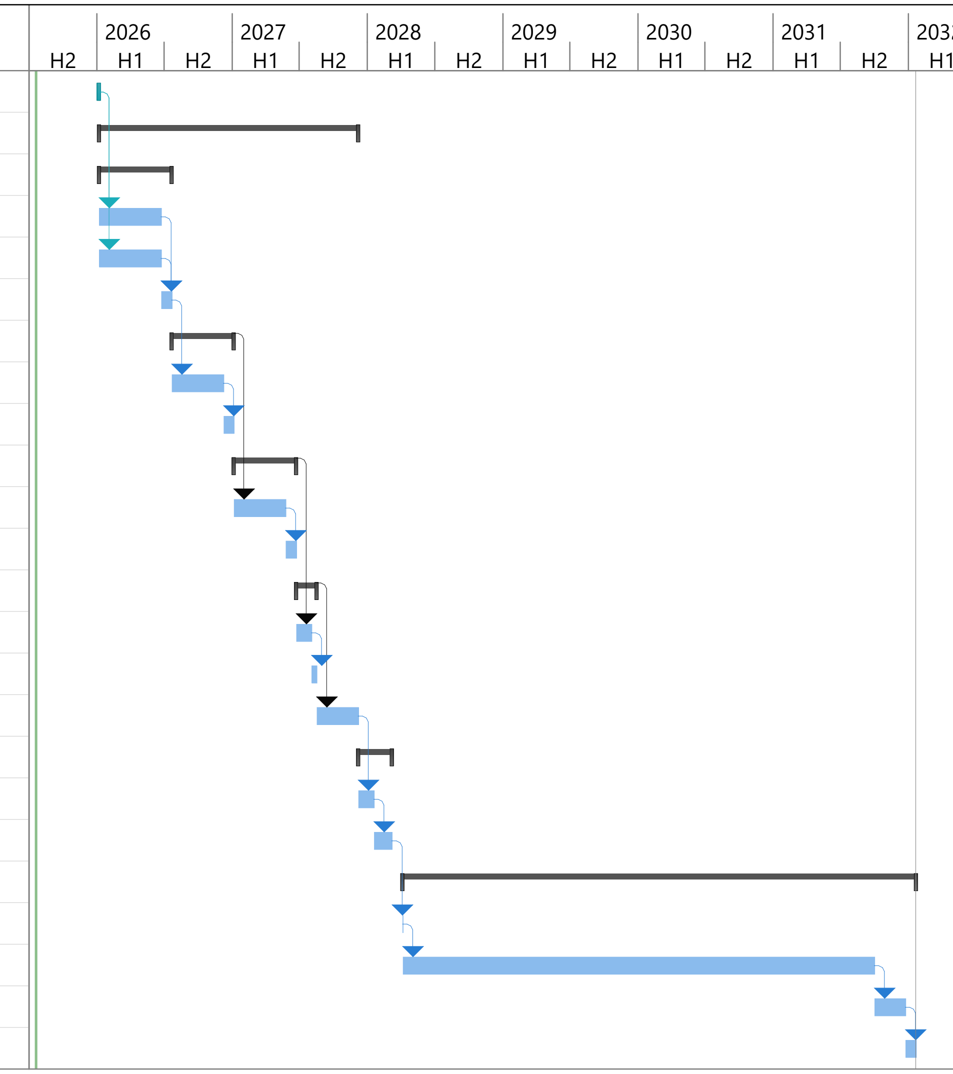
PROJECT NO. 10936-302237
FILE NAME: E006ELPL.DWG
SHEET NO.
E-6

CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

Appendix B Project Schedules

Middle Basin Solids Improvements
Alt. 1 - One DBB Project Summary Schedule

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		Notice to Proceed	1 day	Mon 1/5/26	Mon 1/5/26		
2		**Design Progression**	**500 days**	**Tue 1/6/26**	**Mon 12/6/27**		
3		**30% Design**	**140 days**	**Tue 1/6/26**	**Mon 7/20/26**		
4		Preliminary Engineering Report	120 days	Tue 1/6/26	Mon 6/22/26	1	
5		30% Drawings	120 days	Tue 1/6/26	Mon 6/22/26	1	
6		Client Review	20 days	Tue 6/23/26	Mon 7/20/26	4,5	
7		**60% Design**	**120 days**	**Tue 7/21/26**	**Mon 1/4/27**		
8		Plans and Specifications	100 days	Tue 7/21/26	Mon 12/7/26	6	
9		Client Review	20 days	Tue 12/8/26	Mon 1/4/27	8	
10		**90% Design**	**120 days**	**Tue 1/5/27**	**Mon 6/21/27**		
11		Plans and Specifications	100 days	Tue 1/5/27	Mon 5/24/27	7	
12		Client Review	20 days	Tue 5/25/27	Mon 6/21/27	11	
13		**100% Design**	**40 days**	**Tue 6/22/27**	**Mon 8/16/27**		
14		Plans and Specifications	30 days	Tue 6/22/27	Mon 8/2/27	10	
15		Client Review	10 days	Tue 8/3/27	Mon 8/16/27	14	
16		Permitting	80 days	Tue 8/17/27	Mon 12/6/27	13	
17		**Bidding - One DBB Project**	**65 days**	**Tue 12/7/27**	**Mon 3/6/28**		
18		Advertisement	30 days	Tue 12/7/27	Mon 1/17/28	16	
19		Contract Review and Award	35 days	Tue 1/18/28	Mon 3/6/28	18	
20		**Construction - One DBB Project**	**991 days**	**Tue 4/4/28**	**Tue 1/20/32**		
21		Notice to Proceed	1 day	Tue 4/4/28	Tue 4/4/28	19FS+20 days	
22		Construction Duration	910 days	Wed 4/5/28	Tue 9/30/31	21	
23		Substantial Completion	60 days	Wed 10/1/31	Tue 12/23/31	22	
24		Closeout	20 days	Wed 12/24/31	Tue 1/20/32	23	



