FINAL MEMORANDUM

To: Dabra Seiken

From: Steven Passafaro
Marc Cicalese

CC: Daniel Groher

Date: 20 October 2022

Re: **Arsenic Treatment Plant Upgrade Design**

Pursuant to the request from the U.S. Army Corps of Engineers (USACE), Renova-Sovereign Joint Venture (RSJV) has prepared this memorandum to detail the design of an alternative metals removal system using potassium permanganate ($KMnO_4$) at the Arsenic Treatment Plant (ATP), located at the Shepley's Hill Landfill (SHL) in Devens, Massachusetts (**Figure 1**). The purpose of this alternative metals removal system is to replace the existing chlorine dioxide dosing system and improve the performance and safety of the ATP. The objective for treatment is to meet the discharge limit requirements of the Landfill Discharge Permit from MassDevelopment with a safer alternative, and a copy of this permit has been added to the memorandum as **Attachment B** for reference. Discussions of historical influent concentrations, which are not changing as a result of this upgrade, can be found in previous Annual Reports for the Former Shepley's Hill Landfill.

Background

RSJV initially proposed to conduct a pilot test of a Lamella Gravity Settler and a Dynasand Filter in the Fall of 2020 based on the results of laboratory testing. However, due to issues associated with COVID-19, the availability of subcontracted personnel to travel to the jobsite and the shipment of equipment required for the implementation in the Fall of 2020 was affected, resulting in a cancellation of the planned 2020 pilot test.

RSJV then performed an on-site jar test in December 2020 to evaluate the effectiveness of utilizing sodium hypochlorite, hydrogen peroxide, calcium hydroxide (lime), and ferric chloride ($FeCl_3$) as an alternative to the use of chlorine dioxide to refine the proposed pilot test that was delayed. Based on the results of this study, it was concluded that lime was the best alternative, and a process of oxidation with $FeCl_3$ and lime addition, followed by clarification and filtration was proposed by the testing contractor as an alternative treatment process. However, while lime will remove the dissolved iron, manganese, and arsenic in the influent water, it also creates a much larger quantity of sludge significantly increasing waste disposal costs, creates the potential for fouling, and raises the pH of treated water.

Based on the RSJV engineering team review of the December 2020 jar testing and its experience and research of other effective oxidants to treat dissolved arsenic in groundwater, it was determined that potassium permanganate ($KMnO_4$) should also have been evaluated as an alternative oxidant. $KMnO_4$ is frequently used in the water treatment industry to remove dissolved iron, manganese and arsenic from groundwater. It is known to be relatively easy to handle and store, does not dramatically change the pH of water, is an excellent oxidizer and relatively insensitive to pH, and does not generate a tremendous amount of sludge in comparison to lime. Since $KMnO_4$ was not studied during the December 2020 jar testing,

RSJV determined that there was value in conducting additional bench testing using $KMnO_4$. Therefore, a bench scale test was performed in April 2021to determine the effectiveness of using $KMnO_4$.

As detailed in the June 2021 *Arsenic Treatment Plant $KMnO_4$ Bench Scale Test Results* memorandum, *the* results of the April 2021 $KMnO_4$ bench scale testing demonstrated that arsenic can be efficiently removed using approximately 88 mg/L of $KMnO_4$ (expressed as pure $KMnO_4$), with and without the addition of $FeCl_3$. While most of the arsenic was co-precipitated and a cohesive floc was produced, a final filter polish was required using a 5-micron filter to get the lighter arsenic particles that carried over and to achieve permitted discharge levels for arsenic. Therefore, based on the results of the jar and bench scale testing, the best alternative for the proposed pilot test was a process of oxidation with $KMnO_4$ followed by clarification and filtration as an alternative to the current treatment process.

A pilot test of an alternative treatment system using $KMnO_4$ was subsequently conducted in August 2021 during which groundwater was pumped at 50 gpm through a temporary system located outside of the building footprint. The water was treated with 80 to 125 mg/L of $KMnO_4$, and based on the results of the pilot test, it was found that an alternative metals removal system using $KMnO_4$ with a polishing filter could be used to effectively replace the existing chlorine dioxide microfilter system.

It was noted that filtration of 10 microns or less will be required as a polishing step to ensure compliance and that the existing microfilters could be incorporated into an alternative treatment system. Because the majority of the iron and arsenic will be removed prior to the microfilters, the loading on the filters is anticipated to be minimal. When the $KMnO_4$ dosing was above 100 mg/L during the pilot test, the existing microfilters required only daily backwashing, versus every 14 minutes in the current system. As a result, it was anticipated that the existing microfilters, when incorporated into the alternative system, would require minimal maintenance and cleaning due to decreased loading. Refer to the February 2022 *Revised Arsenic Treatment Plan Pilot Test Completion Memorandum* for further details from the pilot test.

Existing Chlorine Dioxide Arsenic Water Treatment Plant

The existing ATP floor plan is presented on **Figure 2**. Currently, groundwater is extracted from EW-1 and EW-4, and it enters the ATP at the southwest corner of the existing building before flowing in the existing equalization contact tank located adjacent to the microfilter skid. Sodium chlorite and chlorine gas are mixed with potable water to generate chlorine dioxide, and the chlorine dioxide is also injected into the contact tank. The chlorine dioxide oxidizes dissolved metals, primarily dissolved iron in the groundwater and the resulting iron oxyhydroxides precipitate. Dosed water then flows by gravity to the microfilter skid feed tank (Tank T1) from which it is pumped using a transfer pump on the skid through the bank of 10 parallel microfilters that filter the precipitated iron from the water. Filtered water is then directed to the effluent sump.

The microfilters are subsequently backwashed every 14 minutes to remove sludge from the filter membranes, and the sludge is flushed to the drainage sump located north of the microfilter skid. A sump pump periodically transfers sludge from the sump to the existing inclined plate clarifier (IPC) at which the sludge is allowed to settle. A sludge transfer pump then removes accumulated sludge within the IPC, and the sludge is then dosed with polymer before depositing within the existing filter bed roll-off (FBRO). The sludge is allowed to dewater within the FBRO.

Proposed New $KMnO_4$ Arsenic Water Treatment Plant

The proposed $KMnO_4$ ATP floor plan is included as **Figure 3**, and the proposed process diagram is included as **Figure 4**. It is noted that the $KMnO_4$ ATP floor plan (Figure 3) is based on preliminary dimensions provided by the manufacturer and sizes of various tanks. Following the generation of final fabrication drawings of the proposed Lamella Gravity Settlers and associated access platform along with final tank

sizing, the layout will be revised and updated to ensure that proper and safe access is maintained. The $KMnO_4$ ATP proposed process consists of the following elements:

1. Arsenic Water Treatment System – The proposed system will remove arsenic in the extracted groundwater using $KMnO_4$ injection to oxidize and precipitate the dissolved metals, followed by clarification and filtering;
2. Microfilter Backwash – The microfilters will need to be backwashed routinely to remove collected solids;
3. Microfilter Clean-In-Place (CIP) – The microfilters will also require periodic cleaning to maintain performance; and,
4. Sludge Treatment & Handling System- The proposed system will include the treatment and handling of the sludge generated from the precipitation of metals in the extracted groundwater from the new $KMnO_4$ ATP system.

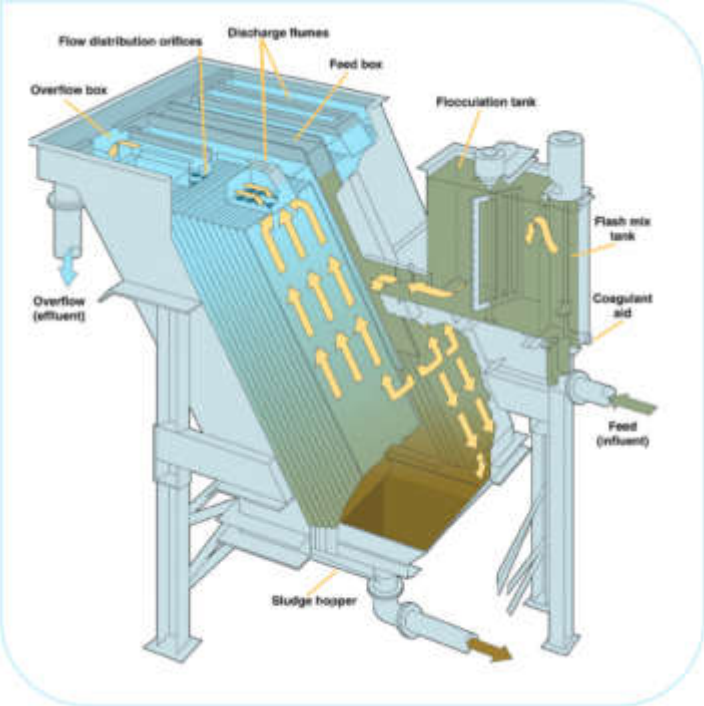
The following provides a description of each of these elements and associated flow paths.

Arsenic Water Treatment System (New)

Figure 4 presents the process flow diagram for the proposed new $KMnO_4$ ATP water treatment system. A more detailed description of the proposed equipment, operation and maintenance is presented below. To effectively treat the arsenic impacted groundwater, the following treatment process is proposed, based on the results and effectiveness of the pilot test:

1. Groundwater will be pumped from existing extraction wells EW-1 and EW-4 using the existing extraction pumps.
2. Influent water from the extraction wells will be dosed with $KMnO_4$. $KMnO_4$ will be stored in new chemical storage tanks near the proposed Lamella Gravity Settlers (LGS), and each tank will include a mixer and a shared injection pump system (lead and lag to serve as backup).
3. $KMnO_4$ dosed water will be directed through an inline static mixer and will then flow into proposed mix / flocculation tanks followed by proposed LGS units for solids settling.
4. Treated water will flow by gravity from the proposed LGS units to the existing microfilter skid feed tank (Tank T1) located on the skid from which it will be pumped through the existing microfilter modules using the existing microfilter skid transfer pump for final filtration.
5. Filtered water from the microfilters will then be directed to the treated water sump from which it will be discharged to the Devens POTW.

For redundancy and to allow for maintenance while minimizing downtime, two (2) LGS 300/55 units with flash mixer/flocculator tanks will be installed in place of the existing chlorine dioxide generation system.



Influent water will enter each LGS unit and flow downward through the inlet chamber before entering the plates through side entry plate slots. As the liquid flows upward across the plates, the solids in the water will settle on the inclined, parallel plates and slide into the sludge hopper at the bottom of the unit. The clarified liquid will then leave the plate assembly through weirs at the top to collection channels leading to the clarified water outlet. This will create a pressure drop across the collection channels to ensure uniform flow distribution across the plates in order to utilize the full settling area.

The LGS 300/55 units can be operated individually or in parallel, and each unit will be capable of handling total design flowrate. The effective plate area of a LGS 300/55 unit is 300 ft^2, and at a maximum design flow rate of 60 gpm, this unit will have a loading rate of 0.20 gpm/ft^2. The typical operational flow rate will be approximately 50 gpm, but the proposed system was designed at 60 gpm to allow for slight instantaneous flow adjustments above 50 gpm as necessary.

