THE FOLLOWING CHANGES ARE PRESENTED HERE FOR FORM 25
1. Replace the previously submitted Form 25 with that included here.

FORM 25
LEACHATE MANAGEMENT – PHASE II

Prepared 06/03; Rev 09/05, 03/12, 10/12, 11/12, 02/15, 11/2023, 09/2024, 02/2025**, 10/2025**

Form 25 - Table of Contents

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised
06/03, Rev 09/05, 03/12, 10/12, 11/12, 02/15, 11/23, 09/24, 10/2024, 02/2025, 10/2025
DEP USE ONLY
Date Received

FORM 25
LEACHATE MANAGEMENT - PHASE II

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 25, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets should match the "date prepared/revised" on this page.

General References: 273.162, 273.163, 273.271 to 273.275/277.162, 277.163, 277.271 to 277.275, 285.122, 285.123

SECTION A. SITE IDENTIFIER

Applicant/permittee: *Westmoreland Sanitary Landfill, LLC*

Site Name: *Sanitary Landfill*

Facility ID (as issued by DEP): *100277*

SECTION B. BASIC TREATMENT METHODS

☒ 1. Discharge to permitted POTW, following pretreatment, if required, by federal, state or local law or by discharge into another permitted treatment facility.

☐ 2. On-site treatment and discharge to stream.

☐ 3. Spray irrigation following treatment.

☐ 4. Other:

For Proposed Site: Will permanent leachate pre-treatment method be in-place before placement of waste? *N/A*

SECTION C. COMPONENTS OF LEACHATE TREATMENT PLAN

Check and/or Describe

1. Estimate of annual leachate quantity and quality and supporting calculations. — *Attachment 25-1 & 25-2*

☒ 2. Plans, designs, and cross sections for the proposed collection and handling system. — *Attachment 25-4*

☒ 3. Plans, designs, and cross-sections for on-site leachate treatment or disposal systems. — *Attachment 25-8*

☐ 4. Description of on-site treatment system already in operation, including NPDES number, capability to treat leachate, and compliance status under The Clean Streams Law. — *N/A*

5. If interim vehicular transportation to an off-site treatment facility is proposed, provide:

☒ a. Copy of signed contractual agreement with operator of off -site facility, or — *Exhibit 25-4.1*

☐ b. Signed letter of intent from operator of the off-site facility to enter a contractual agreement for leachate treatment. — *N/A*

☐ c. Copy of signed contractual agreement with the operator of a 2nd off-site facility as backup, or — *N/A*

☐ d. Signed letter of intent from operator of the 2nd off-site facility to enter a contractual agreement f or leachate treatment. — *N/A*

☐ e. Additional bond in amount sufficient to pay for the cost of vehicular transportation and off-site leachate treatment until final closure; if off-site treatment is negligent. — *N/A*

☐ f. Submit plans, designs, and cross-sections for an on site pretreatment facility. — *N/A*

6. If recirculation of raw or pretreated leachate is proposed in conjunction with another method, describe:

☐ a. Designs and cross-sections of leachate distribution method. — *N/A*

☐ b. Methods to prevent leachate seeps and breakouts. — *N/A*

☐ c. Methods to prevent odors, runoff, and ponding. — *N/A*

☒ 7. Schedule and method for cleaning sludges from the leachate storage and treatment system, and a plan for disposing of such sludges. — *Attachment 25-4*

☒ 8. Method for measuring average flow rate of leachate from landfill to leachate storage/treatment system. — *Attachment 25-4*

☒ 9. Identify if leachate pumping occurs. — *Attachment 25-4*

☒ 10. Plans and designs for secondary containment of underground pipes used for the transport of leachate from the liner system. — *Attachment 25-4*

SECTION D. ADDITIONAL INFORMATION

Location in Application

1. Interim Leachate Transportation — *Attachment 25-10*

Check appropriate items:

- ☐ 1. A permitted and fully operating system for fully pre-treating leachate will be installed before disposal of waste.
- ☐ 2. Direct discharge into a POTW or other permitted treatment facility is attainable within 3 years.
- ☐ 3. Discharge of treated leachate into a receiving stream in a manner consistent with The Clean Stream Law is attainable within 3 years.
- ☐ 4. A leachate recirculation system will be constructed and operated.

2. Leachate Recirculation: (Prohibited, except for landfills with composite liners) — *N/A*

Describe design of system. Show that there is sufficient municipal waste capacity to absorb leachate and that the area subject to leachate recirculation is underlain by a composite liner. Describe system used to recirculate leachate:

3. Leachate Collection and Storage (for storage impoundments, submit Form 24):
Design leachate volume (gal./year) — *Attachment 15-4*

Tanks or Impoundments:

		#1 *(existing)*	#2 *(existing)*	#3 *(existing)*
1.	Volume (gallons)	*250,000*	*250,000*	*440,000 each*
2.	Dimensions (feet)	*106 x 72*	*106 x 72*	*50' dia., 34'H*
3.	Freeboard (feet)	*1-ft*	*1-ft*	*2.3-ft*
4.	Function (equalization, storage, etc.)	*storage*	*storage*	*storage*
5.	Aeration Capacity	*N/A*	*N/A*	*N/A*
6.	Detention Time	*N/A*	*N/A*	*N/A*
7.	Secondary containment or liner	*Attachment 25-4*	*Attachment 25-4*	*Attachment 25-4*

**** Proposed Treatment tanks not include above***

Form 25 – Attachment 25-8
On-Site Leachate Treatment Trial Project

This Form 25 attachment presents design and operational information for a proposed on-site trial project for leachate treatment. At the time of the submittal of this permit modification, the site is currently trucking all leachate to off-site POTWs for treatment. This trial project has been proposed to treat the site's leachate to improve the leachate quality where additional POTWs that require less trucking length could be considered and/or of the treated leachate could be discharged to one of the on-site sewer connections for final treatment resulting in the elimination of regular trucking of leachate from the site.

Trial Project Summary

This trial project will utilize commercially available treatment components in process sequences not previously utilized for the treatment of leachate. A design report prepared by Keystone Engineering Group, Inc. (Keystone) is included here to present information related to proposed treatment equipment.

This trial project is proposed for a 24 month period to allow for the testing of site leachate under different generation rates, leachate seasonal variations and different weather conditions. This trial project is proposed to process approximately 40,000-gallons per day **to evaluate the overall effectiveness of the system**. **The proposed leachate pre-treatment system has a target capacity of 90,000 gallons per day or 63-gpm. The system includes a combination of individual treatment technologies which have a proposed overall design capacity of 90,000-gallons per day. The quantity of leachate trucked off-site for disposal at a POTW facility has been tracked the last several years and reported to the PADEP as part of quarterly progress reports. The average daily leachate disposal is 42,619 gallons per day. The system design is more than adequate to handle anticipated daily leachate generation. See the Supplementary Information Comment 1.h that is attached to the cover letter for more information justifying the 40,000-gpd design capacity.**

As identified on the permit drawings included here, a new pump station is being installed to pump leachate from the on-site leachate conveyance line to the proposed trial project processing area located near the gas processing plant. Following treatment, leachate from the treatment area can be directed to the on-site leachate storage tanks or to the existing on-site leachate haul out and/or on-site POTW connection(s). The PADEP will be contacted in accordance with consent order documents prior to the trucking of leachate to additional POTWs for disposal and/or use of any on-site direct sewer connection. The use of the two existing on-site sewer connections (Belle Vernon Municipal Authority and Mon Valley) are identified in the current PADEP Solid Waste permit for the site.

Trial Project Reporting

Sanitary Landfill will provide DEP with quarterly reports which will indicate leachate treatment volumes/flows**, major equipment downtime and maintenance, and** the assessment of the system and unit processes. The quarterly reports will be submitted within **30** days of the end of the quarter to allow for analytical results to be received. The quarterly operating period will start on the first of the month following the processing of any leachate through any or all of the trial project processes. The laboratory testing and sample locations are identified in the Keystone design report included here.

The following table has been developed from the Keystone Design Report to summarize testing constituents, testing methods, and testing limits.

		OWS		MBBR	DAF	HRT	KDF / GAC	Target Final Limit
Constituent	**Test Method**	**Inf**	**Eff**	**Eff**	**Eff**	**Eff**	**Eff**	**Effluent**
Ammonia Nitrogen, NH3	EPA 350.1	X		X	X		X	4.9 mg/l
Oil and Grease, O&G	SW846-9071B, EPA 1664A	X	X					15.0 mg/l
Total Dissolved Solids, TDS	SM2540C	X	X	X	X	X	X	2000 mg/l
Total Suspended Solids, TSS	SM2540C	X	X	X	X		X	27 mg/l
Chemical Oxygen Demand, COD	HACH 8000	X		X	X		X	-
Metals (Group II Pollutants)	SM 3112 B-11, EPA 200.7	X			X	X	X	-
Biological Oxygen Demand, BOD5	SM 5210B	X					X	37 mg/l
Flow Range	Onsite Flowmeter	X					X	40,000 gpd

Quarterly operating reports shall be submitted to document all operations throughout the trial project. Quarterly reports will include testing of samples collected from any interim points of the treatment process and final treated effluent from the trial project. Quarterly reports will also identify any changes to the equipment and/or order in which the equipment was utilized as part of the process as identified in a Process Flow Diagram or other method provided with the quarterly reports.

Trial Project Summary

This trial project is being performed to provide partially or fully treated leachate that could be trucked to alternative POTWs as compared to those currently utilized and/or potential treated leachate discharge to a POTW. The duration of this trial and proposed processing equipment will allow for the assessment of the equipment and performance to provide design and operational information for the design of a potential future on-site leachate treatment process that would allow discharge of fully treated leachate (following the receipt

of all applicable permitting).

LANDFILL LEACHATE TRIAL PROJECT

111 CONNER LANE
BELLE VERNON, PENNSYLVANIA

PREPARED FOR
NOBLE ENVIRONMENTAL
6000 TOWN CENTER BLVD, STE 145
CANONSBURG, PENNSYLVANIA

PREPARED BY
KEYSTONE ENGINEERING GROUP, INC.
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Megan L. Kawamoto, P.E.
Senior Engineer

Michael D. Wade, P.E.
Vice President

FEBRUARY 2025

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APPENDICES

BASIS OF DESIGN FOR TRIAL PROJECT

Westmoreland Sanitary Landfill, LLC (WSL) owns and operates a Municipal Solid Waste Landfill facility located in Belle Vernon, Rostraver Township, Westmoreland County, Pennsylvania. Currently, leachate is hauled offsite for final treatment at an appropriately permitted POTW facility. Noble is interested in constructing an on-site leachate pre-treatment facility as a trial project to improve the leachate quality. The improved leachate quality may provide additional options for off-site final treatment and may be used to explore the potential re-activation of the site's direct sewer connections. The proposed trial project will have a target treatment of 40,000 gallons per day of leachate or more. The trial project will be performed for a duration of 24 months so that the site can review the treatment process performance through the cyclical nature of the containment loadings and varied weather conditions that the landfills see in their leachate generation.

The proposed trial project will have a target treatment of 40,000 gallons for the demonstration project but the system is being designed for a minimum 90,000 gallons.

1.0 DESCRIPTION OF CURRENT PROCESS

The existing system includes two storage tanks that receive leachate flow from the landfill via gravity. The system then flows via gravity to a truck load out area where the leachate is hauled offsite for final disposal. The site has two on-site permitted direct sewer connections that are not currently utilized.

1.1 DESIGN BASIS

WSL completed significant sampling of leachate for several different parameters, including but not limited to, ammonia, chemical oxygen demand (COD), total suspended solids (TSS), Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Zinc, and pH from February 2017 to March 2024. Keystone analyzed the data by creating histograms that depicted the frequency of sampling and the cumulative percentage of each constituent. These histograms were analyzed to determine an eighty-five (85) percentile of probability concentration. The selected percentiles and corresponding values of the collected samples are summarized in **Table 1.1** in **Appendix A.**

1.2 GENERAL SUMMARY OF PROPOSED PROCESS

Landfill leachate will be conveyed to the proposed trial project equipment by pumps located near the existing leachate storage tanks with flows controlled by pumps with VFDs and a flow meter. The first process will be an oil/water separator (OWS) for the removal of floatable contaminants and bulk solids with disposal at the landfill. The leachate will then gravity flow to the Moving Bed Biofilm Reactor (MBBR) for the removal of BOD and nitrification of ammonia. This process may require additions of soda ash solution (alkalinity), phosphoric acid (micronutrient) and either acid or base for pH adjustment. There is currently no anticipated wasting from this process as activated sludge that will slough off the media and flow to the Dissolve Air Floatation (DAF) for solids removal. The DAF is in place to remove bacteria solids generated within the MBBR with the potential experimental additions of coagulants and flocculants to increase solids removal efficiency. The solids will be skimmed from the DAF and be disposed of at the landfill. If after thorough assessment of the DAF process indicates that its performance is not comparable

to typical coagulation/flocculation sedimentation processes, Westmoreland Sanitary Landfill will notify the Department of the DAF removal and replacement with a sedimentation metals removal process to adequately assess downstream processes.