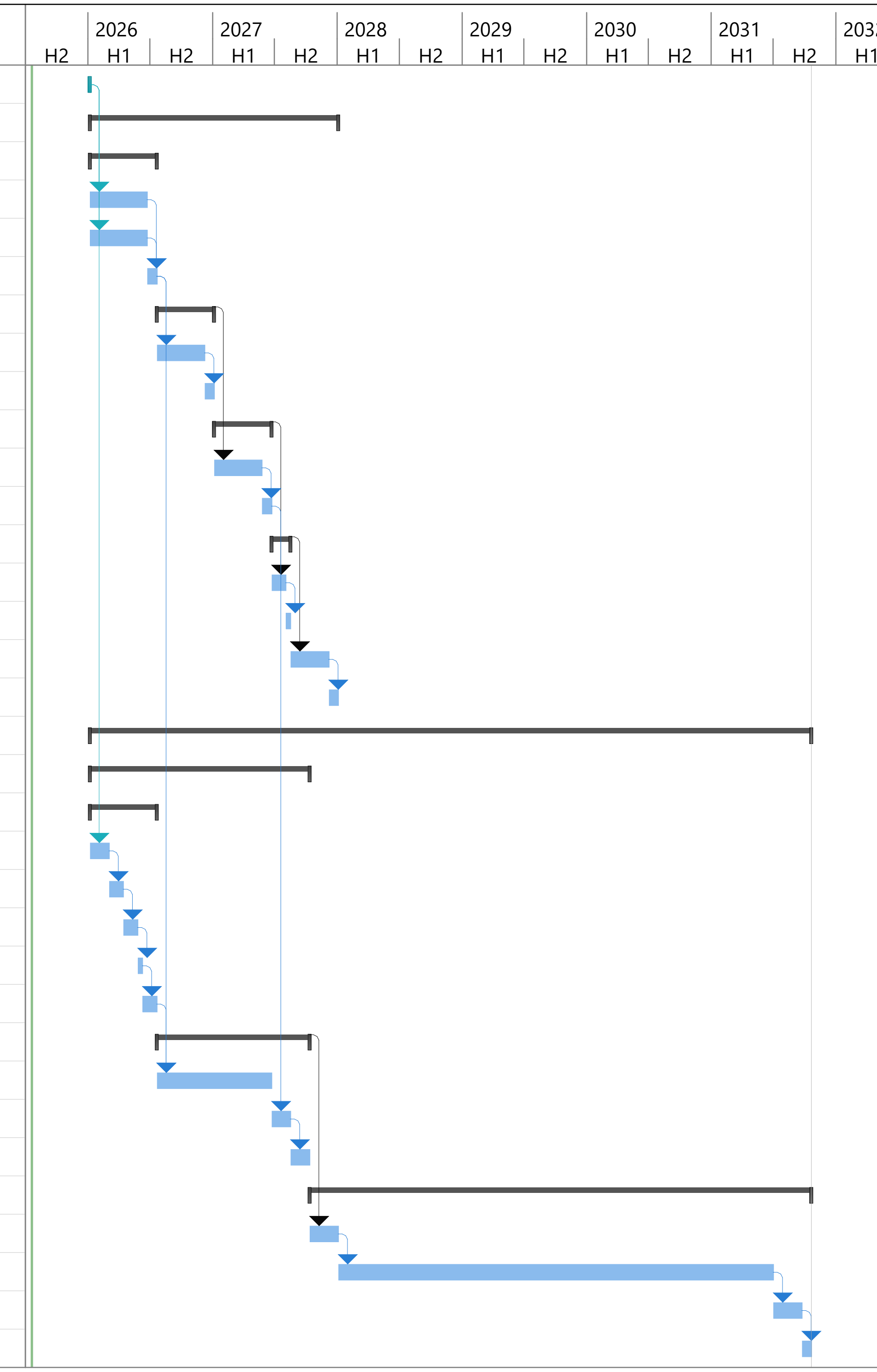
Project: JCW Middle Basin Solid

Task		Project Summary		Manual Task		Start-only		Deadline	
Split		Inactive Task		Duration-only		Finish-only		Progress	
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
Summary		Inactive Summary		Manual Summary		External Milestone			

Middle Basin Solids Improvements

Alt. 2 - One CMAR Delivery Project Summary Schedule

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			Notice to Proceed	1 day	Mon 1/5/26	Mon 1/5/26		
2			**Design Progression**	**520 days**	**Tue 1/6/26**	**Mon 1/3/28**		
3			**30% Design**	**140 days**	**Tue 1/6/26**	**Mon 7/20/26**		
4			Preliminary Engineering Report	120 days	Tue 1/6/26	Mon 6/22/26	1	
5			30% Drawings	120 days	Tue 1/6/26	Mon 6/22/26	1	
6			Client Review	20 days	Tue 6/23/26	Mon 7/20/26	4,5	
7			**60% Design**	**120 days**	**Tue 7/21/26**	**Mon 1/4/27**		
8			Plans and Specifications	100 days	Tue 7/21/26	Mon 12/7/26	6	
9			Client Review	20 days	Tue 12/8/26	Mon 1/4/27	8	
10			**90% Design**	**120 days**	**Tue 1/5/27**	**Mon 6/21/27**		
11			Plans and Specifications	100 days	Tue 1/5/27	Mon 5/24/27	7	
12			Client Review	20 days	Tue 5/25/27	Mon 6/21/27	11	
13			**100% Design**	**40 days**	**Tue 6/22/27**	**Mon 8/16/27**		
14			Plans and Specifications	30 days	Tue 6/22/27	Mon 8/2/27	10	