A dual 38 gal. flash mixer and 219 gal. flocculator tank will be installed ahead of each LGS unit. At the maximum design flow, the retention time in each tank compartment will be approximately 38 seconds and 3.65 minutes respectively. Mixers will be installed in each compartment with motors mounted to the top of the tank, and high-level controls will be added to prevent overflow.

A platform will also be installed between the units to allow for access to the motors and to the top of the clarifier weir for maintenance. A fixed ladder with a safety cage will be used to access the platform. General arrangement referenced drawings for a LGS 300/55 unit and platform assembly are included as **Attachment A**.

Two (2) tanks for $KMnO_4$ storage with mixers will be installed below the discharge flumes of the proposed LGS units. The proposed tanks will be sized to provide a minimum of 5 days of combined storage for the $KMnO_4$ solution. The $KMnO_4$ tanks will be plumbed together at the bottom to allow for equalization of solution height as well as compartmentation as necessary, and each tank will include a mixer and a shared injection pump system (lead and lag to serve as backup). The tanks will be located within a bermed area with a low adjacent platform to allow for easy operator access to the top of the tank to add the $KMnO_4$ for mixing. Lastly, new potable water lines will be installed at the tanks for mixing the $KMnO_4$.

To maximize the space available, the existing microfilter skid backwash tank will be moved to the current location of the equalization contact tank, which itself will be removed with the chlorine dioxide system, as it is no longer needed for contact time. Prior to installation, all components of the existing chlorine dioxide generation system, including by not limited to the sodium chlorite storage tank, the chlorine gas cabinet, the chlorine dioxide generation skid, the equalization contact tank, and the chlorine dioxide injection pipes,

will be removed. In addition, the existing pipe support posts located in the area of the chlorine dioxide generation system will be removed and all remaining pipes will be suspended from the ceiling. Finally, the existing FBRO will be temporarily removed from the building to allow for installation of the proposed LGS units and to allow for minor repositioning of the FBRO to maximize the space available for the proposed LGS units.

Microfilter Backwash

Periodically the microfilters will need to be backwashed to remove solid collected in the final polishing step for the treated water, and the backwash process is as follows:

1. When the pressure in the microfilters reaches a set point to be determined at system prove-out, the system will call for backwashing of the microfilters, which will take approximately 90 seconds and include a 30-second air scour.
2. The microfilter backwash will be directed from the microfilter skid to the existing drainage sump as currently operated.
3. Backwash water within the drainage sump will be periodically pumped from the sump to the existing inclined plate clarifier.

Because the proposed LGS units will remove most of the precipitated metals loading, it is anticipated that the frequency of backwashes will be significantly reduced. Currently, the microfilters backwash every 14 minutes. However, backwashing was conducted daily during the pilot test while dosing with high concentrations of $KMnO_4$. Following proposed upgrades, the filters will be monitored for pressure change, and backwash frequency will be determined based on system performance.

Microfilter Clean-In-Place (CIP)

Over time the microfilters will require chemical cleaning (also known as a CIP) to maintain optimal filter efficiency. Currently, a CIP is done approximately every 4 to 5 weeks. Because the proposed LGS units will carry most of the precipitated metals loading, it is anticipated that the frequency of CIPs will be significantly reduced to every 3 to 4 months based on the rate of transmembrane pressure rise. To reduce the chemical handling by the operators during the performance of a CIP, the following new system for the performance of CIPs is proposed:

1. New acid and caustic injection stations will be installed within secondary containment near the microfilter skid to automate the system and to remove manual handling of the solutions thereby reducing potential exposure to operators. Each injection station will be used to contain one 15 to 30-gallon acid or caustic solution drum within secondary containment for CIP activities.
2. Each setup will also include a dedicated chemical feed pump and a double walled injection line to feed the chemical solution to microfilter feed tank (Tank T1) located on the microfilter skid or the drainage sump, as applicable.
3. A new, dedicated pH probe will also be installed within the drainage sump to allow the operator to manually monitor and adjust the pH of the sump.

Because the frequency of CIPs will be diminished, it will not be necessary to store a significant volume of acid or caustic solutions in the plant. For each CIP, approximately 4 gallons of acid solution is utilized and up to 18 gallons of caustic solution. As a result, one 15-gallon container/drum of acid solution will contain enough acid for a minimum of 3 CIP events, and one 30-gallon container/drum of caustic solution will contain enough solution for one to two CIPs. Additional containers/drums of either solution can then be ordered ahead of subsequent CIPs as necessary to minimize the total amount stored onsite at a time.

Sludge Treatment & Handling System

To treat the sludge generated from the precipitation of metals in the extracted groundwater from the proposed $KMnO_4$ system, the following sludge treatment and handling system will be initially used so that an evaluation of sludge production and settling rates can be determined to allow for the design of the most cost-effective sludge handling system as part of future plant upgrades. A description of the proposed sludge treatment and handling system is as follows:

1. Sludge will be removed periodically from the bottom of each proposed LGS unit using a new double diaphragm pump.
2. The extracted sludge will be dosed with polymer (Redux 843, the same polymer currently used for sludge thickening) at the existing polymer skid before accumulating within the existing FBRO container.
3. The sludge will be allowed to dewater within the FBRO, and supernatant will be drained from the FBRO into the drainage sump.
4. Water within the drainage sump will be periodically pumped from the sump to the existing inclined plate clarifier for settling.
5. Within the existing inclined plate clarifier, any solids remaining in the water will be allowed to settle further before transfer back to the FBRO.
6. Supernatant will then be pumped from the existing inclined plate clarifier through a new set of parallel bag filters with a new pressure differential switch to identify when the bags are full of solids.
7. Filtered water from the bag filters will then be directed to the treated water sump from which it will be discharged to the Devens POTW along with the treated water from the microfilters.
8. Sludge collected and thickened in the FBRO will be periodically removed and disposed of, as is currently performed with the existing system.

Following the water treatment system upgrades, an evaluation of sludge production and settling rates will be conducted to determine what or if a more cost-effective sludge management upgrade is warranted. Options that will be evaluated include, but are not limited to, installation of conical bottom sludge settling tank(s) and/or a filter press system.

System Prove-Out

As part of the new water treatment system, the existing control system will also be upgraded as necessary for the new system, and the upgraded system would be operated initially at 30 gpm and using a dose of 100 mg/L of $KMnO_4$ to evaluate system performance. Following an initial start-up period to be determined based on system performance, the flow rate will be increased to 50 gpm.

During system prove-out, treated water will be periodically field tested using an Arsenic Quick (5 – 500 ppb) or Quick II Test Kit (10 – 200 ppb), a Hach Model IR-20 Iron (0-4 mg/l) and Manganese (0-3 mg/l) Color Disc Test Kit, a CHEMetrics Model K-6010D High Range Iron (0-30 ppm & 30-300 ppm) Test Kit, a turbidity meter, and/or a portable pH meter. In addition, confirmatory laboratory samples will also be collected from the effluent of the treatment system, as determined by the field engineer, for laboratory analysis of arsenic by EPA Method 6020, total suspended solids, and iron and manganese by EPA Method 6010. Once the treatment system is optimized, effluent treated water samples will also be collected from the effluent for analysis of all monitoring parameters (i.e., metals, total toxic organics, total petroleum hydrocarbons, chloride, nitrate, and sulfate) listed under Part 1 Sections A and B of the existing June 2022 MassDevelopment *Landfill Discharge Permit* (**Attachment B**).

Representative samples of the sludge will also be collected for disposal characterization and for additional comprehensive sludge dewatering testing at an offsite facility. This data will be used to determine the

proper polymer type and dose to effectively flocculate the solids to optimize the effectiveness and efficiency of the onsite sludge thickening system.

The system will then be optimized within the first year of operation to refine the dose of $KmnO_4$ and the frequency of backwashes while ensuring compliance with the current discharge permit. Following completion of the prove-out period, RSJV will meet with USACE to discuss system performance. Following the meeting, RSJV will prepare a brief memorandum detailing the installation of the upgrades and providing initial system performance data. The system O&M Manual will also be revised and updated at that time.

Preliminary Installation Schedule

Based on the current lead time associated with the proposed LGS 300/55 Lamella Gravity Settlers is approximately 20 to 24 weeks for fabrication. As a result, it is anticipated that the proposed units will be available for shipment in early calendar year 2023. To avoid working in inclement weather, installation will thus be targeted for April 2023.

It is assumed that that ATP will be off-line for approximately 6 weeks to accommodate the removal of the existing chlorine dioxide system and the installation of the proposed $KMnO_4$ system. The duration of system prove-out will then be determined based on system performance and consultation with USACE.

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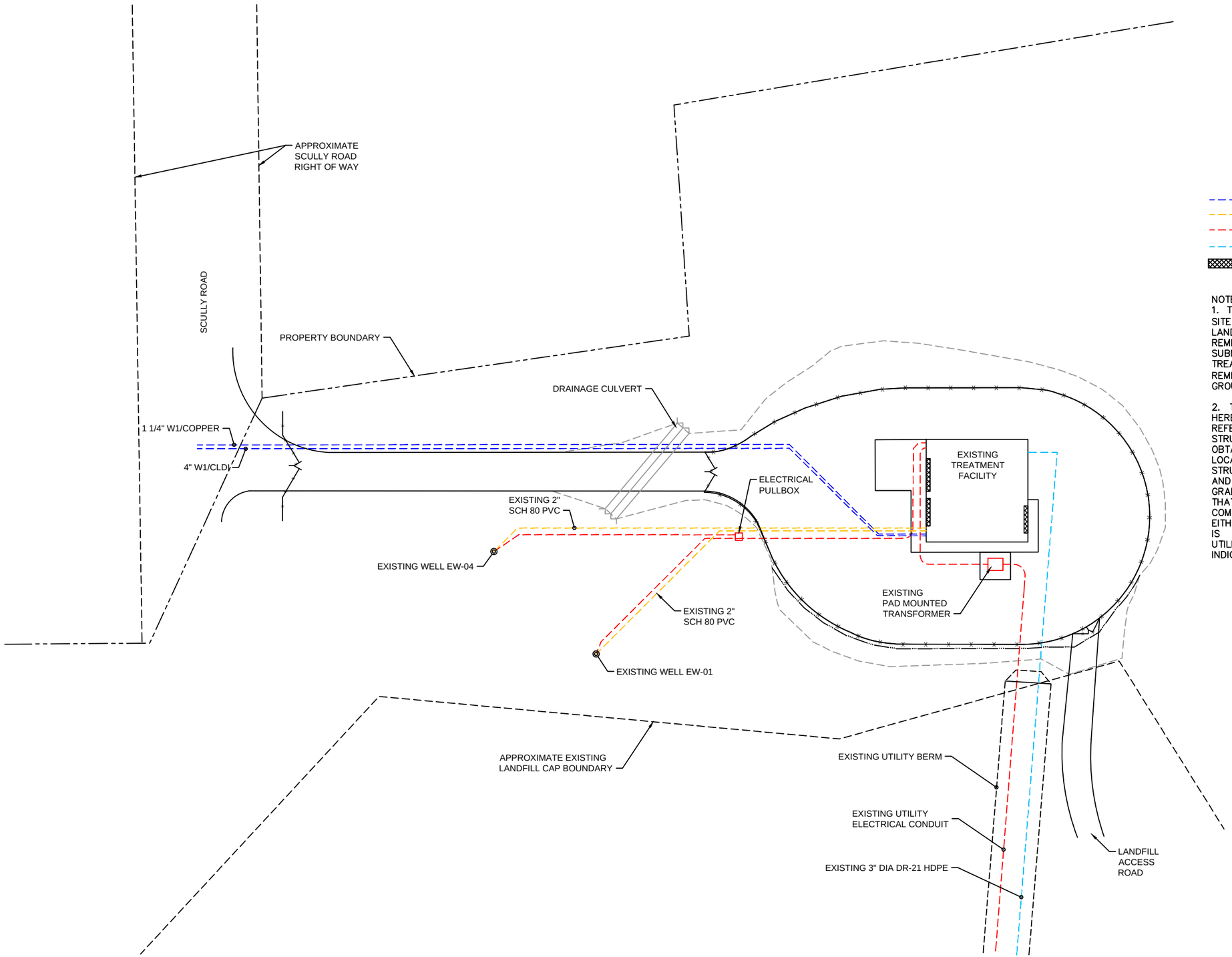
Figures