These first three processes will optimally be entirely gravity flow after the initial conveyance of leachate to the OWS. These OWS would target the initial removal of floatables and bulk solids. The MBBR would facilitate BOD and Ammonia reductions. In addition, the level of aeration in an MBBR can significantly affect the ORP; increased aeration will lead to a higher ORP value due to more dissolved oxygen available for the biofilm. A higher ORP can facilitate the oxidation and precipitation of certain dissolved metals, making them easier to remove from the water. The MBBR would be followed by the DAF which would remove any residual TSS and possibly remove the dissolved metals. The goal is to make the leachate more amenable to further processing in the next steps.

Following the DAF (or suitable replacement) a pump station will be required to pump the leachate through the bag filters and three stage Pentair filtration system (HRT). The bag filters will be plumbed to facilitate a bypass based on the performance of the preceding process. The HRT is a filtration system with the third stage system removing down to 1 micron. The presence of coagulants from the DAF stage may promote the removal of metal contaminants, whereby extending the useful life of the media in the following process. The leachate will need to be repressurized to flow through the next process consisting of KDF and GAC media vessels for further removal of metal contaminants and PFAS. Current plans are to utilize a duplex or triplex system with each 'unit' consisting of a tank with KDF media and a tank with GAC media. The goal is for the KDF media to remove metal contaminants ahead of the granulated activated carbon system furthering the lifespan of the media.

Westmoreland Sanitary Landfill requests the ability to bypass or swap the order of individual processes to accurately assess the performance of individual processes and their performance as a whole. Modifications to the treatment system during the trial project will be documented and identified in the trial project reports submitted to the Department. The ability to bypass, swap or eliminate individual processes is a critical part of the trial project to identify the effectiveness of each process step as it contributes to the operation of other steps and/or the overall treatment effectiveness.

A process flow diagram is provided in **Appendix B.**

2.0 DETAILED DESCRIPTION OF EQUIPMENT

The following sections outline in more detail the specified equipment. Specific equipment is identified in each section below; however, alternative similar performing equipment may be utilized based on availability or other considerations. Final equipment selections will be documented and identified in an as-built equipment process flow diagram provided to the Department.

2.1 OIL AND WATER SEPARATOR

The Oil Water Separator (OWS) will be manufactured by Oil Water Separator Technologies, LLC and will be model SA-HF-SS/CS-300 gpm (or similar). The unit is constructed of stainless steel and will house coalescing media with baffles. This media filter can remove 20-micron size and larger hydrocarbons with an effluent quality of 10 ppm or less of oil and grease. The unit will be equipped with a level switch to detect high levels. Equipment information can be found in **Appendix C.** Waste from this process will go directly into a sealed box which will be weighed prior to disposal in the landfill. A line will be installed as an option to bypass the OWS to assess how the MBBR performs with the carryover solids.

2.2 MOVING BED BIOFILM REACTOR

A moving bed biofilm reactor (MBBR) will be installed as described here or similar. The MBBR will be around a 185,000-gallon process unit with a coarse bubble aeration system. The aeration system will comprise of a 316SS drop pipe, CPVC manifold, CPVC laterals, and fifty-six (56) 24" CPVC coarse bubble diffusers. The aeration grid will be supplied by two 100-HP positive displacement rotary lobe blowers (one duty/one standby) that will provide an air flow demand of approximately 1,200 SCFM. The biomass will be retained on 114 cubic meters of bioFAS B-3500 Biofilm carriers (20% fill). These polyethylene carriers are 1.18 inches in diameter and have a protective surface area of 3,500 square meters per cubic meters. The effluent and drain nozzles on the tank will have media retention screens to prevent the biofilm carriers from escaping the bioreactor. Chemical feed systems will be included for defoamer, pH adjustment chemicals, phosphoric acid, and descaling agent to help create a healthy environment for the microbiology in the MBBR. For the pilot system, the MBBR will be treated in a modular manner to be upgraded with additional media for the full-scale permanent installation. Equipment information can be found in **Appendix D.**

2.3 DISSOLVED AIR FLOTATION UNIT

The MBBR will be followed by a DAF, or dissolved air flotation unit or similar. This carbon steel portable unit manufactured by Westech is sized to handle a hydraulic flow rate between 50 to 300 gpm. The system will have an on-board air induction system and float level controls. An intermediate pump station will send flow from the DAF to the duplex bag filters. Equipment information can be found in **Appendix E.** Waste from this process will go directly into a sealed box which will be weighed prior to disposal in the landfill. Depending on the performance on the DAF in removal of solids generated by both the MBBR and coagulation, the unit may be replaced with a typical setting/sedimentation system to allow the downstream processes to be accurately assessed without carryover solids.

2.4 BAG FILTERS

Flow will be pumped from the DAF to bag filters to remove carry over solids. The duplex bag filters are a pre-filter to the VMAX. The bag filters are a duplex assembly that is a separator. They are manufactured by Pentair and are Part number FMV24066FF-NCS or similar. They will have durafoam coarse – dual layer epoxy coated wire screens inside. The differential pressure will be measured to determine the appropriate time to change out the media. A bypass line will be installed as an option around these filters. Equipment information can be found in **Appendix F.**

2.5 VMAX SEPARATOR

From the bag filters, the flow will go to a VMAX. The VMAX is a coreless filter that flows from the inside to the outside like a bag filter to remove additional solids from the stream. VMAX filters offer three to five times longer life than a conventional bag filter. The VMAX is a duplex assembly that is a separator with a polyester medium. They are manufactured by Pentair and are Part number FMV24066FF-NCS or similar. The dimensions are 42" wide by 30" long skid that contain 24" O.D. vessels with 6 cages. The vessels are rated to meet ANSI 300# certifications. There will be differential pressure switches to determine if the vessels are clogged. Equipment information can be found in **Appendix F.**

2.6 PREFILTER TO HRT (PROCESSOR)

From the VMAX, the flow will continue to the ProcessOR. The ProcessOR is a prefilter for the HRT and is manufactured by Pentair or similar. The ProcessOR with COMPAX Coreless Elements is a 92" long by 60" side skid that contain 36" O.D. vessels with 25 cores to support the 1 µm microfoam filters. The vessels are rated to meet ANSI 300# certifications. The ProcessOR will have differential pressure sensors, two vents, and two drains. Equipment information can be found in **Appendix F.**

2.7 HYDROCARBON RECOVERY TECHNOLOGY (HRT)

The flow then continues to an HRT. The HRT is a hydrocarbon recovery technology – organic separator manufactured by Pentair. Hydrocarbon recovery technology is a process used to remove hydrocarbons. The HRT uses a solvent to dilute hydrocarbons, causing the emulsion to break and separate the phases. This results in clean water, solids, and hydrocarbons with no waste streams or residues. This aqueous/hydrocarbon separator is part number FLH3627GGG-NCS or similar. The skid is 132" long by 60" wide that contain 36" O.D. vessels with swing bolt closures. The vessel has 22 risers to support the coalescing filter element. The vessel is rated for ANSI 300#. Equipment information can be found in **Appendix F.** We do not anticipate any recovery of hydrocarbons but this could be assessed at the time of the trial project.

2.8 KINETIC DEGRATION FILTER (KDF)

From the HRT a filter pump will transfer flow to a KDF or Kinetic Degradation Fluxion media filter. Kinetic Degradation Fluxion (KDF) consists of vessels with media. KDF process media acts as catalysts

to change soluble ferrous cations into insoluble ferric hydroxide, which is easily removed by regular backwashing. KDF process media converts hydrogen sulfide to insoluble sulfide, which can be removed by backwashing. This model is H2K LC-028 liquid phase filter or similar. It is a 72" O.D. vessel with 6 ft side sheet and 11'6" OAH. The virgin grade 80x30 mesh liquid phase is the media filters. The pressure rating is 75 psig. There will be either duplex or triplex of these filters set up. Equipment information can be found in **Appendix G.** Waste from this process will go directly into a sealed box which will be weighed prior to disposal in the landfill. A line will be installed to bypass the KDF filters as an option to review the performance in prolonging the GAC media.

2.9 GRANULAR ACTIVATED CARBON (GAC)

From the KDF filters, the flow will go to the GAC, or granular activated carbon media filter. The Granular activated carbon filter is a tertiary treatment process used to remove dissolved and soluble organics, inorganic compounds, and heavy metals. This filter is manufactured by Cartrol and is 36x72 triple progressive flow carbon with 36 gpm max each tank at 5 gpm sq ft or similar. From there it will go to an effluent storage/effluent pump station. Equipment information can be found in **Appendix G.**

3.0 MONITORING/SAMPLING PLAN AND REPORTING

The plan will include the following sampling:

- Influent of OWS for Oil and Grease, NH3, TSS, TDS, COD, Metals.
- Effluent of OWS for Oil and Grease, TSS, TDS.
- Effluent of MBBR for TSS, TDS, COD, and NH3.
- Effluent of the DAF for NH3, TSS, TDS, COD, and Metals.
- Effluent of the HRT – TDS and Metals.
- Effluent of KDF & GAC – TDS, Metals, NH3, TSS, and COD.

Samples to be completed monthly for the full duration of the trial project. This represents base sampling. Additional sampling will likely be performed to monitor individual processes or when the process is modified for assessment or individual process or overall operation.

30

WSL will provide DEP with quarterly reports that indicate flows and the assessment of the system and unit processes. The quarterly reports will be submitted within 60 days of the end of the quarter to allow for analytical to be reported from the laboratory. The quarterly operating period will start on the first of the month following the processing of any leachate through any or all of the trial project processes. Quarterly operating reports shall be submitted to document all operations throughout the trial project.

4.0 TRIAL PROJECT PERFORMANCE GOALS

Sanitary Landfill is proposing a leachate pre-treatment trial project consisting of several processes the combination of which is unique to landfill leachate treatment. The trial project is anticipated to produce effluent capable of meeting EPA industrial pretreatment standards as well as NPDES permitted discharge. Treated leachate during the trial project will be trucked off-site for final treatment and/or discharged to one of the on-site sewer connections. The hauling of leachate to an additional location or activation of an on-site sewer connection shall include proper notice to the Department in accordance with current permit conditions and consent documents.

APPENDIX A
DESIGN BASIS TABLE

Table 1.1 – Proposed Process WWTP Design Basis

Parameter	Percentile	Value	Unit
Ammonia	90%	800	Mg/L
COD	90%	2,700	Mg/L
TSS	90%	10,600	Mg/l
Arsenic	86%	130	µg/l
Cadmium	100%	<5	µg/l
Chromium	90%	80	µg/l
Copper	93%	40	µg/l
Lead	100%	40	µg/l
Mercury	100%	<0.20	µg/l
Nickel	82%	110	µg/l
Selenium	96%	20	µg/l
Silver	100%	<10	µg/l
Zinc	86%	520	µg/l
pH	Min	6.98	S.U.
pH	Max	8.16	S.U.

APPENDIX B

PUMP SPECIFICATIONS AND PROCESS FLOW DIAGRAM DRAWINGS

LEGEND

EXISTING

PROPOSED

DISCHARGE TO EXISTING TANK

TANK #1 T-

TANK #2 T-

LEACHATE FROM LANDFILL

N.C.

FRAC TANK

TRUCK LOAD

PROPOSED BUILDING

VFD

TRANSFER PUMP

VFD

TRANSFER PUMP

INFLUENT PUMP STATION

FM

SAMPLE

LVL

VENT

COALESCING MEDIA

OIL/WATER SEPARATOR (OWS)

BYPASS

DEFOAMER

DESCALER

PHOSPHORIC ACID

CAUSTIC

SAMPLE

AERATION BLOWERS (2)

MOVING BED BIOFILM REACTOR (MBBR) T-

SAMPLE

FLASH MIXING AND FLOCCULATION TANK

DISSOLVED AIR FLOTATION (DAF) OR TYPICAL SETTLING/SEDIMENTATION SYSTEM

SAMPLE

TRANSFER PUMP

TRANSFER PUMP

INTERMEDIATE PUMP STATION

SAMPLE

BAG FILTERS

WASTE

WASTE

DUMPSTER

NOTE:
SOLIDS WILL GO DIRECTLY INTO A SEALED BOX AND WILL BE WEIGHED PRIOR TO DISPOSAL IN THE LANDFILL

BACKWASH

N.C.