15			Client Review	10 days	Tue 8/3/27	Mon 8/16/27	14	
16			Permitting	80 days	Tue 8/17/27	Mon 12/6/27	13	
17			Release Issued for Construction Documents	20 days	Tue 12/7/27	Mon 1/3/28	16	
18			**CMAR - One Project**	**1510 days**	**Tue 1/6/26**	**Mon 10/20/31**		
19			**CMAR Procurement**	**460 days**	**Tue 1/6/26**	**Mon 10/11/27**		
20			**JCW Alternative Delivery Procurement**	**140 days**	**Tue 1/6/26**	**Mon 7/20/26**		
21			BOCC Approval Process	40 days	Tue 1/6/26	Mon 3/2/26	1	
22			Phase 1: RFQ	30 days	Tue 3/3/26	Mon 4/13/26	21	
23			Phase 2: RFP	30 days	Tue 4/14/26	Mon 5/25/26	22	
24			Phase 3: Interview	10 days	Tue 5/26/26	Mon 6/8/26	23	
25			Contract Negotiation and Approval	30 days	Tue 6/9/26	Mon 7/20/26	24	
26			**Preconstruction Services**	**320 days**	**Tue 7/21/26**	**Mon 10/11/27**		
27			Design Review, Risk Register, ROM Costs, Schedule	240 days	Tue 7/21/26	Mon 6/21/27	6,25	
28			GMP Preparation (After 90%)	40 days	Tue 6/22/27	Mon 8/16/27	12	
29			GMP Client Approval	40 days	Tue 8/17/27	Mon 10/11/27	28	
30			**CMAR Construction Services**	**1050 days**	**Tue 10/12/27**	**Mon 10/20/31**		
31			Procurement Phase	60 days	Tue 10/12/27	Mon 1/3/28	26	
32			Construction Duration	910 days	Tue 1/4/28	Mon 6/30/31	31	
33			Substantial Completion	60 days	Tue 7/1/31	Mon 9/22/31	32	
34			Close Out	20 days	Tue 9/23/31	Mon 10/20/31	33	