Figure 1 – Site Plan
Figure 2 – Existing Floor Plan
Figure 3 – Proposed Floor Plan
Figure 4 – Process Flow Diagram

Attachments

Attachment A – Lamella EcoFlow Gravity Settler Reference Drawings and Brochure
Attachment B – Landfill Discharge Permit
Attachment C – Response to Regulator Comments

FIGURES



N

LEGEND

- POTABLE WATER LINE
- RAW WATER EXTRACTION LINE
- UNDERGROUND ELECTRICAL LINE
- TREATED WATER DISCHARGE LINE
- OVERHEAD DOOR

NOTES

1. THIS PLAN WAS PREPARED USING SHEET C-3 SITE PIPING PLAN FROM "SHEPLEY'S HILL LANDFILL, FT. DEVENS, MA, REMEDIAL DESIGN AND REMEDIAL ACTION WORKPLAN FINAL 100% SUBMITTAL, GROUNDWATER EXTRACTION, TREATMENT, AND DISCHARGE CONTINGENCY REMEDY" (APRIL 2005). AN ACTUAL ON THE GROUND FIELD SURVEY WAS NOT CONDUCTED.

2. THE LOCATION OF THE UTILITIES AS SHOWN HEREON HAVE BEEN COMPILED FROM THE PLAN REFERENCED IN NOTE 1 AND FROM VISIBLE STRUCTURES ONLY. NO RECORD INFORMATION WAS OBTAINED FROM ANY SOURCES. THE ACTUAL LOCATION OF ALL UTILITIES AND UNDERGROUND STRUCTURES SHALL BE CONSIDERED APPROXIMATE AND SHALL BE VERIFIED PRIOR TO ANY BELOW GRADE ACTIVITIES. NO GUARANTEES ARE MADE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICES OR ABANDONED, AND THERE IS NO WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED.

0 20 40 60

APPROXIMATE SCALE

FIGURE 1
SITE PLAN

ARSENIC TREATMENT PLANT
LOCATED AT
SHEPLEY'S HILL LANDFILL
AYER, MA
PREPARED FOR
U.S. ARMY CORPS OF ENGINEERS

RENOVA/SOVEREIGN JOINT VENTURE
RENOVA-SOVEREIGN JV
9 PAYSON ROAD
FOXBOROUGH, MA 02035
TEL:(508) 339-3200

PREPARED	UPDATED	UPDATED	UPDATED	UPDATED
JUNE 2022				
BY: SRP	BY:	BY:	BY:	BY:

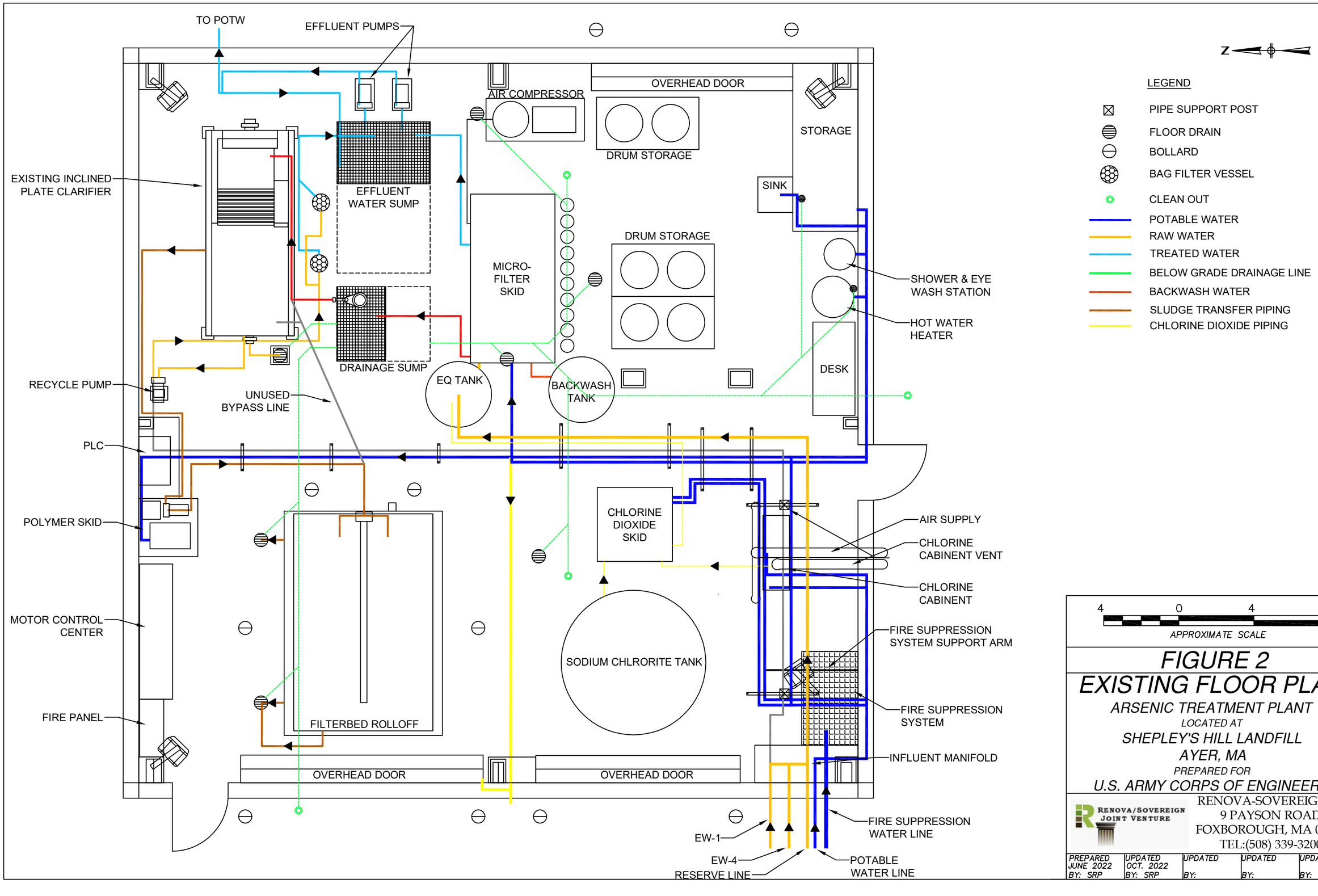
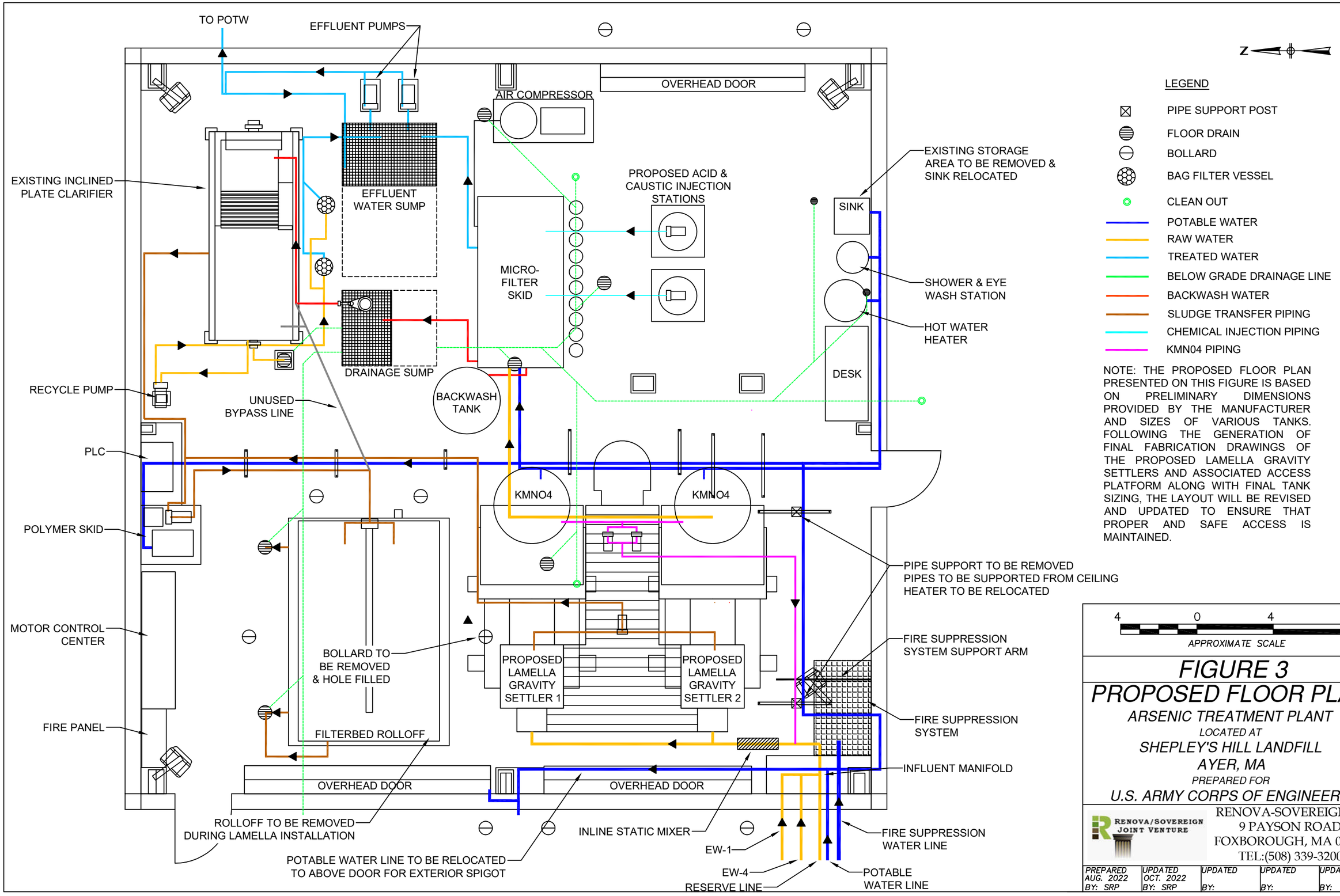