INTERMEDIATE PUMP STATION

BAG FILTERS

VMAX SEPARATOR

PROCESSOR (PRE-FILTER)

HYDROCARBONS

HYDROCARBON RECOVERY TECHNOLOGY (HRT)

FILTER PUMP

KINETIC DEGRADATION FLUXION (KDF)

GRANULAR ACTIVATED CARBON (GAC)

BYPASS

EFFLUENT STORAGE T-

TRANSFER PUMP

TRANSFER PUMP

EFFLUENT PUMP STATION

FM

DISCHARGE TO EXISTING TANK

DISCHARGE TO POTW

PROJECT #: XXX	NO.	ISSUE / REVISION DESCRIPTION	DRAWN	APPROVED	DATE
	1	**REVISED PER DEP MEETING**	**RSW**	**MLK**	**11/20/24**
	0	**ISSUED FOR DEMONSTRATION PLAN**	**RSW**	**MLK**	**10/11/24**

Keystone ENGINEERING GROUP

FRAZER, PENNSYLVANIA
(610) 407-4100
KEGI.NET

PRELIMINARY
FOR REVIEW NOT CONSTRUCTION

NOBLE ENVIRONMENTAL, INC.

WESTMORELAND - PILOT DEMONSTRATION
111 CONNER LANE, BELLE VERNON, PA 15012

PROCESS FLOW DIAGRAM

Drawn By:	RSW
Designed By:	MLK
Approved By:	MDW
Date:	10/04/2024
Sheet:	OF X
Drawing No.	D-601

PIPE VELOCITY CALCULATOR

PROJECT:	***Noble - Westmoreland***
PROJECT #:	***2024.00194***
DATE:	***2/3/2025***
Prepared By:	***MDW***
Checked By:	

FLOW (GPM)	C	DIA (IN)	VEL (FPS)	(FT)	(FT/100)
25	100	3	1.14	0.02	0.38
25	100	4	0.64	0.01	0.09
25	100	6	0.28	0.00	0.01
25	100	8	0.16	0.00	0.00
50	100	3	2.27	0.08	1.38
50	100	4	1.28	0.03	0.34
50	100	6	0.57	0.01	0.05
50	100	8	0.32	0.00	0.01
75	100	3	3.41	0.18	2.93
75	100	4	1.92	0.06	0.72
75	100	6	0.85	0.01	0.10
75	100	8	0.48	0.00	0.02
100	120	3	4.54	0.32	3.55
100	120	4	2.55	0.10	0.88
100	120	6	1.14	0.02	0.12
100	120	8	0.64	0.01	0.03
150	120	3	6.81	0.72	7.53
150	120	4	3.83	0.23	1.86
150	120	6	1.70	0.05	0.26
150	120	8	0.96	0.01	0.06

HYDRAULIC PROFILE CALCULATOR - HIGH HEAD

PROJECT:	***Noble - Westmoreland***
PROJECT #:	***2024.00194***
DATE:	***2/3/2025***
Prepared By:	***MDW***
Checked By:	

Summary of Results

Elevation @ pipe entrance:	950.0 ft	Design Flow:	*75 gpm*
Elevation @ pipe exit:	1015.0 ft	Selected Pipe Dia:	*4 inch*
Headloss due to friction:	5.317 ft	Pipe Material:	*PVC*
Total Dynamic Head	**70.3 ft**	Selected 'C' Factor:	*120*

Insert Entry

Generage System Curve

PIPE SECTION: *Preliminary - Leachate Inlet to Pilot Treatment System*

ITEM	QUANTITY	DESCRIPTION	Elev. (ft.) ΔH (ft.)	Dia.1 (in.) Dia.2 (in.)	Area 1 (ft^2) Area 2 (ft^2)	Pressure Head (ft.)	Length of Pipe (ft.)	Friction Loss, h_f (ft.)	Fraction of Total Flow	Flow (MGD) Flow (GPM)	VELOCITY FPS	VELOCITY HEAD ($v^2/2g$)	K Factor for Fitting	Total K	Loss in Fitting (feet)	Loss in Contraction (ft.) Loss in Expansion (ft.)	Head Loss (ft.)
Entrance Loss	1	Pipe Inlet	950	4	0.087				1	0.11 75.00	1.91	0.057	0.50	0.500	0.028		**0.028**
		Linear Pipe		4	0.087		10	0.05	1	0.11 75.00	1.91	0.057	0.00				**0.051**
90 Bend	2	Elbow Fitting		4	0.087				1	0.11 75.00	1.91	0.057	0.30	0.600	0.034		**0.034**
Side Outlet Tee	1	Tee Fitting		4	0.087				1	0.11 75.00	1.91	0.057	1.80	1.800	0.102		**0.102**
Butterfly Valve	1	Isolation Valve		4	0.087				1	0.11 75.00	1.91	0.057	0.50	0.500	0.028		**0.028**
		Pump Inlet		4 1.5	0.087 0.012				1	0.11 75.00	1.91	0.057	0.00			0.02	**0.024**
		Pump Outlet		1.5 4	0.012 0.087				1	0.11 75.00	13.62	2.879	0.00			2.13	**2.126**
Check Valve	1	check valve		4	0.087				1	0.11 75.00	1.91	0.057	2.50	2.500	0.142		**0.142**
Butterfly Valve	1	Isolation Valve		4	0.087				1	0.11 75.00	1.91	0.057	0.50	0.500	0.028		**0.028**
Side Outlet Tee	1	Tee Fitting		4	0.087				1	0.11 75.00	1.91	0.057	1.80	1.800	0.102		**0.102**
90 Bend	10	Elbow Fitting		4	0.087				1	0.11 75.00	1.91	0.057	0.30	3.000	0.171		**0.171**
		Linear Pipe		4	0.087		470	2.42	1	0.11 75.00	1.91	0.057	0.00				**2.420**
Outlet Loss	1	Pipe Outlet	1015	4	0.087				1	0.11 75.00	1.91	0.057	1.00	1.000	0.057		**0.057**
					Total Length=		**480.00**					**Total K Value=**	**9.20**			**Friction Headloss (feet)**	**5.317**

References: Loss in Contraction Calc. from **Cameron Hydraulic Data**, pg.3-117
Loss in Expansion Calc. from **Cameron Hydraulic Data**, pg.3-117
hf= 0.002083 x L x (100/C)^1.85 x gpm^1.85/d^4.8655 (hazen and williams method)

HYDRAULIC PROFILE CALCULATOR - LOW HEAD

PROJECT:	***Noble - Westmoreland***
PROJECT #:	***2024.00194***
DATE:	***2/3/2025***
Prepared By:	***MDW***
Checked By:	

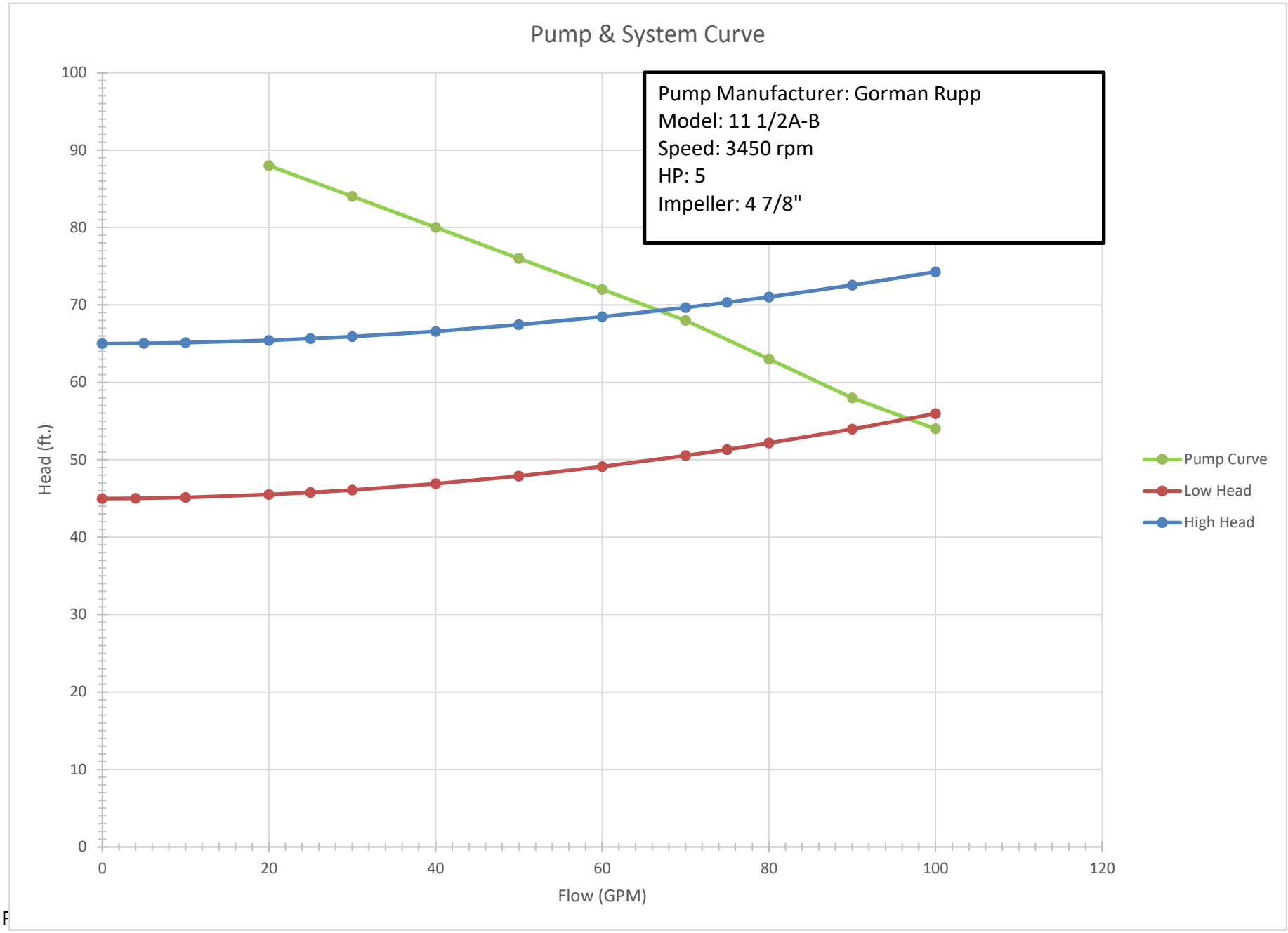
Summary of Results

Elevation @ pipe entrance:	970.0	ft	Design Flow:	*100 gpm*
Elevation @ pipe exit:	1015.0	ft	Selected Pipe Dia:	*6 inch*
Headloss due to friction:	10.954	ft	Pipe Material:	*Ductile Iron*
Total Dynamic Head	**56.0**	**ft**	Selected 'C' Factor:	*100*

PIPE SECTION: *Preliminary - Leachate Inlet to Pilot Treatment System*

ITEM	QUANTITY	DESCRIPTION	Elev. (ft.) / ΔH (ft.)	Dia.1 (in.) / Dia.2 (in.)	Area 1 (ft^2) / Area 2 (ft^2)	Pressure Head (ft.)	Length of Pipe (ft.)	Friction Loss, h_f (ft.)	Fraction of Total Flow	Flow (MGD) / Flow (GPM)	VELOCITY FPS	VELOCITY HEAD ($v^2/2g$)	K Factor for Fitting	Total K	Loss in Fitting (feet)	Loss in Contraction (ft.) / Loss in Expansion (ft.)	Head Loss (ft.)
Entrance Loss	1	Pipe Inlet	970	4	0.087				1	0.14	2.55	0.101	0.50	0.500	0.051		**0.051**
										100.00							
0	0	Linear Pipe		4	0.087		10	0.12	1	0.14	2.55	0.101	0.00				**0.123**
										100.00							
90 Bend	2	Elbow Fitting		4	0.087				1	0.14	2.55	0.101	0.30	0.600	0.061		**0.061**
										100.00							
Side Outlet Tee	1	Tee Fitting		4	0.087				1	0.14	2.55	0.101	1.80	1.800	0.182		**0.182**
										100.00							
Butterfly Valve	1	Isolation Valve		4	0.087				1	0.14	2.55	0.101	0.50	0.500	0.051		**0.051**
										100.00							
0	0	Pump Inlet		4	0.087				1	0.14	2.55	0.101	0.00			0.04	**0.043**
				2	0.012					100.00							
0	0	Pump Outlet		1.5	0.012				1	0.14	18.15	5.118	0.00				**3.780**
				4	0.087					100.00						3.78	
Check Valve	1	check valve		4	0.087				1	0.14	2.55	0.101	2.50	2.500	0.253		**0.253**
										100.00							
Butterfly Valve	1	Isolation Valve		4	0.087				1	0.14	2.55	0.101	0.50	0.500	0.051		**0.051**
										100.00							
Side Outlet Tee	1	Tee Fitting		4	0.087				1	0.14	2.55	0.101	1.80	1.800	0.182		**0.182**
										100.00							
90 Bend	10	Elbow Fitting		4	0.087				1	0.14	2.55	0.101	0.30	3.000	0.304		**0.304**
										100.00							
0	0	Linear Pipe		4	0.087		470	5.77	1	0.14	2.55	0.101	0.00				**5.774**
										100.00							
Outlet Loss	1	Pipe Outlet	1015	4	0.087				1	0.14	2.55	0.101	1.00	1.000	0.101		**0.101**
										100.00							
				Total Length=	**480.00**								**Total K Value=**	**9.20**	**Friction Headloss (feet)**		**10.954**