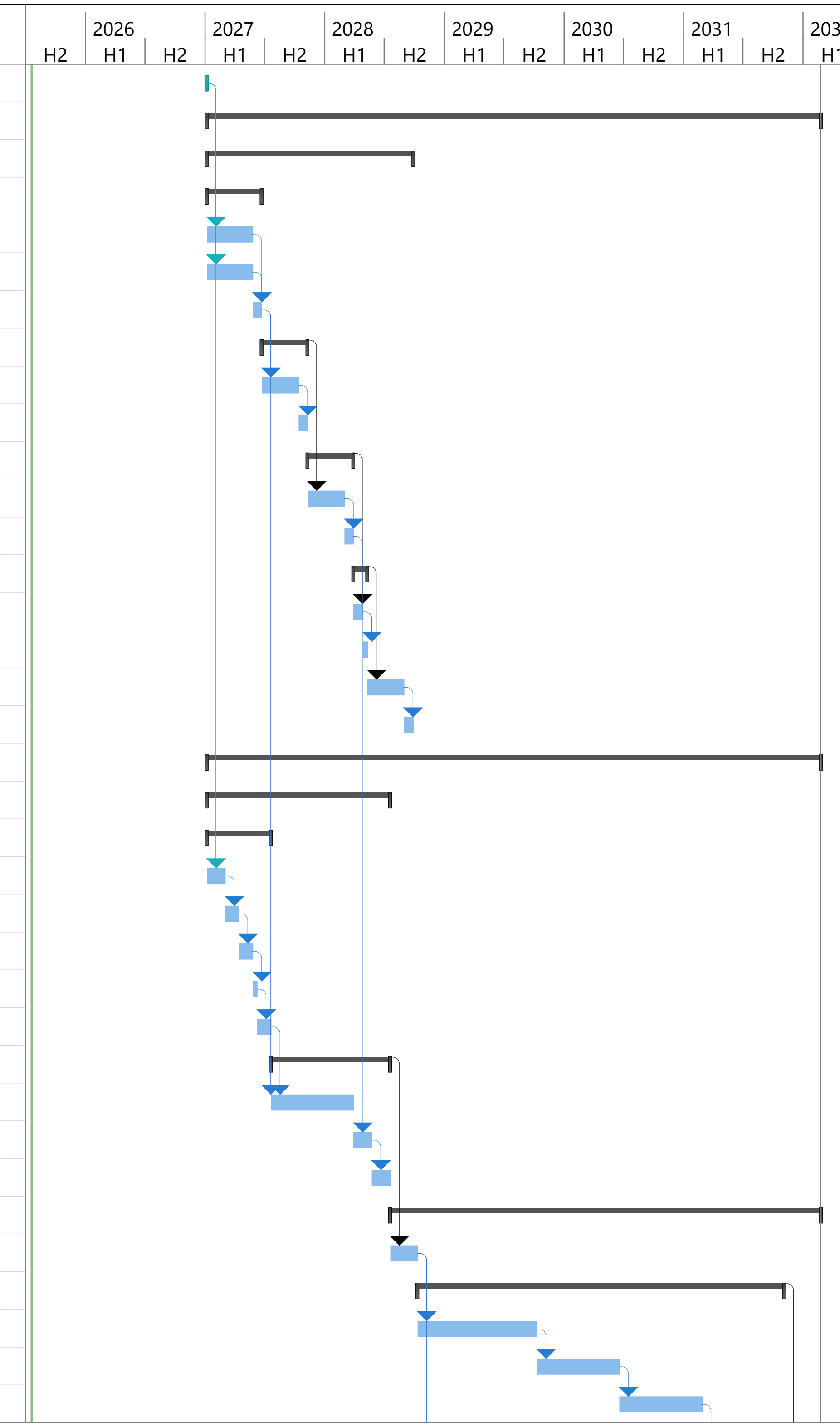


Project: JCW Middle Basin Solid

Middle Basin Solids Improvements

Alt 3 - Digester CMAR and Dewatering DBB Deliveries Project Summary Schedule

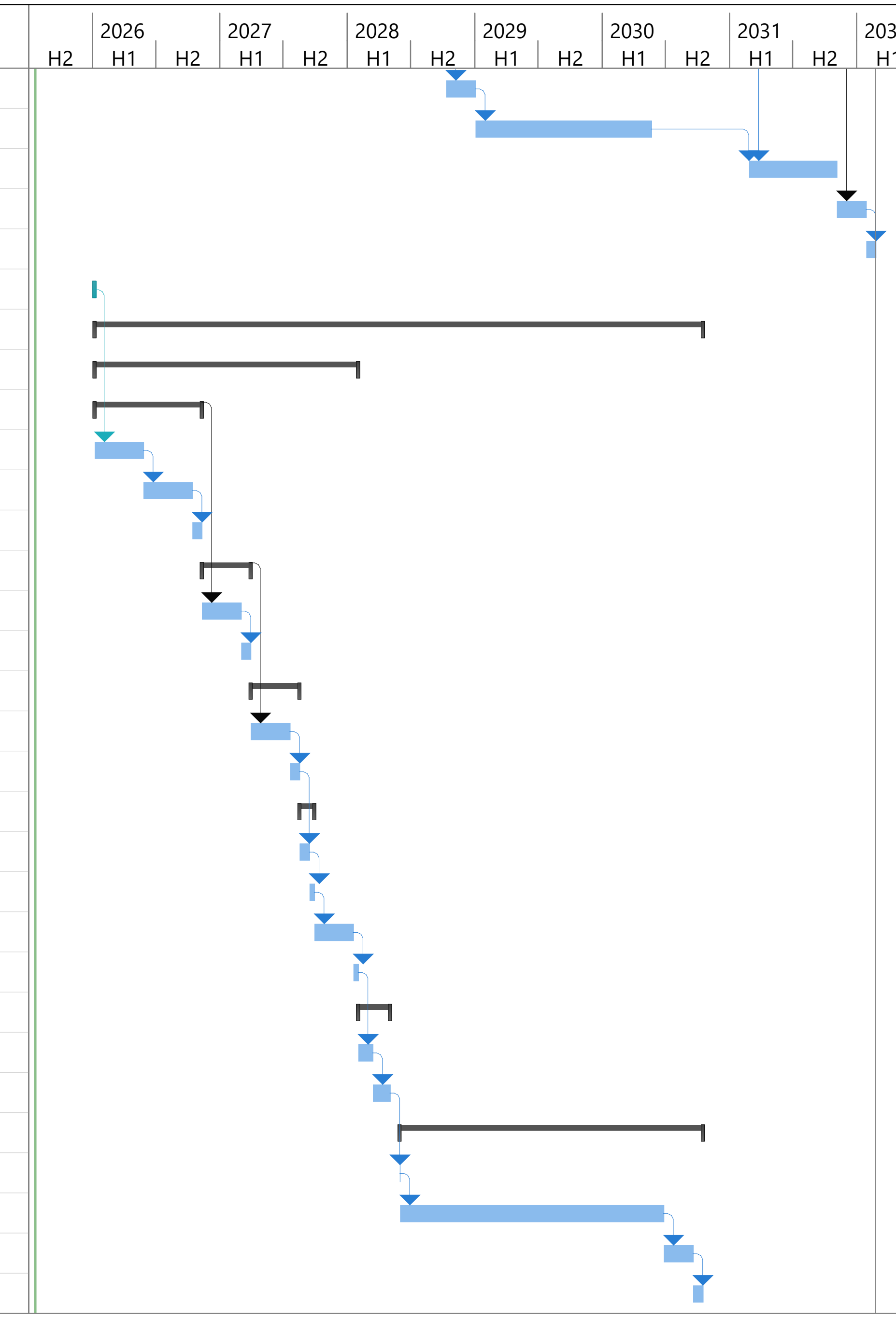
ID	ⓘ	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			Notice to Proceed - Digesters Project	1 day	Mon 1/4/27	Mon 1/4/27		
2			**Digesters Project - CMAR Delivery**	**1340 days**	**Tue 1/5/27**	**Mon 2/23/32**		
3			**Design Progression - Digesters**	**450 days**	**Tue 1/5/27**	**Mon 9/25/28**		
4			**30% Design**	**120 days**	**Tue 1/5/27**	**Mon 6/21/27**		
5			Preliminary Engineering Report	100 days	Tue 1/5/27	Mon 5/24/27	1	
6			30% Drawings	100 days	Tue 1/5/27	Mon 5/24/27	1	
7			Client Review	20 days	Tue 5/25/27	Mon 6/21/27	5,6	
8			**60% Design**	**100 days**	**Tue 6/22/27**	**Mon 11/8/27**		
9			Plans and Specifications	80 days	Tue 6/22/27	Mon 10/11/27	7	
10			Client Review	20 days	Tue 10/12/27	Mon 11/8/27	9	
11			**90% Design**	**100 days**	**Tue 11/9/27**	**Mon 3/27/28**		
12			Plans and Specifications	80 days	Tue 11/9/27	Mon 2/28/28	8	
13			Client Review	20 days	Tue 2/29/28	Mon 3/27/28	12	
14			**100% Design**	**30 days**	**Tue 3/28/28**	**Mon 5/8/28**		
15			Plans and Specifications	20 days	Tue 3/28/28	Mon 4/24/28	11	
16			Client Review	10 days	Tue 4/25/28	Mon 5/8/28	15	