FIGURE 2
EXISTING FLOOR PLAN
ARSENIC TREATMENT PLANT
LOCATED AT
SHEPLEY'S HILL LANDFILL
AYER, MA
PREPARED FOR
U.S. ARMY CORPS OF ENGINEERS

RENOVA/SOVEREIGN JOINT VENTURE
RENOVA-SOVEREIGN JV
9 PAYSON ROAD
FOXBOROUGH, MA 02035
TEL:(508) 339-3200

PREPARED	UPDATED	UPDATED	UPDATED	UPDATED
JUNE 2022	OCT. 2022			
BY: SRP	BY: SRP	BY:	BY:	BY:



NOTE: THE PROPOSED FLOOR PLAN PRESENTED ON THIS FIGURE IS BASED ON PRELIMINARY DIMENSIONS PROVIDED BY THE MANUFACTURER AND SIZES OF VARIOUS TANKS. FOLLOWING THE GENERATION OF FINAL FABRICATION DRAWINGS OF THE PROPOSED LAMELLA GRAVITY SETTLERS AND ASSOCIATED ACCESS PLATFORM ALONG WITH FINAL TANK SIZING, THE LAYOUT WILL BE REVISED AND UPDATED TO ENSURE THAT PROPER AND SAFE ACCESS IS MAINTAINED.

4 0 4 8

APPROXIMATE SCALE

FIGURE 3

PROPOSED FLOOR PLAN

ARSENIC TREATMENT PLANT

LOCATED AT

SHEPLEY'S HILL LANDFILL

AYER, MA

PREPARED FOR

U.S. ARMY CORPS OF ENGINEERS

RENOVA/SOVEREIGN JOINT VENTURE

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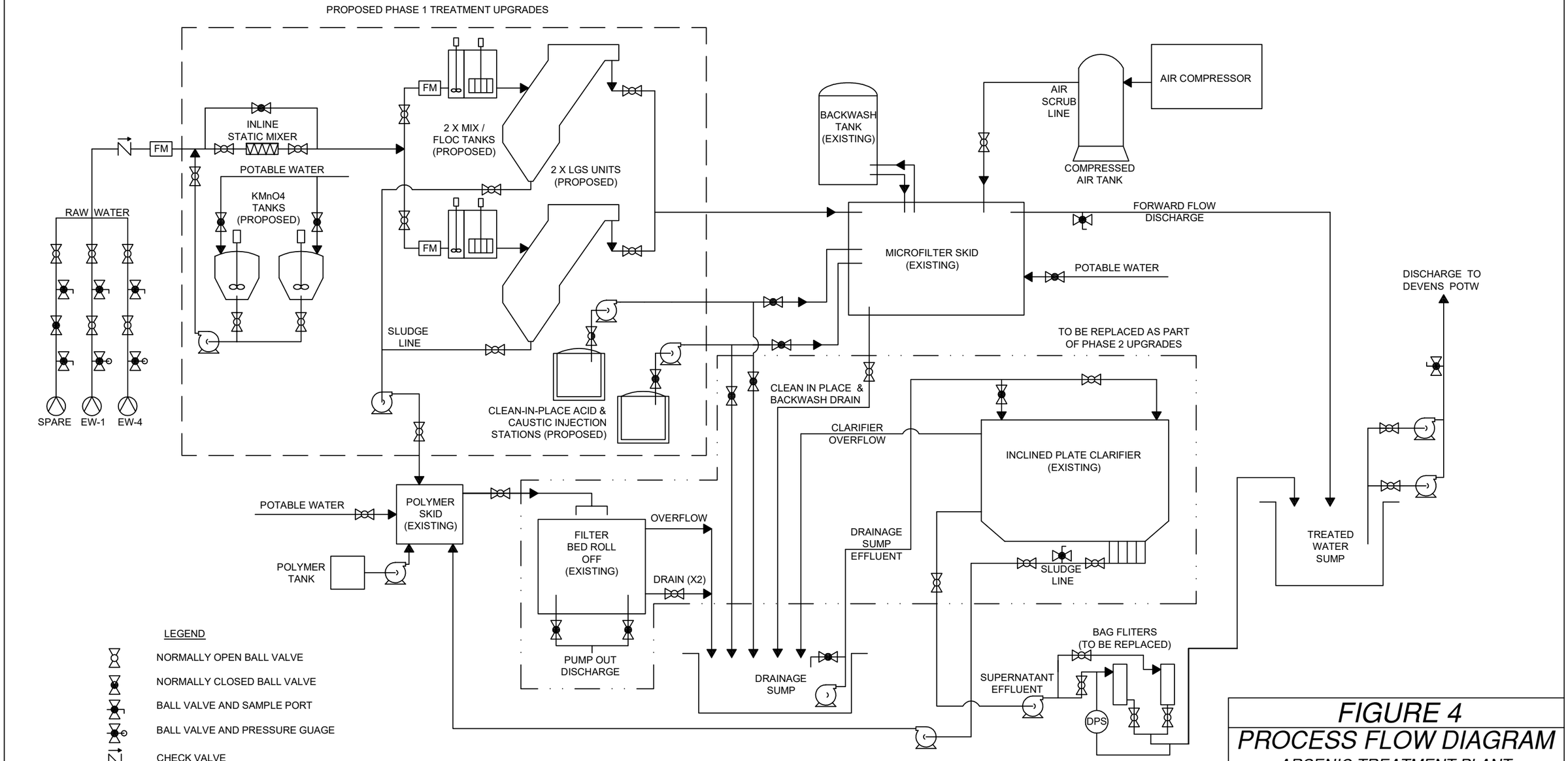
PREPARED	UPDATED	UPDATED	UPDATED	UPDATED
AUG. 2022	OCT. 2022			
BY: SRP	BY: SRP	BY:	BY:	BY:



NOTE: PHASE 2 SLUDGE MANAGEMENT UPGRADES TO BE EVALUATED FOLLOWING REVIEW OF SLUDGE PRODUCTION AND SETTLING RATES AFTER INSTALLATION OF PROPOSED TREATMENT UPGRADES.

FIGURE 4

PROCESS FLOW DIAGRAM

ARSENIC TREATMENT PLANT

LOCATED AT

SHEPLEY'S HILL LANDFILL

AYER, MA

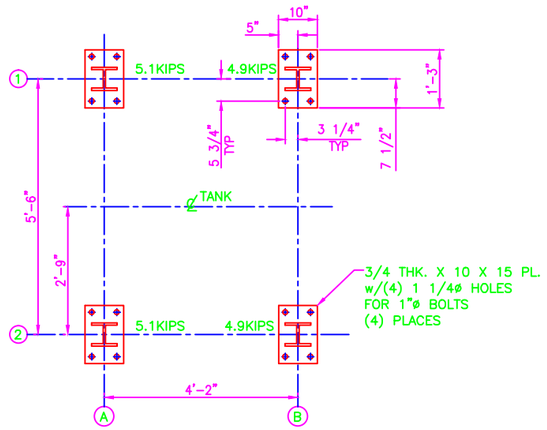
PREPARED FOR

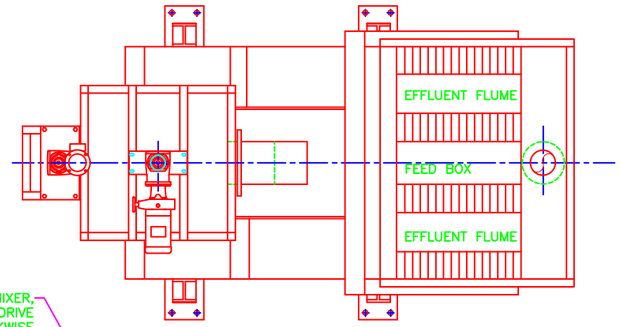
U.S. ARMY CORPS OF ENGINEERS

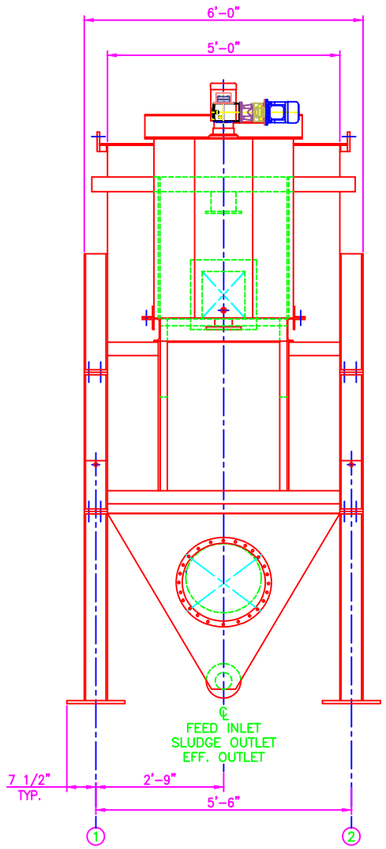
RENOVA-SOVEREIGN JV
9 PAYSON ROAD
FOXBOROUGH, MA 02035
TEL:(508) 339-3200