References: Loss in Contraction Calc. from **Cameron Hydraulic Data**, pg.3-117
Loss in Expansion Calc. from **Cameron Hydraulic Data**, pg.3-117
hf= 0.002083 x L x (100/C)^1.85 x gpm^1.85/d^4.8655 (hazen and williams method)

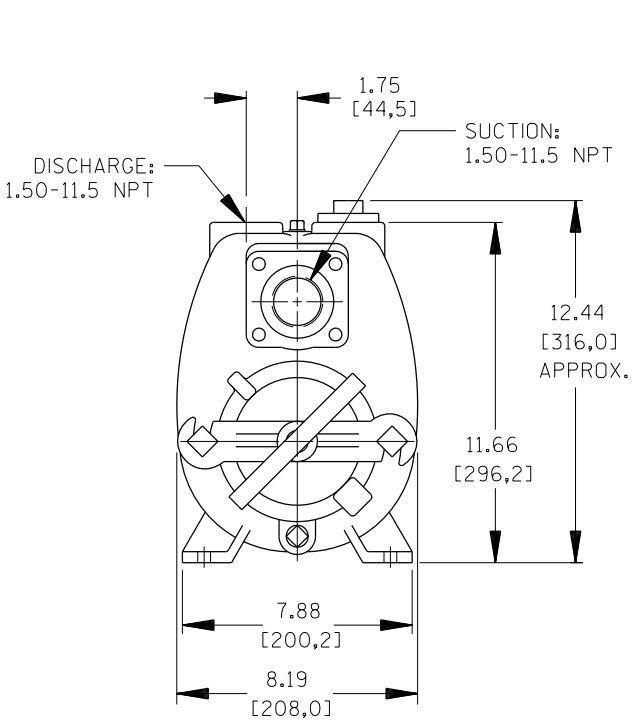


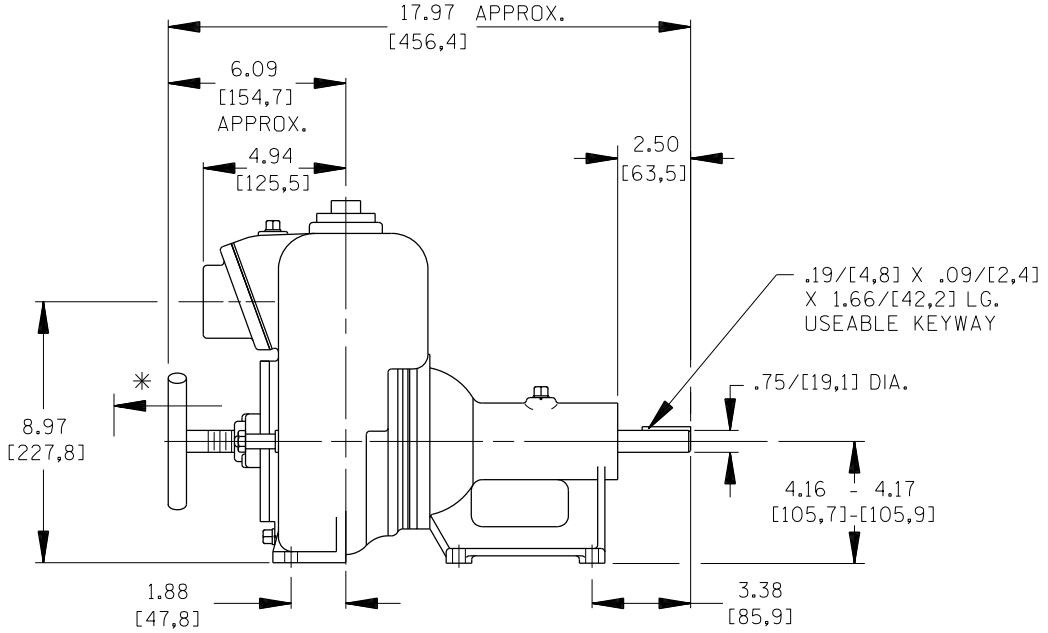
Preliminary, Noble Westmoreland
Leachate Inlet Feed

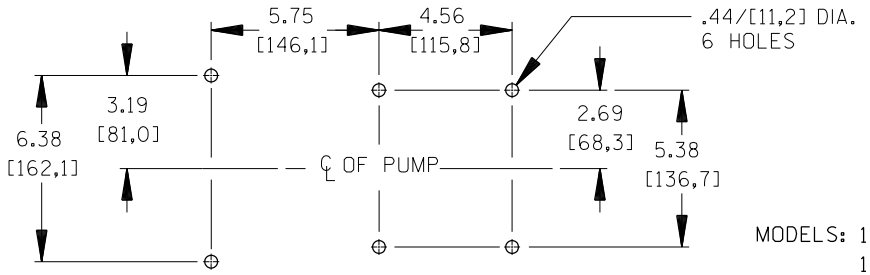
A-12381

B 12381

NOTE: SEE DWG. 12384 FOR OTHER MODELS







PLAN VIEW

✳ 18.00/[457,2] RECOMMENDED FOR REMOVAL OF BACK COVER PLATE
6.00/[152,4] REQUIRED FOR REMOVAL OF BACK COVER PLATE

MODELS: 11 1/2A2-B
11 1/2A3-B
11 1/2A52-B

DIMENSIONS:
INCHES
[MILLIMETERS]

00-059

THE GORMAN-RUPP CO.
MANSFIELD, OHIO ST. THOMAS, ONTARIO

DRAWN BY	SCALE	MODEL
ML	1/4	NOTED
DATE	REVISED	OUTLINE NUMBER
3-12-65	9-15-00	12381

PERFORMANCE CURVE

MAXIMUM DRY PRIMING LIFTS					
RPM	1750	2200	2600	3000	3450
FEET	13	18	20	21	23
METERS	3,9	5,5	6,1	6,4	7

Figure NPSH required prior to using above table.
DO NOT use as available Suction Lifts.

Dry priming is defined as suction and discharge pipes without liquid, pump casing filled with 70° water.

1.00"/[25,4] DIAMETER MAX. SPHERICAL SOLIDS

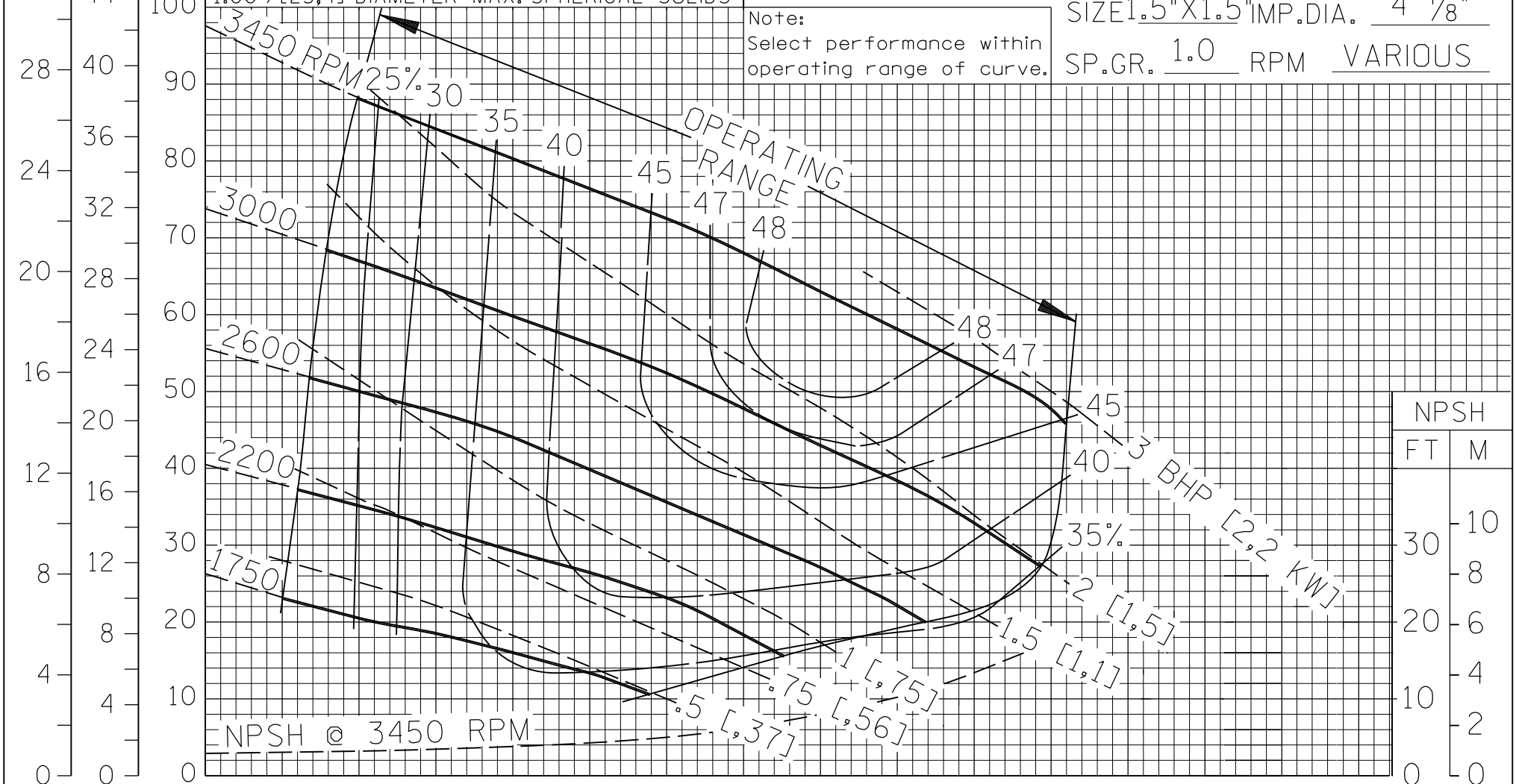
VOLUTE 12367 CI / 12367B SST CURVE 11 1/2A-B-1

IMPELLER 12368 MODEL 11 1/2A-B

SIZE 1.5"X1.5" IMP.DIA. 4 7/8"

SP.GR. 1.0 RPM VARIOUS

Note:
Select performance within operating range of curve.



GORMAN-RUPP PUMPS

C-10-13-R

FILE NO. 1112AB.S01

C

Self Priming Centrifugal Pump

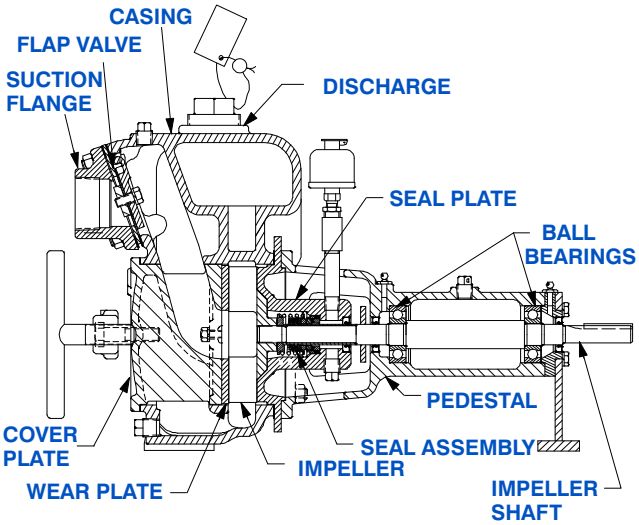
Models 11 1/2A9–B *and* 11 1/2A22–B

Size 1-1/2” x 1-1/2”

PUMP SPECIFICATIONS

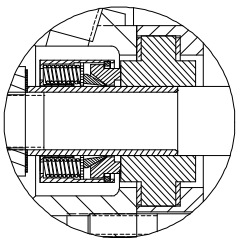
Size: 1-1/2” x 1-1/2” (38 mm x 38 mm) NPT - Female.
Casing: Stainless Steel 316.
Maximum Operating Pressure 64 psi (441 kPa).*
Semi-Open Type, Two Vane Impeller: Stainless Steel 316.
Handles 1” (25,4 mm) Diameter Spherical Solids.
Impeller Shaft: Stainless Steel 316.
Replaceable Wear Plate: Stainless Steel 316.
Removable Cover Plate: Stainless Steel 316; 6 lbs. (3 kg).
Pedestal: Gray Iron 30.
Seal Plate: Stainless Steel 316.
Flap Valve: Stainless Steel Alloy 20; Stainless Steel 316; Fluorocarbon Elastomers (DuPont Viton® or Equivalent).
Shaft Sleeve: **(11-1/2A9–B)** Stainless Steel 17-4 PH; **(11-1/2A22–B)** Stainless Steel 316.
Radial and Thrust Bearings: Open Single Row Ball.
Bearing Lubrication: Grease.
Flange: Stainless Steel 316.
Gaskets: Fluorocarbon (DuPont Viton® or Equivalent).
Hardware: Stainless Steel 316.
Optional Equipment: Consult Factory.