17			Permitting	80 days	Tue 5/9/28	Mon 8/28/28	14	
18			Release Issued for Construction Documents	20 days	Tue 8/29/28	Mon 9/25/28	17	
19			**CMAR - Digesters Project**	**1340 days**	**Tue 1/5/27**	**Mon 2/23/32**		
20			**CMAR Procurement**	**400 days**	**Tue 1/5/27**	**Mon 7/17/28**		
21			**JCW Alternative Delivery Procurement**	**140 days**	**Tue 1/5/27**	**Mon 7/19/27**		
22			BOCC Approval Process	40 days	Tue 1/5/27	Mon 3/1/27	1	
23			Phase 1: RFQ	30 days	Tue 3/2/27	Mon 4/12/27	22	
24			Phase 2: RFP	30 days	Tue 4/13/27	Mon 5/24/27	23	
25			Phase 3: Interview	10 days	Tue 5/25/27	Mon 6/7/27	24	
26			Contract Negotiation and Approval	30 days	Tue 6/8/27	Mon 7/19/27	25	
27			**Preconstruction Services**	**260 days**	**Tue 7/20/27**	**Mon 7/17/28**		
28			Design Review, Risk Register, ROM Costs, Schedule	180 days	Tue 7/20/27	Mon 3/27/28	7,26	
29			GMP Preparation (After 90%)	40 days	Tue 3/28/28	Mon 5/22/28	13	
30			GMP Client Approval	40 days	Tue 5/23/28	Mon 7/17/28	29	
31			**CMAR Construction Services**	**940 days**	**Tue 7/18/28**	**Mon 2/23/32**		
32			Procurement Phase	60 days	Tue 7/18/28	Mon 10/9/28	27	
33			**Construction Duration**	**800 days**	**Tue 10/10/28**	**Mon 11/3/31**		
34			Digester 1 Imps	260 days	Tue 10/10/28	Mon 10/8/29	32	
35			Digester 3 Imps	180 days	Tue 10/9/29	Mon 6/17/30	34	
36			Digester 4 Imps	180 days	Tue 6/18/30	Mon 2/24/31	35	