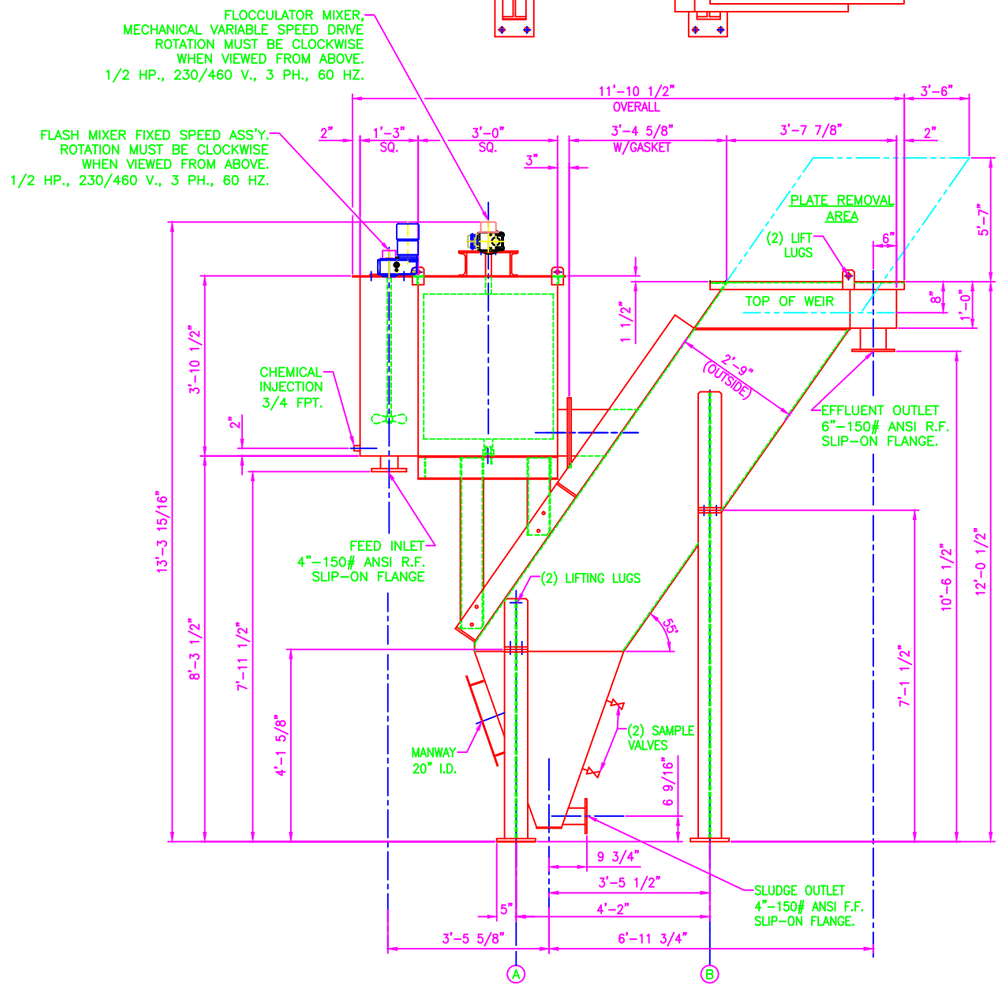
PREPARED JUNE 2022 BY: SRP	UPDATED BY:	UPDATED BY:	UPDATED BY:	UPDATED BY:

ATTACHMENT A









NOTES:

1. MATERIALS OF CONSTRUCTION:
   LAMELLA PLATES: SEE SPECS.
   LAMELLA TANK: 1/4 PL. A-36 C.S.
   HOPPER: 1/4 PL. A-36 C.S.
   FLOC./MIX. TANK: 1/4 PL. A-36 C.S.
   STRUCTURAL: A-36 C.S.
2. ALL WELDS PER LATEST AMERICAN WELDING SOCIETY STANDARD.
3. SEE PAINT SPECIFICATIONS FOR PREPARATION AND COATINGS.
4. USE SPREADER BARS OF ADEQUATE WIDTH AND CAPACITY WHEN LIFTING LAMELLA TANK.
5. ALL BOLT HOLES AT 150# FLANGED PIPE CONNECTIONS STRADDLE NORMAL CENTERLINES.
6. CAULK ALL EXTERNAL STIFFENERS TOP AND BOTTOM AFTER APPLICATION OF BASE COAT.
7. CUSTOMER TO PROVIDE ALLOWANCE FOR A MINIMUM OF 1" OF GROUT BELOW BASE PLATES

FOR REFERENCE ONLY
NOT FOR CONSTRUCTION

SHIPPING WEIGHT
LAMELLA TANK: 4,300#
FLOC. & MIX. TANK: 1,600#

WT. FULL OF LIQUID:
LAMELLA TANK: 15,400#
FLOC. & MIX TANK: 4,600#

REV	DESCRIPTION	DATE	BY
1	UPDATE DRAWING AND TITLEBLOCK	8-6-13	PLG

__PRELIMINARY __APPROVAL
X INFORMATION __CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
Gm-j	9-28-94
CHECKED BY	DATE
HDH	1-23-95
SCALE	SIZE
NTS	B

Parkson
Lamella EcoFlow

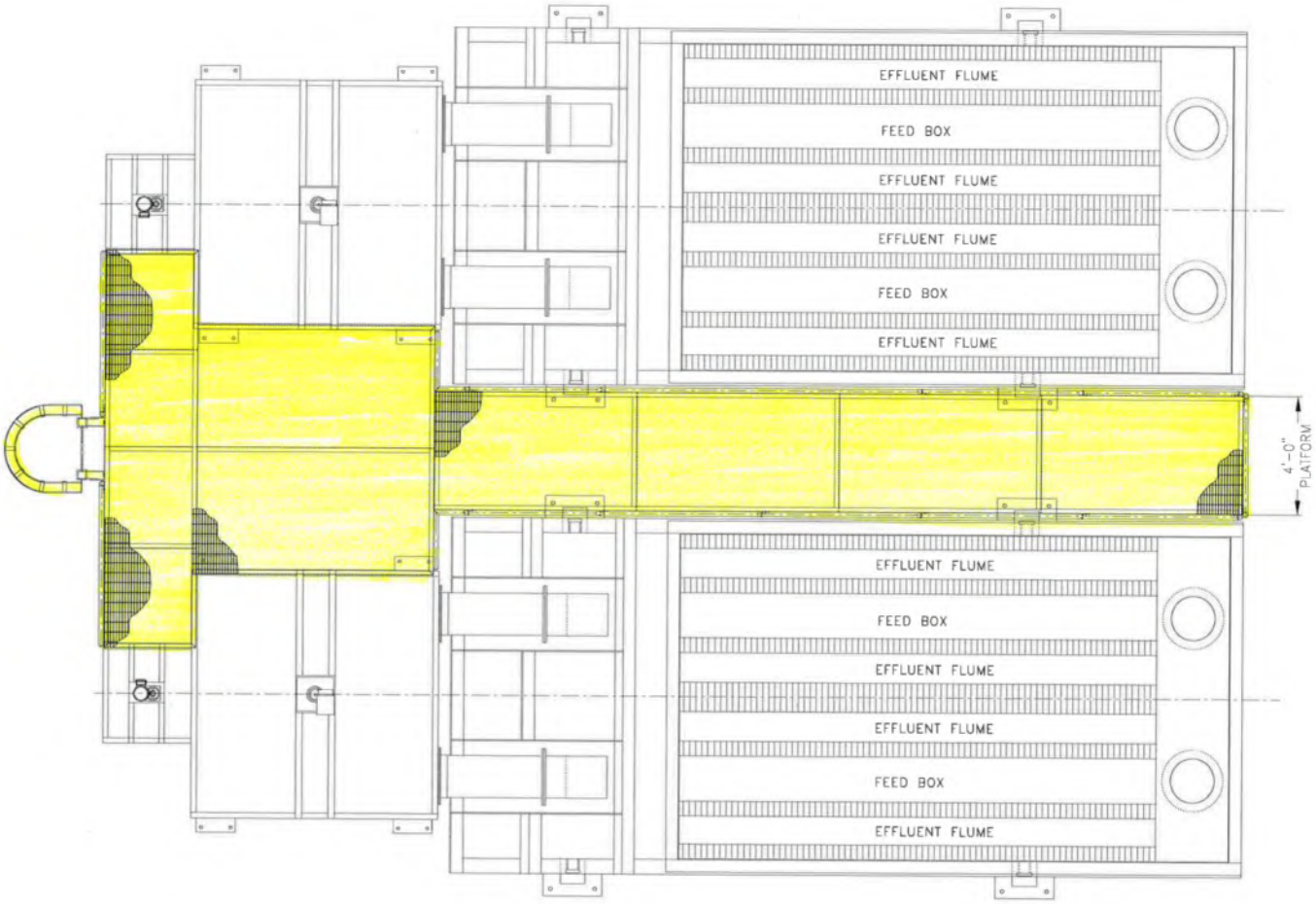
PROJECT NAME
PROJECT NUMBER
PROJECT NAME
PROJECT LOCATION

REFERENCE INFORMATION

TITLE
Lamella® EcoFlow™
GENERAL ARRANGEMENT
MODEL 300/55X W/"B" FLOC. & MIX. TANK

DRAWING NO
LGN300FBX

REV
1



REV	DESCRIPTION	DATE	BY

__ PRELIMINARY __ APPROVAL

X INFORMATION __ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
P. GORDON	09/21/21
CHECKED BY	DATE
SCALE	SIZE
NONE	B

Parkson

PROJECT NAME

REFERENCE INFORMATION

TITLE

LAMELLA® ECO FLOW
MODEL 3900/55 W/"G" FLOC/FM TANK
PLATFORM PLAN VIEW

DRAWING NO

P01001XXX01

SHEET 1 OF 1

REV

—

Parkson™
Treating Water Right

LamellaEcoFlow®

Inclined Plate Settler

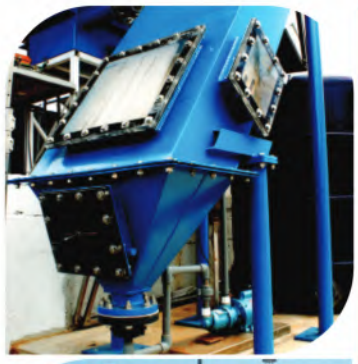
- 25% increase in capacity over traditional plate settlers
- Improved hydraulics yield improved efficiency
- Easy to retrofit existing settlers
- Improved effluent quality and sludge thickening

Optimizing settling by using Lamella®

Lamella® Gravity Settler requires only one tenth the space of conventional clarification equipment with the same settling capacity. This means faster settling because the effective gravity settling area of the inclined plate design equals each plate's area projected on a horizontal surface. Up to ten square feet of settling area becomes available for each square foot of physical area occupied by the unit. Loading rates normally used for the design of conventional settlers can be applied to the sizing of a Lamella® by substituting projected area for the surface settling area of a conventional clarifier.