**Consult Factory for Applications Exceeding Maximum Pressure and/or Temperature Indicated.*

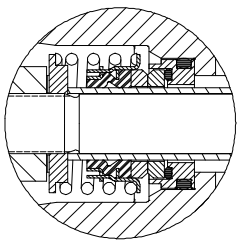


11 1/2A22–B SHOWN

11 1/2A9–B SEAL DETAIL



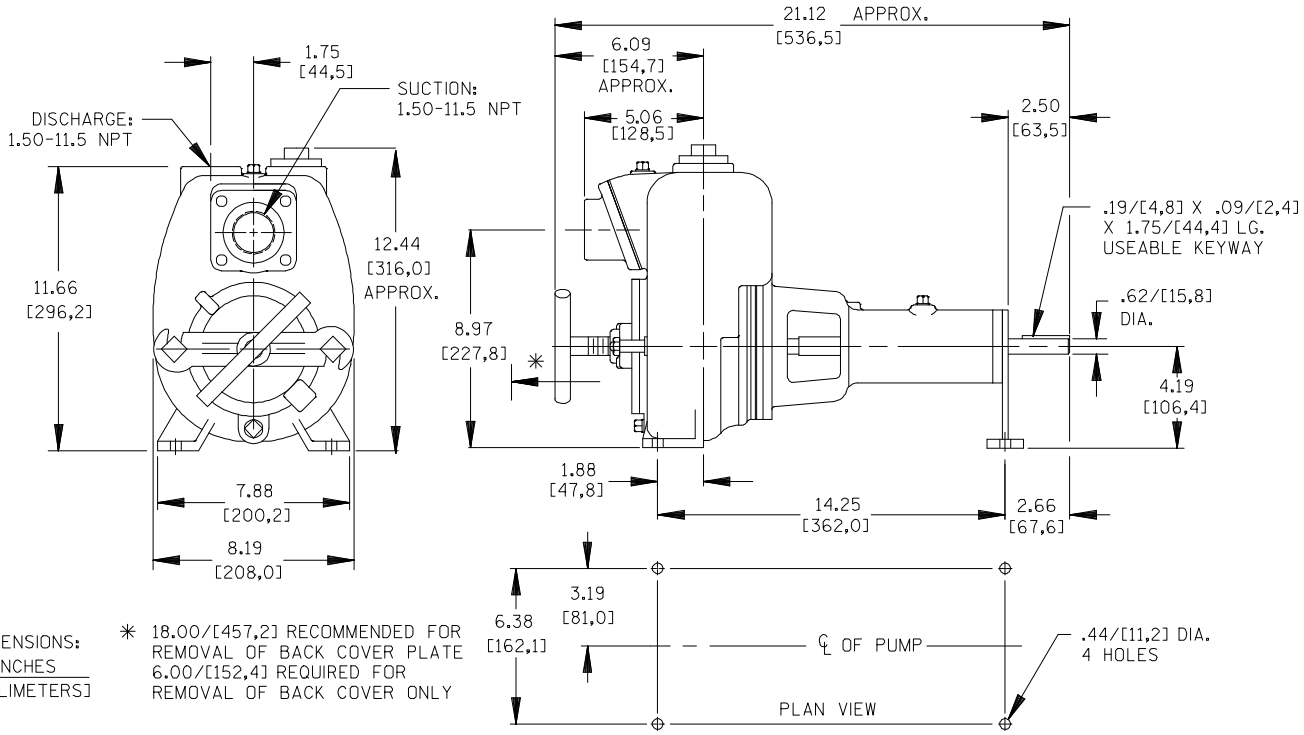
Type 9, Mechanical, Self-Lubricated. Tungsten Carbide Rotating and Stationary Faces. PTFE Elastomers. Stainless Steel 316 Cage and Spring. Maximum Temperature of Liquid Pumped, 160°F (71°C).*

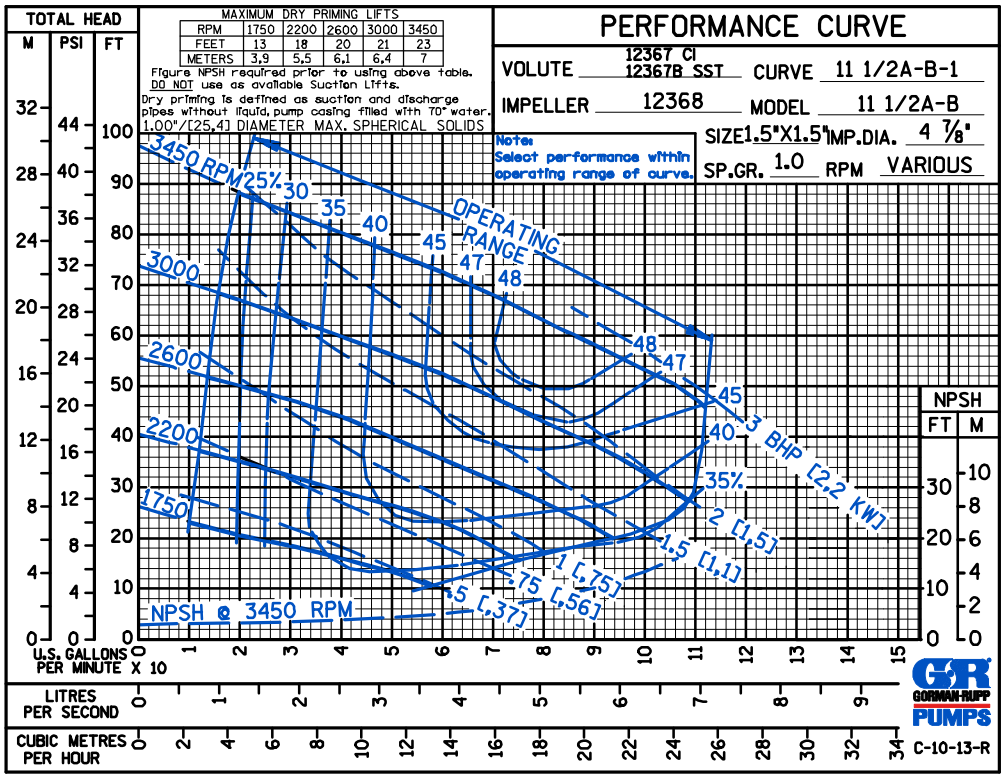


11 1/2A22–B SEAL DETAIL

Type 2, Mechanical, Oil-Lubricated, Double Floating, Self-Aligning. Tungsten Titanium Carbide Rotating and Stationary Faces. Stainless Steel 316 Stationary Seat. Fluorocarbon Elastomers (DuPont Viton® or Equivalent). Stainless Steel 18-8 Cage and Spring. Maximum Temperature of Liquid Pumped, 160°F (71°C).*

Specification Data	APPROXIMATE DIMENSIONS and WEIGHTS	NET WEIGHT: 71 LBS. (32,2 KG.)
SECTION 55, PAGE 104		SHIPPING WEIGHT: 81 LBS. (36,7 KG.)
		EXPORT CRATE SIZE: 3.5 CU. FT. (0,1 CU. M.)





THE GORMAN-RUPP COMPANY ● MANSFIELD, OHIO

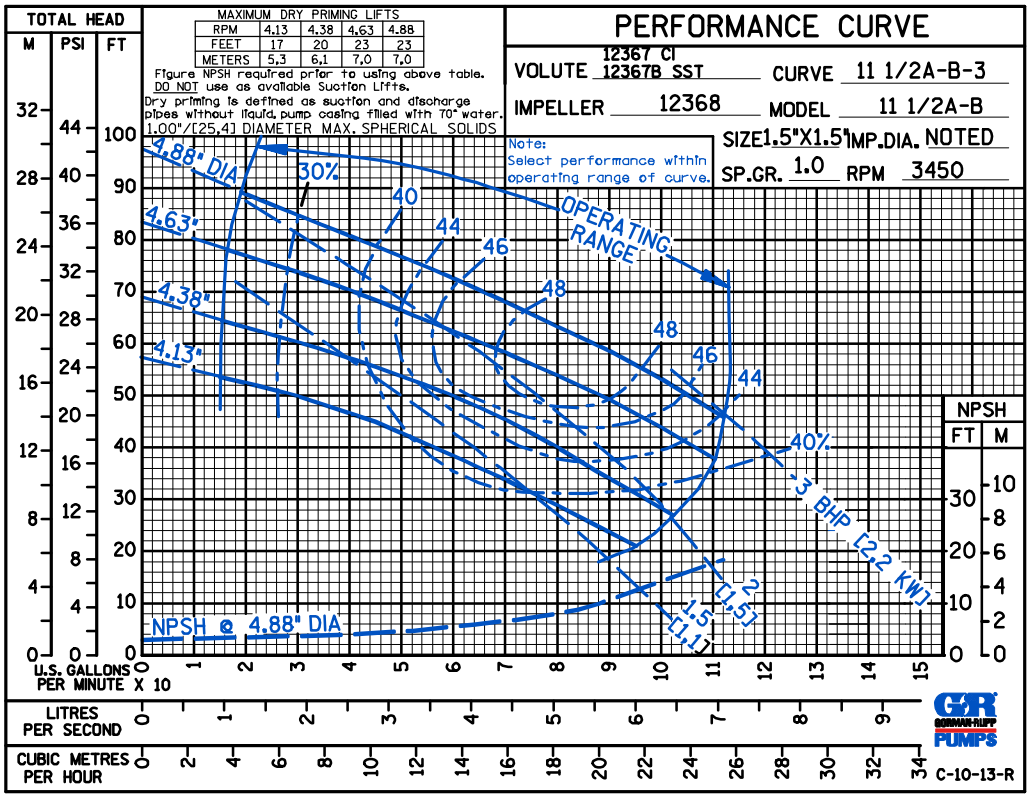
GORMAN-RUPP OF CANADA LIMITED ● ST. THOMAS, ONTARIO, CANADA