Project: JCW Middle Basin Solid

Task		Project Summary		Manual Task		Start-only		Deadline	
Split		Inactive Task		Duration-only		Finish-only		Progress	
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
Summary		Inactive Summary		Manual Summary		External Milestone			

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
37			Digester Gas Storage Tank Pad Demolition	60 days	Tue 10/10/28	Mon 1/1/29	32	
38			DSST and Support Construction - 18 months	360 days	Tue 1/2/29	Mon 5/20/30	37	
39			Digester 2 Imps	180 days	Tue 2/25/31	Mon 11/3/31	38,36	
40			Substantial Completion	60 days	Tue 11/4/31	Mon 1/26/32	33	
41			Close Out	20 days	Tue 1/27/32	Mon 2/23/32	40	
42			Dewatering NTP	1 day	Mon 1/5/26	Mon 1/5/26		
43			**Dewatering Building Project**	**1246 days**	**Tue 1/6/26**	**Tue 10/15/30**		
44			**Design Progression - Dewatering Building**	**540 days**	**Tue 1/6/26**	**Mon 1/31/28**		
45			**30% Design**	**220 days**	**Tue 1/6/26**	**Mon 11/9/26**		
46			Preliminary Engineering Report	100 days	Tue 1/6/26	Mon 5/25/26	42	
47			30% Drawings	100 days	Tue 5/26/26	Mon 10/12/26	46	
48			Client Review	20 days	Tue 10/13/26	Mon 11/9/26	47	
49			**60% Design**	**100 days**	**Tue 11/10/26**	**Mon 3/29/27**		
50			Plans and Specifications	80 days	Tue 11/10/26	Mon 3/1/27	45	
51			Client Review	20 days	Tue 3/2/27	Mon 3/29/27	50	
52			**90% Design**	**100 days**	**Tue 3/30/27**	**Mon 8/16/27**		
53			Plans and Specifications	80 days	Tue 3/30/27	Mon 7/19/27	49	
54			Client Review	20 days	Tue 7/20/27	Mon 8/16/27	53	
55			**100% Design**	**30 days**	**Tue 8/17/27**	**Mon 9/27/27**		
56			Plans and Specifications	20 days	Tue 8/17/27	Mon 9/13/27	54	
57			Client Review	10 days	Tue 9/14/27	Mon 9/27/27	56	
58			Permitting	80 days	Tue 9/28/27	Mon 1/17/28	57	
59			Release Issued for Construction Documents	10 days	Tue 1/18/28	Mon 1/31/28	58	
60			**Bidding - Dewatering Bldg DBB Project**	**65 days**	**Tue 2/1/28**	**Mon 5/1/28**		
61			Advertisement	30 days	Tue 2/1/28	Mon 3/13/28	59	
62			Contract Review and Award	35 days	Tue 3/14/28	Mon 5/1/28	61	
63			**Construction - Dewatering Bldg DBB Project**	**621 days**	**Tue 5/30/28**	**Tue 10/15/30**		
64			Notice to Proceed	1 day	Tue 5/30/28	Tue 5/30/28	62FS+20 days	
65			Construction Duration - 2.5 years	540 days	Wed 5/31/28	Tue 6/25/30	64	
66			Substantial Completion	60 days	Wed 6/26/30	Tue 9/17/30	65	
67			Closeout	20 days	Wed 9/18/30	Tue 10/15/30	66	



Project: JCW Middle Basin Solid
Date: Mon 7/21/25

Task	Project Summary	Manual Task	Start-only	Deadline
Split	Inactive Task	Duration-only	Finish-only	Progress
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress
Summary	Inactive Summary	Manual Summary	External Milestone	