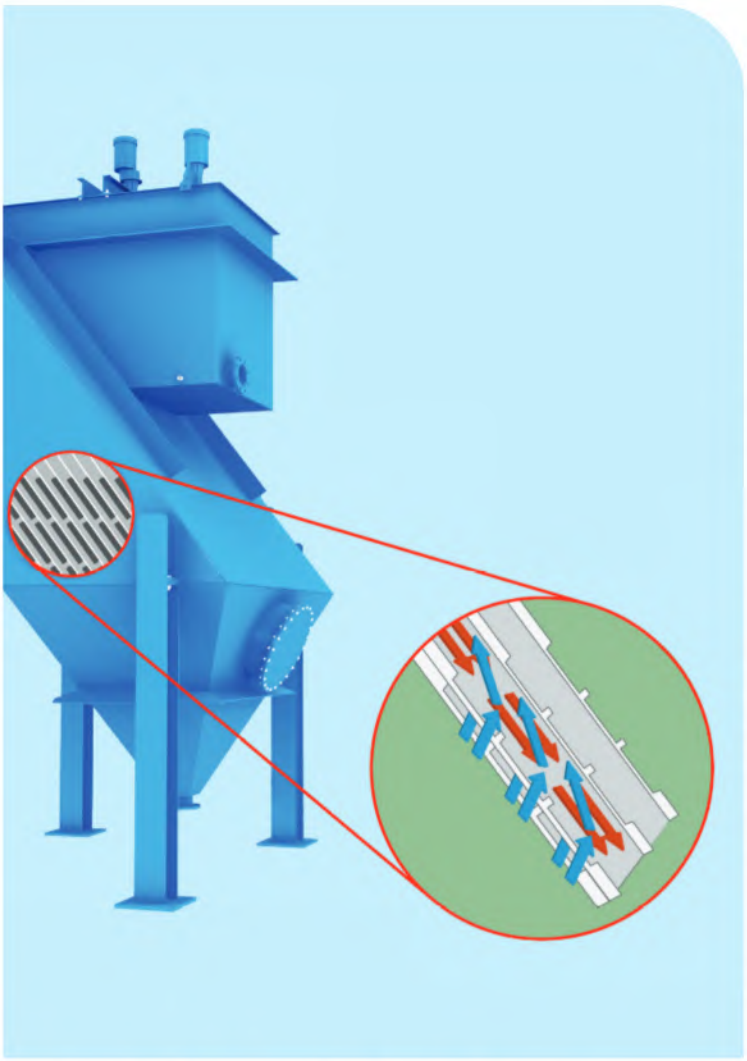
Principle of Operation

Influent enters the Lamella® Gravity Settler, flows downward through the inlet chamber and enters the plates through side-entry plate slots. The countercurrent design, unlike typical bottom feed designs, reduces the risk of disturbing previously settled solids. As the liquid flows upward, the solids settle on the inclined, parallel plates and slide into the sludge hopper at the bottom. Further thickening of the sludge is achieved in the hopper due to compression in the quiescent zone achieved by the side feed design.



The clarified liquid leaves the plate assembly through orifices or weirs at the top and is distributed into collection channels leading to the clarified water outlet. This creates a pressure drop across the collection channels which ensures uniform flow distribution across the plates in order to utilize the full area for settling.

The compact design minimizes hydraulic disturbances caused by wind or temperature changes. Balanced flow distribution ensures equal flow to each plate and across the plate surface area, preventing short-circuiting. Units and plate packs arrive at the job site factory assembled, which reduces installation time and lowers installation costs. Minimal moving parts mean low maintenance costs.



Three Standard Designs

The LGS (Lamella® Gravity Settler) design is a self-contained, packaged settling unit with a conical sludge hopper. The LGST (Lamella® Gravity Settler/Thickener) design is a high rate gravity settler combined with a circular, picket-fence sludge thickener/ scraper.

The LGST handles solids loadings beyond the capacity of a packaged settler unit. It produces higher sludge concentrations and provides sludge storage, allowing for flexibility of further sludge dewatering equipment. Underflow sludge concentrations are up to 3 to 5 times higher.

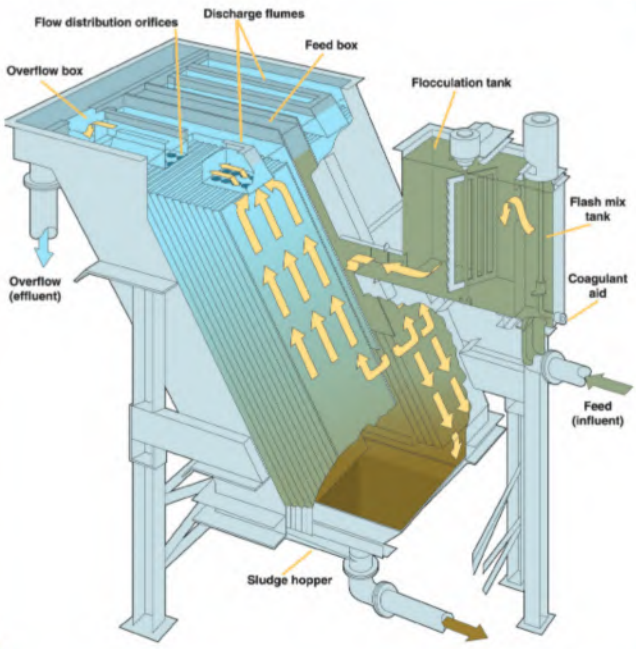
In addition to self-contained designs, the plate pack assembly is appropriate for installation in concrete basins or steel tanks for larger flows. This can be a low maintenance, cost-effective means of increasing existing basin capacity. The plate pack assemblies operate in the same manner as the free-standing units. Both designs can be equipped with a flash mixing and flocculation tank upstream of the inlet pipe. The chemical flocculant is added in a separate flash mixing compartment.

Parkson offers integrated flash/floc design for space constraint projects and FRP units for highly corrosive applications.

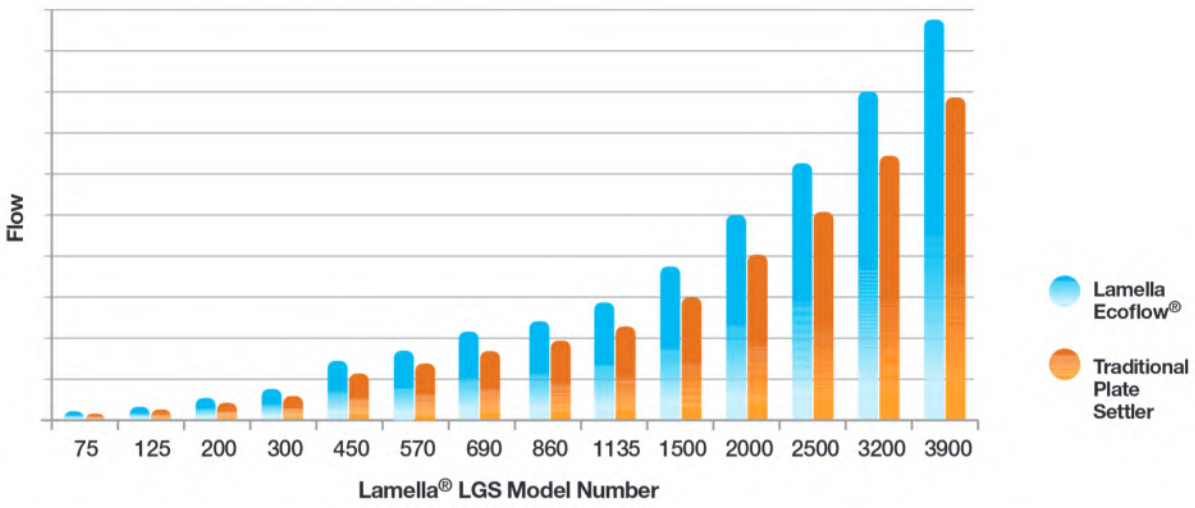
EcoFlow® Way – 100% Settling Area

Traditional plate settlers orient the feed slots in such a way that the influent stream collides with the solids front moving down the plate to the sludge hopper. This creates a zone of interference that renders the bottom 20% of the plate area unusable for settling.

The patented EcoFlow® design changes the orientation of the feed slots to allow the influent to flow over the top of the solids front. Elimination of the mixing zone allows for 100% utilization of the plate settling area. The increase in settling area allows for 25% more flow to be processed in a given Lamella® tank with traditional plates. Alternatively, a given flow rate can be handled with a 25% reduction in equipment size. Patented EcoFlow plates allow for better effluent quality and enhanced sludge thickening due to influent, effluent and solids streams not interfering with each other.



Added Capacity Using Lamella EcoFlow®



Process Knowledge

Parkson has unparalled process knowledge gained from more than 4,000 installations, 12,000 laboratory tests and 1,000 pilot tests.

Water Research Facility and Pilot Testing

The Parkson WRF offers laboratory and pilot rental services, staffed with separations experts that are available to perform jar testing and optimization studies on your custom application. Sample analysis at the WRF laboratory provides effective treatment solutions and equipment sizing for various applications. Parkson also offers pilot units for rental.

Retrofits of Existing Plate Settlers

Parkson can retrofit plate settlers from most manufacturers. A Lamella EcoFlow® plate retrofit is the most cost-effective way to increase capacity with the benefit of not changing the footprint. Parkson can perform the work with our personnel or offer the option of supervising plant personnel. Either option utilizes the 45+ years of experience that we have in plate settler retrofits and all work comes with a warranty.

Parkson™
Treating Water Right

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technology@parkson.com
www.parkson.com

ECOFLOW

ATTACHMENT B

MASSDEVELOPMENT

33 Andrews Parkway
Devens, MA 01434

LANDFILL DISCHARGE PERMIT

Permittee Name:	U.S Army Corp of Engineers
Facility Address:	Shepley's Hill Landfill Devens, Massachusetts 01434
Contact Name:	Dabra I. Seiken, PG; CG Engineering Technical Lead/Project Manager U.S Army Corp of Engineers New England District
Contact Phone:	(978) 318-8391
Contact Email:	Dabra.I.Seiken@usace.army.mil

The above permittee is authorized to discharge treated groundwater from the Shepley's Hill Landfill to the Devens Sewerage System in compliance with the *Sewer Rules and Regulations for the Devens Sewerage Service Area*, as adopted by MassDevelopment (MDFA), including any applicable provisions of Federal or Commonwealth of Massachusetts laws or regulations, and in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein.

Effective Date of Permit: June 28, 2022

Expiration Date of Permit: June 28, 2025

Issued by: Mark Cohen 6/21/2022
Mark Cohen
Devens Utilities Dept
MassDevelopment

PART I - Wastewater Discharge Limitations and Monitoring Requirements

A. The permittee shall comply with all Local Effluent Limitations and monitor the discharge as specified below:

Parameter	Limitations	Type	Frequency
Arsenic	0.20 mg/l*	Composite	Monthly
Chromium (total)	0.40 mg/l	Composite	Annually
Cadmium	0.045 mg/l	Composite	Annually
Copper	0.75 mg/l	Composite	Annually
Lead	0.20 mg/l	Composite	Annually
Silver	0.30 mg/l	Composite	Annually
Selenium	0.03 mg/l	Composite	Annually
Mercury	0.001 mg/l	Composite	Annually
Total Toxic Organics	5.0 mg/l	Composite	Annually
Total Petroleum Hydrocarbons	100 mg/l	Composite	Annually
pH (units)	5.5 - 9.5	Meter	Continuous

* Maximum daily loading for Arsenic shall not exceed 0.10 pounds per day.

B. The permittee shall comply with the additional effluent monitoring requirements specified below:

Parameter	Type	Frequency
Flow (MGD)	Meter	Continuous
Barium	Composite	Quarterly
Manganese	Composite	Quarterly
Magnesium	Composite	Quarterly
Chloride	Composite	Quarterly
Nitrate	Composite	Quarterly
Sulfate	Composite	Quarterly

Notes:

(1) A flow meter shall be used for recording effluent discharge into the Devens sewer system. The flowmeter shall be properly maintained in accordance with the manufacturer's requirements and it shall be calibrated at least annually by a certified and qualified manufacturer's representative. A copy of the "Certificate of Calibration" shall be submitted to MDFA following each calibration.