A C D E

60 HERTZ

PERFORMANCE BASED ON WATER

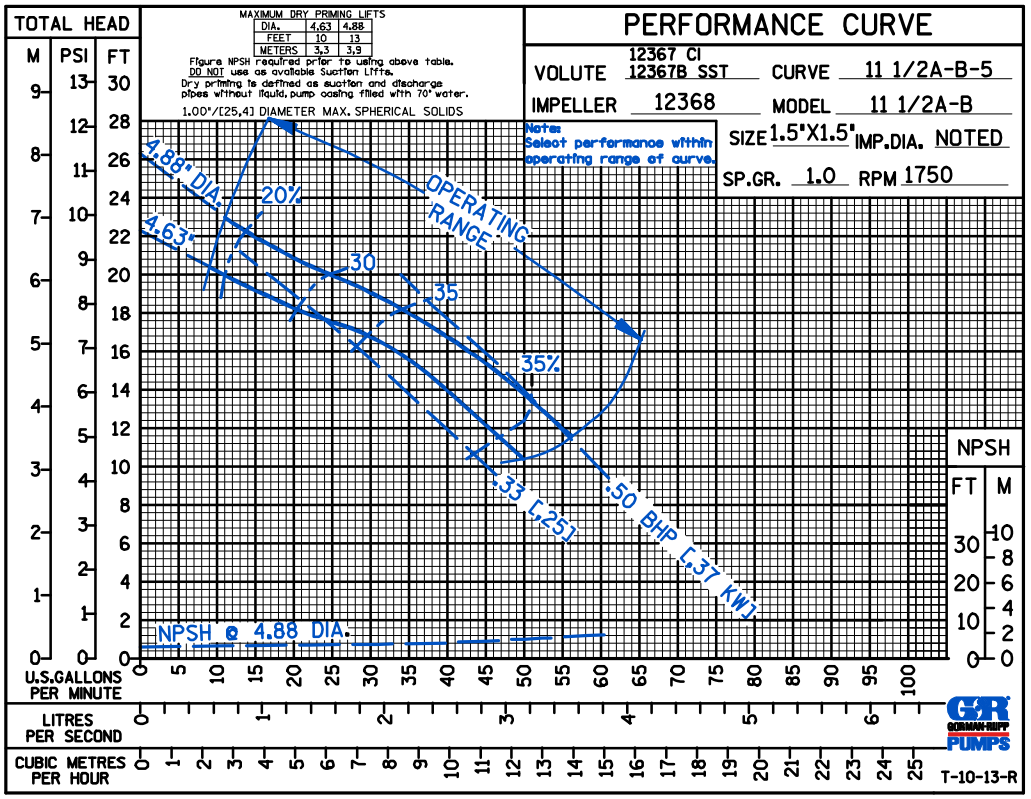
TRIMMED IMPELLER



60 HERTZ

PERFORMANCE BASED ON WATER

TRIMMED IMPELLER

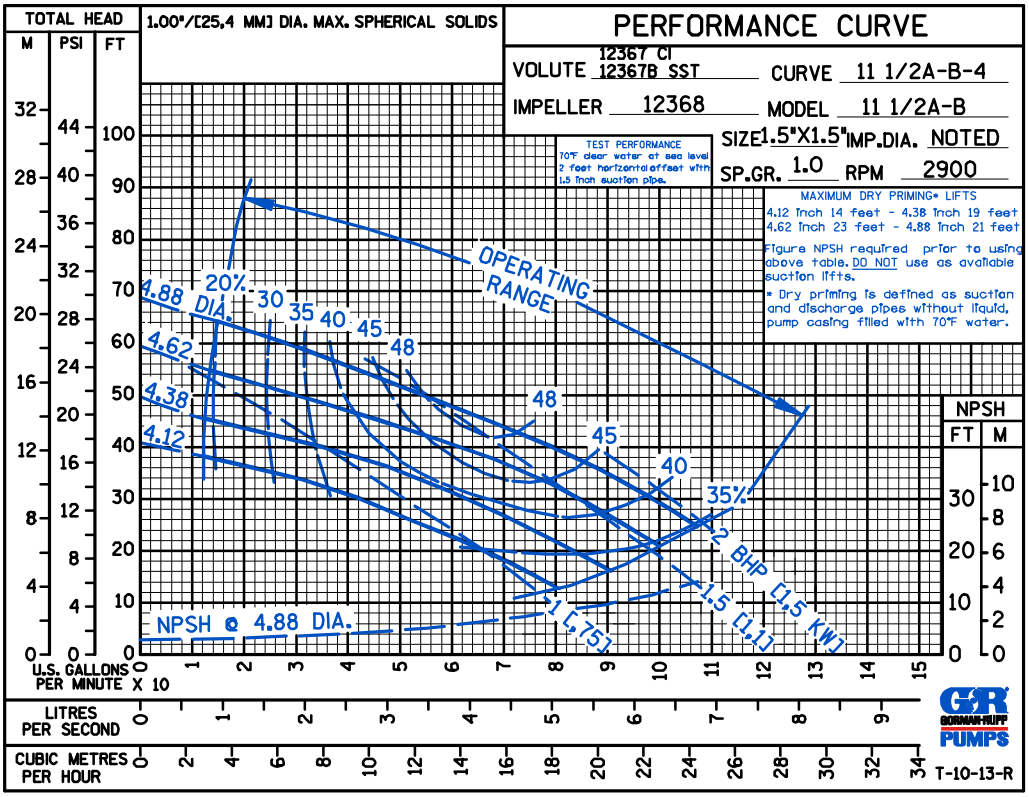


A C D E

50 HERTZ

PERFORMANCE BASED ON WATER

TRIMMED IMPELLER



APPENDIX C

EQUIPMENT INFORMATION: OIL AND WATER SEPARATOR

OIL WATER SEPARATOR TECHNOLOGIES, LLC

7020 GEORGIA AVE, STE. A, WEST PALM BEACH, FL 33405

PHONE: 1-800-770-0099 FAX: (561) 459-4615

Email: SALES@OWSTECH.COM

To: Andrew

Company: Noble

Date: 7/29/24

Quote # S24-5096

Oil Water Separator Quote:

Item #1

One (1) OWS-SA-HF-SS-300 oil water separator per attached drawing #4S5037.

Unit ais constructed of stainless steel 304L for corrosion resistance.

Unit removes 20-micron size and larger hydrocarbons with an effluent quality of 10 ppm or less.

Flow rate: 0- 200 gpm pumped.

Installation: Above grade

Price for (1) unit: $72,000

Price for (3) units: $68,400

Price for (6) units: $66,240

Optional equipment

Item #2

(Nema 4) Freeze Protection Package consisting of the following:

1. Control panel (480 V/3PH)
2. (2) Heaters
3. Thermostat

Price: $7,950

Item #3

Nema 4 High oil level switch package consisting of the following:

(Indicates when to remove excess oil)

1. Control panel (110 V)
2. Level switch

Price: $2,489

Freight: TBD

Delivery for (1) unit estimated at 10-12 weeks after P.O.

Delivery for (3) units estimated at 10-15 weeks after P.O.

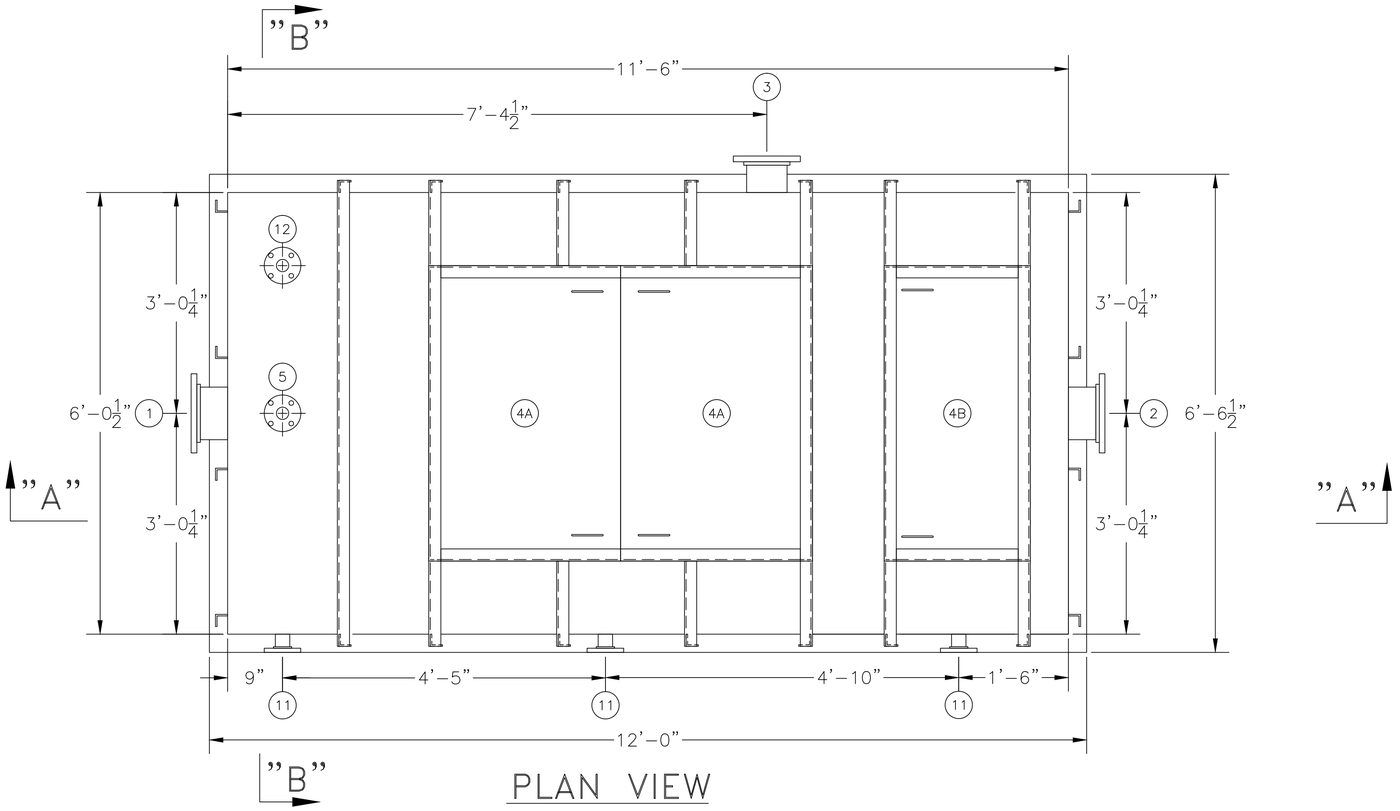
Delivery for (6) units estimated at 10-20 weeks after P.O.

Terms: 30% with P.O., 60% prior shipment and balance due net 30 days after shipment.

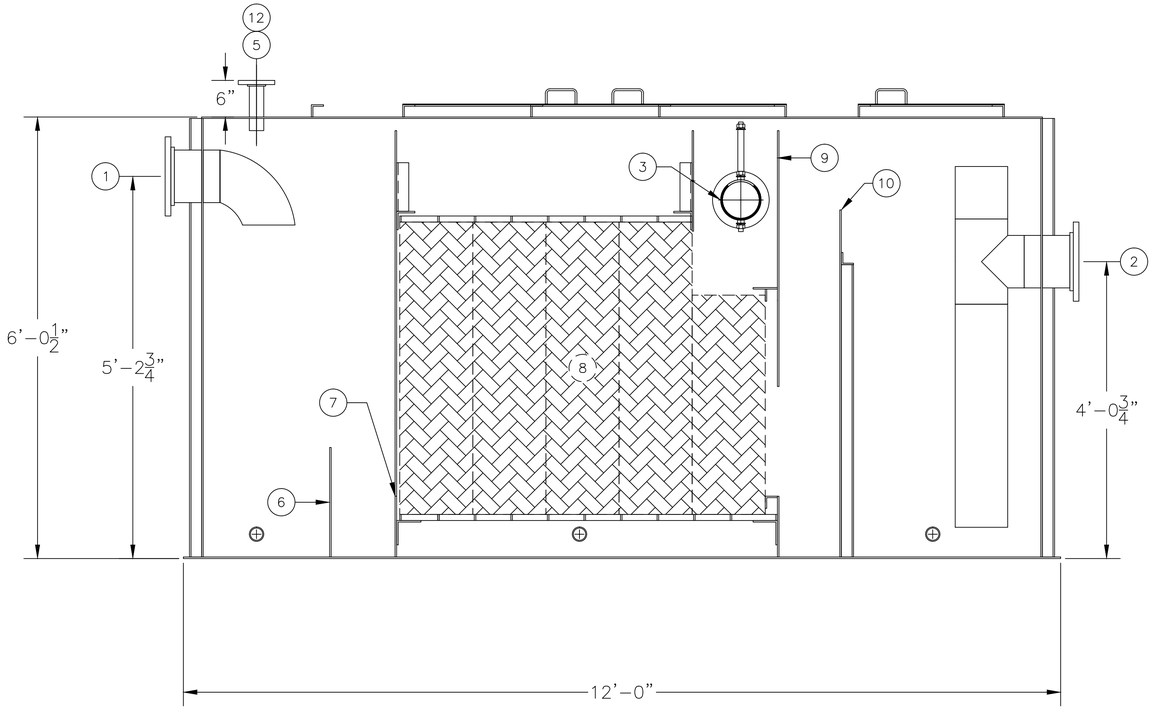
If you have any questions, please contact us.