(2) A pH meter shall be used to continuously measure the pH of the discharge. The pH meter shall be a continuous monitoring instrument with a chart recorder. All charts shall be maintained on file onsite for a minimum of 3 years. At a minimum, the pH meter shall be calibrated weekly and a calibration log maintained on file onsite for a minimum of 3 years. The pH meter shall be properly maintained in accordance with the manufacturer's requirements and it shall be calibrated at least every six months by a certified and qualified manufacturer's representative. A copy of the "Certificate of Calibration" shall be submitted to the MDFA following each calibration.

(3) Spill protection shall be provided for all chemicals stored at the site. Adequate spill protection must be capable of containing all chemical spills and preventing them from entering the sewer or harming the environment.

C. Samples shall be obtained from the discharge of the pretreatment system installed to reduce pollutant levels. The location of the sampling point and discharge pipeline are shown on the attached drawing.

(1) Composite Sample - A composite sample shall be the collection of individual grab samples obtained at regular intervals either based on time intervals or flow intervals. Each individual grab sample is either combined with the others or analyzed individually and the results averaged. In time composite sampling the samples are collected after equal time intervals and combined in proportion to the rate of flow when the sample was collected. Flow composite sampling can be produced by varying the volume of the aliquot collected in proportion to the amount of flow that passed over the time interval which the sample represents. Composite samples are designed to be representative of the effluent conditions by reflecting the average conditions during the entire sampling period.

(2) Grab Sample - A grab sample shall be a sample, which is taken from a wastestream without regard to the flow in the wastestream and over a period of time not to exceed 15 minutes.

(3) Representative Sample - A representative sample shall mean a sample taken from a wastestream that is nearly identical in composition to that in the larger volume of wastewater being discharged during a normal production day as approved by MDFA.

D. Approved flow for the permittee:

The maximum anticipated flow is 93,600 gallons per day (65 gallons per minute). If the Permittee desires to exceed this flow, the Permittee shall request an increase from the Devens Utilities Department.

E. Automatic Re-sampling: If the results of the permittee's wastewater analyses indicate that a violation of this permit has occurred, the permittee must:

(1) Inform the Industrial Pretreatment Coordinator and the Devens Utilities Department Manager of the violation within 24 hours; and,

(2) Repeat the sampling and pollutant analysis for the parameters that exceeded the permit limit and submit, in writing to MDFA, the results of the second analysis within 30 days of the first violation; and,

(3) If the re-sample results still exceed the permit limit, submit an explanation for the violation and an action plan to prevent a recurrence of the non-compliance event within 30 days of the violation.

Part II - Special Conditions

A. The Army shall take all reasonable steps to prevent any adverse impact to the Devens wastewater treatment facility or the environment due to the operation of the facility and shall assure the proper operation of the facility as specified in the treatment system manufacturer specifications and operating manual. If the arsenic concentration in the effluent exceeds 75 ug/l for a monthly sample event, the permittee shall, within 7 days of receiving the exceedance results, commence weekly sampling of arsenic until the concentration does not exceed 75 ug/l.

If the weekly samples exceed 75 ug/l for more than 4 consecutive weeks, the permittee shall shut down plant operation and submit a Corrective Action Plan to MDFA for review and comment. Resumption of operation and discharge to the Devens wastewater treatment facility will require written authorization of MDFA.

B. The Industrial Pretreatment Coordinator and MDFA Devens Utilities Department staff will review the facility Self-Monitoring data, and Devens wastewater treatment facility influent, effluent and sludge monitoring "baseline" data and operational data on an ongoing basis to determine whether there is any potential adverse affect on the Devens wastewater treatment facility influent, effluent or sludge quality, or any adverse impact on the Devens wastewater treatment facility operation or environment due to the operation of the Army's treatment facility. In the event that MDFA determines the data analysis indicates that an adverse affect has taken place, MDFA shall notify the Army and the Army shall immediately cease all discharge and shall disconnect from the Devens sewer system. (Initial notification may be made verbally with a written notice to follow.) For the purpose of this section, cessation of discharge and disconnection is required if:

(1) The arsenic concentration in the effluent from the Shepley's Hill treatment system is greater than 75 ug/l, and
(2) The arsenic concentration in the Devens wastewater treatment facility effluent is greater than 10 ug/l or sludge is greater than 40 mg/kg, or
(3) There is some other indication of adverse environmental impact resulting from the Shepley's Hill discharge.

Part III - Monitoring Requirements

A. The permittee shall provide monthly, quarterly and annual sampling and analysis for the parameters listed in Part I, Section A and Section B of this Permit.

B. All sampling and analysis shall be performed in accordance with 40 CFR Part 136 and amendments thereto.

C. All sample analysis required by this permit shall be performed by an independent laboratory certified by the MADEP for the parameters being analyzed. The use of a laboratory with provisional MADEP certification is prohibited.

D. The permittee shall submit a copy of the "Massachusetts Certification for Chemical Analysis of Water" for each laboratory that performs an analysis submitted to MassDevelopment by or on behalf of the permittee.

E. The Self-Monitoring results shall be submitted to MDFA/Devens within 30 days of the analysis.

F. Each Self-Monitoring Report shall be signed by an authorized representative of the permittee submitting the Report, and shall be certified as accurate. An authorized representative shall be an individual described in 40 C.F.R. Part 403.12(I). The Self Monitoring Report shall contain a certification statement consistent with the following:

"I certify under the penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Part IV - <u>Reporting Requirements</u>

A. As required in the MDFA *Sewer Use Rules and Regulations*, Section 1.012, the permittee shall notify MDFA/Devens and the MADEP immediately by telephone of any accidental or slug discharge to the sewer. Formal written notification addressing the circumstances and remedies shall be submitted to MDFA/Devens within 5 days of the occurrence. Furthermore, a notice shall be permanently posted on the permittee's bulletin board or other prominent location advising employees whom to call in the event of an accidental, slug or dangerous discharge. The permittee shall instruct all necessary employees of the emergency notification procedure.

B. The permittee shall notify MDFA/Devens prior to the introduction of new wastewater or pollutants or any substantial change in volume or characteristics of the wastewater being introduced to the sewer from the permittee's industrial process. Formal written notification shall follow within thirty (30) days of such introduction.

C. The permittee shall submit a monitoring report that tabulates the flow and sample analysis results for the composite samples and grab samples required in Part I. The monitoring quarters and due dates are as follows:

Quarter	Report Due Date	Data to be Reported
January 1 - March 31	April 5th	Quarterly Sampling, Flows
April 1 - June 30	July 5th	Quarterly Sampling, Flows
July 1 - September 30	October 5th	Quarterly/Annual Sampling, Flows
October 1 - December 31	January 5th	Quarterly Sampling, Flows

The monthly analysis results for arsenic samples required in Part I are due no later than the 5th of the month following the month the sample was taken.

D. All reports shall be submitted to the following address:

Devens Utilities Department Manager
MassDevelopment
33 Andrews Parkway
Devens, Massachusetts 01434

With copy to: Industrial Pretreatment Coordinator
Veolia
85 Walker Rd
Shirley MA, 01464

E. Emergency notifications shall be made to:

Devens Dispatch
Phone: (978) 772-7200

-and-

Veolia – Devens Wastewater Operations
Phone: (978) 772-4250

Part V - Standard Conditions

A. *General Prohibitions.* The permittee shall comply with all general and specific prohibitive discharge standards described in Sections 1.021, 1.022 and 1.023 of the MassDevelopment, *Sewer Use Rules and Regulations*.

B. *Right of Entry.* The permittee shall, in accordance with Section 1.011 (3) of the Sewer Use Rules and Regulations, allow MassDevelopment or their representatives to enter upon the premises of the permittee, at any time, for the purpose of inspection, sampling or records inspection.

C. *Records Retention.* The permittee shall retain and preserve for no less than three (3) years, any records, books, documents, memoranda, reports, correspondence and any and all summaries thereof, relating to monitoring, sampling and chemical analyses made by or in behalf of the permittee in connection with its discharge. All records that pertain to matters

that are the subject of special orders or any other enforcement or litigation activities brought by MassDevelopment shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired. Copies must be provided as required by MassDevelopment.

D. *Confidential Information.* Information and data on a permittee obtained from reports, questionnaires, permit applications, permits and monitoring programs and from inspections shall be available to the public or other governmental agency without restriction unless the permittee specifically requests and is able to demonstrate to the satisfaction of MassDevelopment that the release of such information would divulge information, process or methods of production entitled to protection as trade secrets of the permittee.

When requested by the person furnishing a report, the portions of a report which might disclose trade secrets or secret processes shall not be made available for inspection by the public, but shall be made available upon written request to governmental agencies for uses related to the Rules and Regulations, the Devens wastewater treatment facility's Groundwater Discharge Permit, State Disposal System permit and/or the Pretreatment Programs and also provided that such portions of a report shall be available for use by the State or any State agency in judicial review, or enforcement proceedings involving the person furnishing the report. Wastewater constituents and characteristics will not be recognized as confidential information. Information accepted by MassDevelopment as confidential shall not be transmitted to the general public until notice is given to the permittee. EPA officials shall have unrestricted and immediate access to all information collected by MassDevelopment.

E. *Recording of Results.* For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall have the following information recorded:

1. The exact place, date, time of sampling and the person performing the sampling;
2. The dates the analyses were performed;
3. The person(s) who performed the analyses;
4. The analytical techniques or methods used;
5. Sample preservation; and,
6. The results of all required analyses.

F. *Dilution.* The permittee shall not increase the use of potable water or process water or, in anyway, attempt to dilute a discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit.

G. *Proper Disposal of Pretreatment Sludges and Spent Chemicals.* The disposal of sludges and spent chemicals generated shall be done in accordance with Section 405 of the Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act.

H. *Signatory Requirements.* All applications, reports, or information submitted to MassDevelopment, must contain the following certification statement and be signed as required in Sections 1, 2, 3, or 4 below:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified

personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Authorized Representative of the Permittee:

1. If the permittee is a corporation, a responsible corporate officer means:

   a. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principle business function or any other person who performs similar policy or decision-making functions for the corporation; or

   b. The manager of one or more manufacturing, production, or operation facilities employing more than two hundred fifty (250) persons or having a gross annual sales or expenditures exceeding twenty five (25) million dollars, if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

2. If the permittee is a partnership or sole proprietorship: a general partner or proprietor, respectively.

3. If the permittee is a Federal, State or local governmental facility: a director or highest official appointed or designated to oversee the operation and performance of the activities of the government facility, or their designee.

4. The individuals described in paragraphs 1 through 3 above may designate another authorized representative if the authorization is in writing, the authorization specifies the individual or person responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for the environmental matters for the company, and the written authorization is submitted to MassDevelopment.

5. If the authorization under paragraph 4 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility or company, a new authorization satisfying the requirements of paragraph 4 of this section must be submitted to MassDevelopment prior to or together with any reports to be signed by an authorized representative.

I. *Revocation of Permit.* The permit issued to the permittee by MassDevelopment may be revoked when, after inspection, monitoring or analyses it is determined that the discharge of wastewater to the sanitary sewer is in violation of Federal, State or Local laws, ordinances or regulations. Additionally, falsification or intentional misrepresentation of data or statements pertaining to the permit application or any other required reporting form, shall be cause for permit revocation and possible criminal prosecution.

J. *Limitation of Permit Transfer.* Wastewater discharge permits are issued to a specific

permittee for a specific operation and are not assignable to another user or transferable to any other location without the prior written approval of MassDevelopment. Sale of a permitted facility shall obligate the purchaser to seek prior written approval of MassDevelopment for continued discharge to the Devens Regional Wastewater Treatment Facility.

K. *Falsifying Information or Tampering With Monitoring Equipment.* Any person who knowingly makes any false statements, representation or certification in any application, record, report, plan or other document filed or required to be maintained pursuant to the *Sewer Use Rules and Regulations*, or permit, or who falsifies, tampers with or knowingly renders inaccurate, any monitoring device or method required under these Rules and Regulations, may, upon conviction, be punished by fine of up to $10,000 per day and imprisonment up to six months, or by both.

L. *Civil Penalties.* Any permittee who is found to have violated an Order of MassDevelopment or who failed to comply with any provision of the Rules and Regulations, and the orders, rules, regulations and permits issued hereunder, may be fined up to $10,000 for each offense. Each day on which a violation shall occur or continue shall be deemed a separate and distinct offense. In addition to the penalties provided herein, MassDevelopment may recover reasonable attorney's fees, court costs, court reporters' fees and other expenses of litigation by appropriate suit at law against the person found to have violated the Rules and Regulations or the orders, rules, regulations and permits issued hereunder. Nothing in the permit shall be construed to relieve the permittee from civil and/or criminal penalties for noncompliance under these Rules and Regulations or State or Federal laws or regulations.

M. *Recovery of Cost Incurred.* In addition to civil and criminal liability, the permittee violating any of the provisions of this permit or causing damage to or otherwise inhibiting the Agency's wastewater disposal system shall be liable to the Agency for any expenses, loss, or damage caused by such violation or discharge. The Agency shall assess the permittee for the cost incurred by the Agency for any cleaning, repair, or replacement work caused by the violation or discharge.

N. *Duty to Comply.* The permittee must comply with all conditions of this permit. Failure to comply with the requirements of this permit may be grounds for administrative action, or enforcement proceedings including civil or criminal penalties, injunctive relief and summary abatements.

O. *Duty to Mitigate.* The permittee shall take all reasonable steps to minimize or correct any adverse impact to the public treatment plant or to the environment resulting from noncompliance with this permit, including such accelerated monitoring as necessary to determine the nature and impact of the noncompliance discharge.

P. *Duty to Halt or Reduce Activity.* Upon reduction of efficiency of operation, or loss or failure of all or part of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control the production or discharges, or both, until operation of the treatment facility is restored or an alternate method of treatment is provided.

Q. *Modification or Revision of the Permit.* The terms and conditions of this permit may be subject to modifications by MassDevelopment at any time as limitations or requirements

are modified or other just cause exists. This permit may be modified for other just cause. This permit may also be modified to incorporate special conditions resulting from the issuance of a special order promulgating a new pretreatment standard. Any permit modifications which result in new conditions in the permit shall include a reasonable time schedule for compliance.

R. *Duty to Reapply.* The permittee shall apply for permit renewal a minimum of sixty (60) days prior to the expiration of the Permittee's existing permit.

S. *Severability.* The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit are deemed invalid, the remainder of this permit shall not be affected thereby.

T. *Property Rights.* The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any invasion of personal rights, nor any infringement of Federal, State or Local regulations.

ATTACHMENT C

MEMORANDUM

To: Dabra Seiken

From: Steven Passafaro

CC: Daniel Groher, Marc Cicalese

Date: 20 October 2022

Re: **Draft ATP Upgrade Design Memorandum**
Response to Regulator Comments

Renova-Sovereign Joint Venture (RSJV) has prepared this memorandum to provide responses to regulator comments on the August 2022 Draft Arsenic Treatment Plant (ATP) Upgrade Design Memorandum. For ease of review, the original comment has been provided in italics followed by the response.

USEPA General Comments

1. *The memorandum should include a section on treatment system objectives, including influent metals concentrations and discharge limits and other chemical parameters, such as pH. A discussion of historical influent concentrations should also be included.*

   Response: The objective for treatment is to meet the discharge limit requirements of the Landfill Discharge Permit from MassDevelopment with a safer alternative, and a copy of this permit has been added to the memorandum as Attachment B for reference. Discussions of historical influent concentrations, which are not changing as a result of this upgrade, can be found in previous Annual Reports for the Former Shepley's Hill Landfill.

2. *It is unclear if the potassium permanganate ($KMnO_4$) dosing values are of pure $KMnO_4$ or of a $KMnO_4$ solution (e.g., 4% $KMnO_4$ solution in water). This should be clarified.*

   Response: The dosing values are for pure $KMnO_4$. A note to this effect has been added to the memo text.

3. *The document should include a mass balance for arsenic, iron, manganese and $KMnO_4$. This will aid in the estimation of sludge generation rates during full-scale operation and will confirm $KMnO_4$ dosing requirements. Other parameters may need to be included to complete the mass balance.*

   Response: A mass balance for the proposed upgrade is not necessary. The upgrade is limited to a change in oxidation method, and pumping rates, influent metals concentrations, and permitted discharge limitations will not change. Further, the addition of manganese to the system from the $KMnO_4$ will be negligible, and sludge generation rates are not anticipated to change based on the data from the pilot test. As noted in the memorandum, an evaluation of sludge production and

settling rates will be conducted following treatment system upgrades to allow for the design of the most cost-effective sludge handling system as part of future plant upgrades. No changes have been made to the memo in response to this comment.

USEPA Specific Comments

1. *Page 1, Background - This section should provide a summary of the pilot test results including contact time of KMnO4 with influent groundwater prior to entering the tube clarifier.*

   Response: The background section of the design memorandum provides a summary of the pilot test. For further details, refer to the February 2022 *Revised Arsenic Treatment Plan Pilot Test Completion Memorandum*.

2. *Page 3, Arsenic Water Treatment System (New) – A discussion should be provided on how precipitate removal via the proposed Lamella Gravity Settler (LGS) will compare with tube clarifier and sand filter that were used during the pilot test. A discussion, including specific design criteria and supporting data, should be provided to support the specific LGS units that were selected.*

   Response: The specific LGS units were selected based on discussions with the manufacturer, the design parameters determined during the pilot and bench testing conducted in 2021, and overall system flow. The tube clarifier was utilized during the pilot test as it was readily available and could be used to gather performance data for use in LGS sizing. However, precipitate removal via the LGS will be more efficient than the tube clarifier. In addition, the LGS is more compact, and there will be less fouling than observed with the tube clarifier as well. The existing microfilters will then be used as a polishing filter in place of a sand filter. No change has been made to the memo in response to this comment.

3. *Page 3, Arsenic Water Treatment System (New) – It appears that the proposed Lamella Gravity Settlers are equipped with a flash mix tank with coagulant feed. It is recommended that you explain the rationale for injection of $KMnO_4$ upstream of an in-line mixer rather than using the coagulant feed and flash mix tank.*

   Response: $KMnO_4$ will be injected upstream of an in-liner mixer similar to the setup from the pilot test and based on discussions with the LGS manufacturer. According to the manufacturer, the flash mix tank is typically used for coagulant feed and has been included for future use if the addition of coagulant is deemed necessary and if the microfilters are no longer required. Injection of coagulant upstream of the microfilters will cause fouling. No change has been made to the memo in response to this comment.

4. *Page 5, Sludge Handling and Treatment System – The type of polymer to be used on the sludge should be noted and this should also be included in the mass-balance calculations.*

   Response: The type of polymer to be used for sludge thickening within the existing filter bed roll-off following the upgrade to the treatment system will be the same polymer that is currently used for sludge thickening (Redux 843). (The text has been changed to note this.) This polymer was

also used for sludge thickening during the pilot test. See response to General Comment No. 3 regarding a mass-balance calculation.

5. *Page 6, System Prove-Out – A more detailed operation and maintenance plan, to include a more detailed sampling and analysis plan, should be provided prior to or immediately after system prove-out.*

   Response: As noted in this section, a revised O&M Manual will be provided following system upgrades. A prove-out plan which will include a detailed sampling and analysis plan to demonstrate that the upgraded system meets permit discharge criteria will be developed with MassDevelopment prior to system operation. No change has been made to the memo in response to this comment.

6. *Page 6, System Prove-Out – EPA recommends that measurements of dissolved oxygen be conducted for treated water. These data may be useful relative to consideration of remedy components currently proposed for the Focused Feasibility Study (FFS) evaluation.*

   Response: Comment noted. The Army will assess the need for dissolved oxygen measurements in the future as part of the FSS. No change has been made to the memo in response to this comment.

7. *Page 6, System Prove Out - The inclusion of two Lamella Gravity Settlers that can operate in parallel provides the ability to treat extracted groundwater at a flow rate greater than 50 gpm. Provided the existing extraction system can be operated at a rate higher than 50 gpm, it is suggested that system prove-out testing include assessing the ability to treat groundwater at a rate at a total flow rate greater than 50 gpm. Operating at an increased extraction rate could be an alternative to installation of a third extraction well. Provided the schedule for system prove-out testing is compatible with the schedule for delivery of a draft FFS report, information from this assessment could be useful for consideration of alternative remedy components.*

   Response: Comment noted. The Army will consider operation at an increased extraction rate in the future as part of the FSS. However, the overall instantaneous capacity of the system is currently limited by the maximum flow of the microfilter skid which is 65 gpm. (The average or effective capacity of the microfilter skid is less than 65 gpm due to normal and routine system downtime and operation and maintenance.) The inclusion of the second LGS unit is for redundancy and to limit system downtime. No change has been made to the memo in response to this comment.

8. *Figures 2 & 3 – There are floor drains that are shown to receive liquids from the various equipment; please confirm that these drains direct flow into the drainage sump. These lines should also be depicted in the figures.*

   Response: All flow drains in the building discharge to the drainage sump. The figures have been updated to show the below grade drainage lines.

9. *Figure 3 – Please provide an entry in the legend for the grey colored line connecting the Filterbed Rolloff and the Existing Inclined Plate Clarifier.*

   Response: The grey line between the existing inclined plate clarifier and the filter bed roll-off is an existing unused bypass line. A label has been added to Figures 2 and 3.