Thanks,

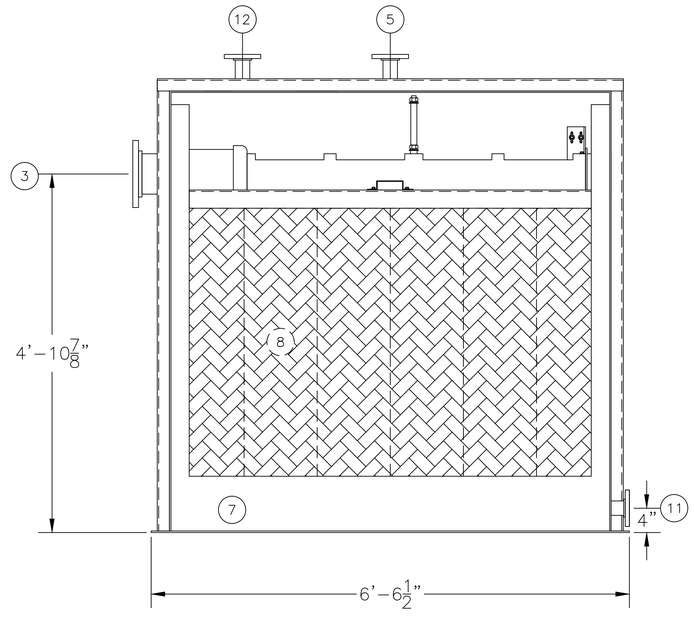
Brett Bieneman



PLAN VIEW



SECTION "A-A"



SECTION "B-B"

ASSEMBLY LIST

1. 8"ø INLET, FLANGED
2. 8"ø OUTLET, FLANGED
3. 6" ROTARY PIPE SKIMMER/OIL OUTLET, FLANGED
4A. 5'-3" x 4'-0" MANWAY
4B. 4'-0" x 2'-0" MANWAY
5. 2"ø VENT, FLANGED
6. SLUDGE BAFFLE
7. INLET BAFFLE
8. COALESCING MEDIA
9. OIL RETENTION BAFFLE
10. WEIR WALL
11. 2"ø DRAIN, FLANGED(3 REQ'D.)
12. 2"ø LEVEL SWITCH MOUNTING PROVISION, FLANGED

DRAWN BY: TMB
CHECKED BY:
SCALE: N.T.S.
DATE: 11/5/14

OIL WATER SEPARATOR TECHNOLOGIES, LLC

1109 25TH STREET W.P.B., FL. 33407

OWS JOB No. –
DRAWING No. 4S5037
FILE: SA-HF-SS-300 11/5/14

MODEL: SA-HF-SS/CS-300 G.P.M.
JOB: OWS TECHNOLOGIES

APPENDIX D

EQUIPMENT INFORMATION: MOVING BED BIOFILM REACTOR

BUDGETARY PROPOSAL FOR:

NOBLE ENVIRONMENTAL – WESTMORELAND LANDFILL

40,000 GPD DESIGN – BIOFAS™ MBBR SOLUTION

Attention: Andrew Thomas

SUBMITTED BY:

BIOPROCESSH2O
45 Highpoint Avenue
Portsmouth, RI 02871

RE: Proposal for a bioFAS™ MBBR Wastewater Treatment System – Noble Environmental - Westmoreland

Project Number: B24-133-Rev2

Date: November 26, 2024

PROPRIETARY AND CONFIDENTIAL

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2. AGREES THAT IT WILL NOT DIRECTLY, OR INDIRECTLY, DISCLOSE THE INFORMATION CONTAINED HEREIN TO A THIRD PARTY (EXCEPT AS PERMITTED IN #3, BELOW), AND;

3. AGREES TO LIMIT THE EXPOSURE OF THE INFORMATION CONTAINED HEREIN TO AS FEW A NUMBER OF PERSONS AS POSSIBLE AND ONLY TO THOSE PERSONNEL AND SUBCONTRACTORS WHO HAVE A 'NEED TO KNOW', AND;

4. AGREES TO NOT DISCLOSE THESE DOCUMENTS, OR INFORMATION CONTAINED IN THE DOCUMENTS, TO COMPETITORS OF BIOPROCESSH2O LLC WITHOUT THE EXPRESS WRITTEN PERMISSION OF BIOPROCESSH2O LLC.

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FAILURE TO RETURN THE DOCUMENTS TO BIOPROCESSH2O LLC IMMEDIATELY CONSTITUTES ACCEPTANCE OF THESE TERMS.

SUMMARY

This budgetary proposal is for a bioprocessH2O supplied bioFAS™ Moving Bed Biological Reactor (MBBR) leachate treatment system designed for the influent & effluent criteria listed in Table 1. The intent of the tank sizing for the system outlined in this proposal is to provide a foundation for the full flow rate of approximately 90,000 GPD that the facility will eventually receive in the second phase of this project after the initial 40,000 GPD. This will minimize long term capital expenses on the overall infrastructure and site development across phase 1 and phase 2.

TABLE 1: APPLICATION DESIGN PARAMETERS

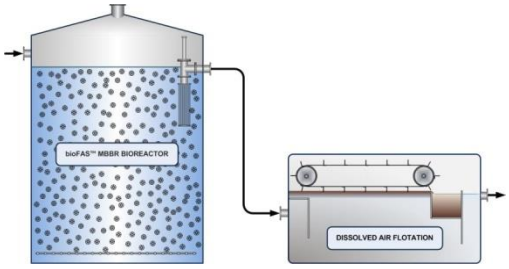
Parameter	Influent to MBBR	Effluent Discharge Requirements
Design Flow	40,000 GPD (Phase 1)	NA
bCOD (Biodegradable COD)	1,790 mg/L (Assumed)	NA
COD	3575 mg/L	NA
Total Suspended Solids	100 mg/L (Assumed)	NA
NH3-N	1014 mg/L	4.9 mg/L
Temperature	10°C – 25°C	NA
pH	6 – 9 S.U.	6 – 9 S.U.

NOTES:

1. The influent wastewater parameters have been provided to bioprocessH2O for the purpose of establishing the design basis for the proposed bioprocessH2O equipment and biological treatment process.
2. The influent loading rates are based on the calculation of the 95th percentile of sampling data provided to bioprocessH2O by Noble Environmental.
3. The bioFAS™ MBBR has been designed to produce the listed target effluent quality based on the enhanced biokinetics anticipated from a high-rate bioreactor system per in-house computer modeling programs and software.
4. Fats, Oils, and Grease (FOG) within the influent must be <50 mg/L prior to entering the bioFAS MBBR system.
5. It has been assumed that influent wastewater nutrient (nitrogen and phosphorus) concentrations are insufficient for supporting biological oxidation in the MBBR. It has also been noted that the influent has possibilities for hardness due to higher levels of calcium and magnesium. Therefore, nutrient and chemical addition systems are included within this proposal to sustain biological treatment and nitrification. Chemical addition for pH neutralization is also included in the proposal outlined below.

bioprocessH2O WASTEWATER TREATMENT PROCESS

The proposed treatment process is a single pass bioFAS™ MBBR which employs bioprocessH2O's mobile biofilm carriers that provide a high density of attached growth biomass and excellent mass transfer conditions. Air is applied to the bioFAS™ MBBR tank(s) using a positive displacement blower and coarse bubble aeration grid assembly. The neutrally buoyant biofilm carriers within the aeration tanks provide a stable base for the growth of a diverse community of microorganisms. The biofilm carriers have a very high surface-to-volume ratio, allowing for a high concentration of microorganisms to thrive within the internally protected areas of the media. bioFAS™ MBBR is a self-sustaining biological process, eliminating the need to periodically waste sludge to maintain a food-to-microorganism (F/M) ratio. The biomass continuously sloughs from the media and is discharged from the bioreactors along with the treated wastewater. Biological solids are typically removed using a clarifier or DAF unit.



bioFAS™ MBBR PROCESS ADVANTAGES:

The bioFAS™ MBBR process is resilient to load fluctuations, assimilating toxic loads and is capable of higher organic loading rates than other biological treatment systems. The single pass bioFAS™ MBBR treatment process is easy to operate and maintain since the only process parameters that need monitoring include: 1) the bioreactor dissolved oxygen (DO) and pH; 2) the wastewater nutrient concentrations (carbon:nitrogen:phosphorus) are supplied at rule of thumb ratio (100:5:1) and; 3) the addition of a defoamer to control possible foaming events. The bioFAS™ MBBR process does not require monitoring of food to mass (F:M) ratios and adjustment of wasting rates because of the fixed film nature of the process and the fact that the dead bacteria is continuously sloughed from the biofilm carriers. Furthermore, the MBBR process is not prone to filamentous bacteria, sludge bulking problems, oxygen deficiency or mechanical problems that can occur with other biological treatment systems. The benefits of the bioFAS™ MBBR include:

- **Ease of Operation**: The single pass process is easy to operate and maintain since the only process parameters that require monitoring include the DO, pH, defoamer and the nutrient concentrations.
- **Small Footprint**: The bioFAS™ MBBR will typically require less space than an activated sludge process treating equivalent loads.
- **Ideal for High Loads**: Large aperture areas within the carrier result in an ability to handle high organic loads without biomass clogging.
- **Responds to Load Fluctuations without Operator Intervention**: The self-regulating nature of the biofilm adjusts to variations in organic load. As the contaminant load increases, the microbial population in the biofilm increases enabling additional treatment capacity. Likewise, during low loading conditions, the biological population decreases.
- **Resilient to Toxic Shocks**: Fixed film processes are resistant to toxic contaminants as the inner layer of biofilm microorganisms are protected.

DESCRIPTION OF SCOPE AND SERVICES – bioprocessH2O shall provide the following equipment and services as described below.

Collection, Screening, and Equalization Module
Collection, screening, and equalization is to be **provided by others**, unless otherwise requested by the Customer. bioprocessH2O can provide the ancillary equipment package for necessary screening and equalization, however additional information will need to be provide in order to properly design this equipment module.

bioFAS™ MBBR Module

As stated above, the design approach outlined in this proposal is to accommodate the initial Phase 1 flow rate of 40,000 GPD as well as the Phase 2 – total anticipated future design flow rate of 90,000 GPD within the same reactor tank. To meet the demands down the road for Phase 2 the modifications to the system would only be addition of more biofilm carrier media, adding an additional blower to convert from a duplex blower package to a triplex to meet the increase air demands, and adding a second clarifier to be plumbed in parallel to the clarifier of Phase 1. Table 2 below outlines the MBBR reactor tank module parameters for both Phase 1 and Phase 2, however the remainder of this proposal only outlines the bioFAS™ MBBR package for Phase 1.

Table 2: MBBR Module Parameters

Parameter	Quantity
Phase 1 –Design Flow	40,000 GPD
Phase 2 – Future Total Design Flow	90,000 GPD
Phase 1 – Media Required	114 m^3
Phase 2 – Future Media Addition	114 m^3 (combined total of 228 m^3)
Phase 1 – Fill Fraction	20%
Phase 2 – Future Fill Fraction	40%
Minimum Working Volume of the Bioreactor	~150,000 gallons
Number of Reactors	1
Phase 1 – Approximate Design HRT	90 hours
Phase 2 – Total Flow HRT	40 hours

bioFAS™ MBBR Aeration Tank
One (1) vertical cylindrical open top 304SS tank (**supplied by others**) shall provide a working volume of ~150,000 gallons having approximate dimensions of 31' diameter x 33' high, 27' side water depth, equipped with the following:

- All necessary flanged nozzle connections
- Ladder and work platform, or spiral staircase and shared platform between MBBR and equalization tank

bioFAS™ MBBR Bioreactor Instrument Module – (shipped loose)

- One (1) pH electrode and analyzer (Hach or equal) – pH monitoring only
- One (1) DO Sensor (Hach or equal)
- One (1) float-type high level sensor (Connery)
- Two (2) schedule 80 PVC Instrument stilling wells with slotted sides for the pH electrode and DO sensor. Note the stilling well supports are to be provided by others and coordinated with bioprocessH2O.

bioFAS ™ B-3500 Biofilm Carriers
bioprocessH2O will supply one hundred fourteen (114) m^3 of bioFAS™ B-3500 Biofilm Carriers for the MBBR. The carriers shall be delivered in 1.5 m^3 super sacks and installed in a 150,000-gallon tank (**Tank by Others**) This quantity of media has been calculated based on the influent and effluent criteria that has been provided by Noble Environmental outlined in Table 1.

Table 3: MBBR Media Specifications

B-3500 Biofilm Carrier	SI Units	US Units
Nominal Diameter	30 mm	1.18 inches
Nominal Length	1.1 mm	0.04 inches
Specific Gravity	0.95	
Active Surface Area	3500 m^2/m^3	
Materials of Construction	Polyethylene (PE)	

Media Retention Screens
One (1) flange mounted wedge wire media retention screen assembly and drain screen assembly will be provided for the bioFAS™ MBBR.

The retention screen has a very high open area that provides excellent flow through capacity. The wedge wire screen shall have slot openings of approximately 10 mm (0.39") that continuously widen inwardly so that particles will pass through the screen and the media will be retained.

- One (1) Effluent Retention Screen: 6" diameter x 36" long mounted on an 8" ANSI flange. A retention screen support bracket assembly shall be provided if required. The surface of the vertically or horizontally mounted screen shall be constantly scoured by the bioFAS™ biofilm carriers.

- One (1) 4" drain screen constructed of 304SS welded wire mesh disc inserted between two flanges shall be provided for retaining the biomass carriers during tank draining.

Carrier Retention Screen Specifications

Parameters	Values
Plant Design Flow	90,000 GPD (Total Phase 1 & 2)
Connection / ANSI Flange Diameter	8 inch
Screen Diameter	6 inch
Screen Length	36 inch
Screen Slot Opening	~0.39 inch (~10 mm)
Installation Orientation	Vertical/Submerged
Material	316 Stainless Steel

bioFAS™ Aeration Grid Assembly - Oxygen is required to provide sufficient mixing and to ensure that the biological oxidation air requirements are satisfied. The coarse bubble aeration grid is constructed for robust operation, practically eliminating aeration grid maintenance. CPVC and/or 316SS components make the grids resistant to corrosion in municipal and industrial environments. The grids are designed to induce sufficient mixing within the reactor to promote high mass transfer rates and maintain a biofilm with an ideal thickness. The aeration grid assembly shall consist of the following components:

- **Drop leg** – One (1) 316SS drop pipe shall be provided with a flanged top and bottom connection that shall attach to the 316SS manifold assembly.
- **Stainless Steel Coupling** – One 316SS coupling to join plain ends of the drop leg and manifold.
- **Air Manifold Assembly –** 316SS assembly shipped in sub-assemblies. Assembly includes flanged connections at all field joints, diffuser outlet ports, end cap and 316SS flange fasteners.
- **Stainless Steel Air Header Assembly** – 316SS assembly provided factory assembled and shipped in sub-assemblies. Assembly includes flanged connections at all field joints, diffuser outlet ports, end cap and stainless steel flange fasteners.
- **Diffusers –** 24" CPVC duplex coarse bubble air diffusers shall be furnished with bottom deflectors and 3/4" NPT threaded connections for field assembly to the 3/4" tees that are furnished on the laterals.
- **Supports** – for manifold and lateral shall be supplied (including anchor bolts).

bioFAS™ Air Diffusers

Approximately fifty-six (56) coarse bubble aeration diffusers shall be provided for the bioreactor to meet the aeration requirements. The diffusers shall have the following characteristics:

Model	**24" CPVC Coarse Bubble Diffuser**
Airflow Range	0 – 55 SCFM
Design Air Flow Range	0 – 36 SCFM
Unit DWP Range	0.5 – 7.0 Inches H_2O
Assembly Length	24.4" long

Minimum Blower Air Requirements

- The total airflow for the MBBR system for Phase 1 at 30°C: 712 SCFM
- Blower discharge pressure at ~27' SWD is 13.19 psig (including pipe losses)

MBBR Process Air Blowers

Two (2) energy efficient hybrid type positive displacement blowers (one duty, one standby) shall provide air to the bioFAS™ MBBR aeration grid assembly. Each blower shall be complete with a factory installed sound enclosure to limit the sound level to 70 dB(A) at one meter.

- Type — Rotary Lobe Delta Hybrid (screw type)
- Manufacturer — Atlas Copco, model ZS4 or equal
- Capacity Rating — 1,200 SCFM @ 13.8 PSIG
- Motor — 100 HP TEFC VFD Driven
- Power Requirements — 460 VAC/3Ø/60 Hz
- Dimensions — 81"L x 50"W x 78"H

Air Supply and Wastewater Feed Control Logic
A dissolved oxygen sensor provided in the MBBR shall send a 4-20 mA signal to the PLC controller to adjust the system air flow by increasing/decreasing the motor speed of the VFD driven blower(s) to maintain a dissolved oxygen concentration of 3 mg/L in the aeration tank.

This control logic shall provide a wide range of air supply with maximum blower turndown/ramp up capabilities to cover the anticipated minimum, average and maximum loading conditions. This mode of operation is designed for energy conservation.

Chemical Addition Module
One (1) Shelf or stand mounted chemical feed module shall be provided for pH adjustment, nitrogen, phosphorus, defoamer, and descaling agent for the MBBR. Six (6) chemical feed pumps shall be shipped loose and shall include:

- One (1) 304SS chemical metering shelf or stand
- Metering Pumps: Walchem diaphragm, Stenner peristaltic, AOD or equal
- Chemical totes or drums by others

Note: Chemical feed equipment must be installed indoors and kept from temperatures below 55°F.

Clarifier Module
One (1) Hopper Bottom Clarifier shall be provided to allow the separation of biological solids and the treated effluent.

The Hopper Bottom Clarifier Assembly shall include:

- One (1) epoxy coated carbon steel hopper bottom clarifier with dimensions of 10'L x 10'W x 12.5'H that shall include an effluent V notch weir, a full width scum baffle, all the necessary flanged connections.
- One (1) 0.5HP 460VAC/3Ø/60Hz Goulds submersible or centrifugal wasting and recirculation pump rated for approximately 35 GPM @ 15' (Goulds or equal)
- Two (2) electrically actuated valves to allow sludge wasting (WAS) or sludge recirculation (RAS)
    - Interconnecting RAS piping from Clarifier to MBBR Tank (**Provided by Others**)
- One (1) floating scum pump (Tsurumi or equal)

Solids Holding Tank Module – Excess biological solids generated in the clarifier can be stored in a concrete sludge storage tank that shall contain an overflow to the flow equalization tank (**tank and overflow to be provided by others**).

Electrical Control Module
One (1) Electrical Panel to control all process functions of the bioprocessH2O supplied equipment shall be housed in NEMA 12 painted steel multi bay enclosures equipped with forced air ventilation, rated for a maximum ambient temperature of ≤90°F. The control system will include components such as circuit breakers, motor starters, variable frequency drives (VFD's) as required, programmable logic controller (PLC) and operator interface terminal (OIT). The OIT offered is an Allen Bradley Panel View Plus CE. The OIT shall contain a 15" color touch screen that will provide multiple operating and set-up screens as well as data logging capabilities. The

system shall be capable of being operated remotely via the internet (via Ethernet cable or cell – provided by the client) which will provide the capability for remote viewing, control and operation. No special software shall be required to access the OIT remotely and a password shall provide security to prevent unauthorized access. bioprocessH2O will require specific information regarding the internet or cell service provider and access to the clients local IT contact to accurately provide the remote monitoring features. All I/O will be wired to terminal blocks located in the panel enclosure. The control panel will be completely assembled, programmed and functionally tested prior to shipment.

The following list contains highlights for the bioprocessH2O supplied electrical control panel:

a. NEMA 12 painted steel multi bay enclosures with back panel and forced air ventilation with dimensions of 72"L x 78"W x 18"D
b. Allen Bradley Ethernet Processor (CompactLogix 5380) including all necessary digital and analog I/O required to operate the bioFAS™ MBBR System that is included in this proposal. All I/O will be wired to terminal blocks.
c. UPS backup system - Note the UPS, PLC, 12V and 24V relays will be mounted in a single end bay. 460V will be mounted in the remaining bays.
d. Thru Door Disconnect switch sized for entire panel connected load.
e. All starter/overload relays will be preceded with branch circuit breakers.
f. Two (2) Yaskawa configured Variable Frequency Drives
g. Operator Interface Terminal (OIT) – A PanelView model 1000 with a 15" color touch screen programmed with multiple screen views to allow the operator to adjust operating parameters, monitor plant functions and alarm conditions.

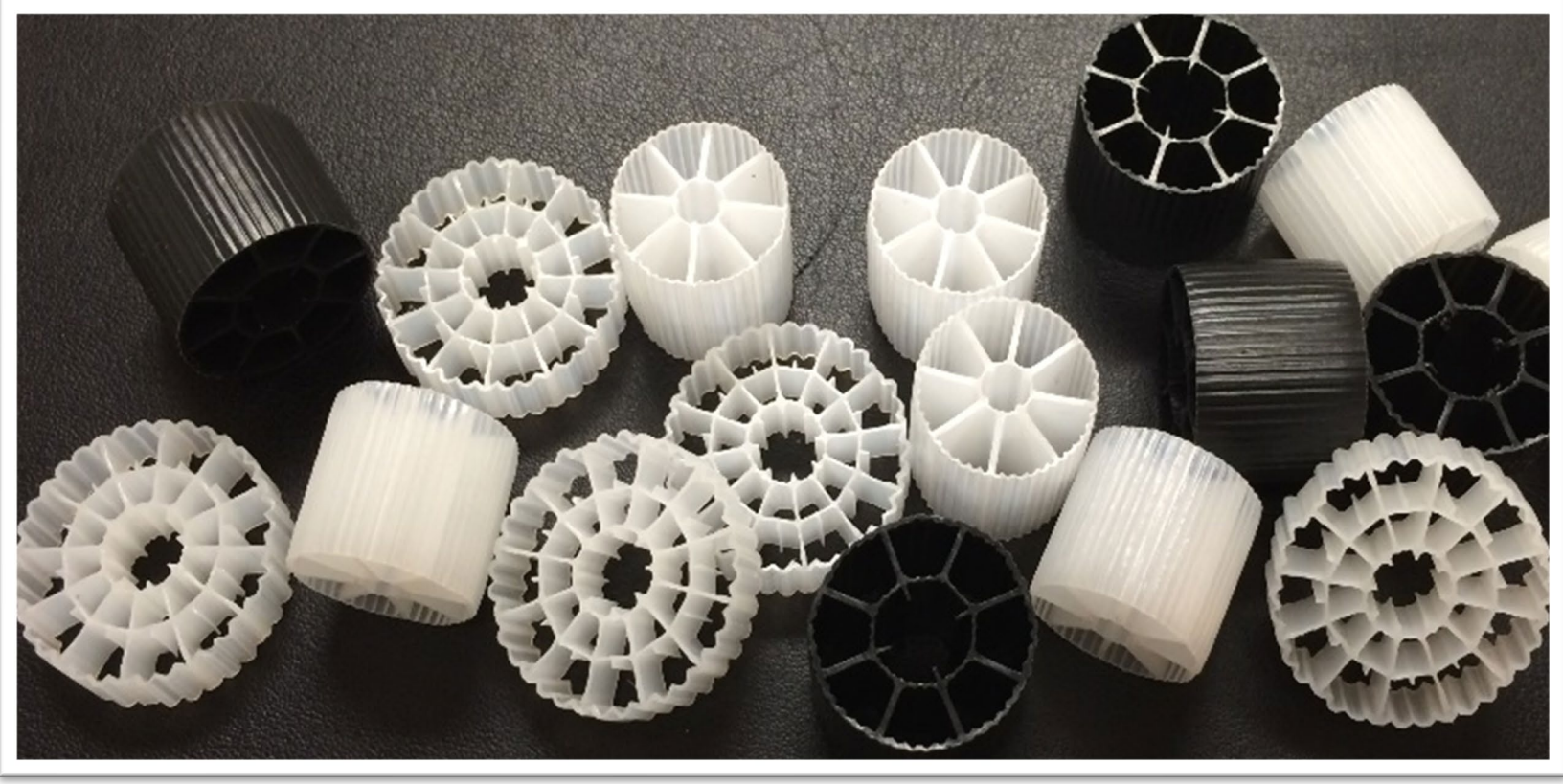
Variable Frequency Drives (VFD's) – The following equipment will be controlled using Yaskawa VFD's to allow for automatic process adjustments and reduced operating costs.

QTY	Service	HP
2	MBBR Blowers (1-Duty / 1-Standby)	100

Engineering – bioprocessH2O will provide engineering to include equipment drawings, general arrangement drawings, submittal information and IO&M manuals in an electronic format. The IO&M manual will include manufactures specific IO&M's for each piece of equipment as well as a detailed functional description/process narrative. A full set of control panel schematics will also be provided. The general arrangement drawings are not intended to be used as construction drawings rather a guide to the engineer that is generating the construction drawings.

Plant Commissioning / Operator Training – bioprocessH2O has allotted the following time for plant commissioning / operator training.

- Commissioning/Startup/Operating Training – Five (5) person days for one (1) mechanical engineer and one (1) electrical engineer, portal to portal. Ten (10) person days total, portal to portal.
    - If additional commissioning and startup support is needed, bioprocessH2O can provide those at a rate of $1,750/person day, plus travel expenses.



bioFAS™ MBBR Process Design Calculations for:

NOBLE ENVIRONMENTAL – WESTMORELAND LANDFILL, PA
Attention: Andrew Thomas

Submitted by:
bioprocessh2o
45 Highpoint Avenue
Portsmouth, RI 02871

Project Number: B24-133

Date: October 13, 2025

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PROCESS DESCRIPTION AND DESIGN CALCULATIONS

bioprocessH2O shall supply an equipment package for a bioFAS™ Moving Bed Biological Reactor (MBBR) system to treat the Noble Environmental Westmoreland leachate. The system has been designed for the influent & effluent criteria listed in Table 1. The equipment shall be provided in two Phases, Phase I will be designed for 40,000 GPD and expandable to 90,000 GPD. A list of bioprocessH2O's landfill leachate treatment system installations has been provided in Appendix A.

TABLE 1: APPLICATION DESIGN PARAMETERS

Parameter	Influent to MBBR (Phase I & Phase II)	Anticipated Effluent Discharge Requirements for NPDES
Design Flow Phase I Phase II	 40,000 GPD 90,000 GPD	NA
BOD5	Not Sampled	<37.0 mg/L
bCOD (Biodegradable COD)	1,790 mg/L (Assumed)	<37.0 mg/L
Total COD	3,575 mg/L	NA
Total Suspended Solids	<100 mg/L	<27.0 mg/L
NH3-N	1,014 mg/L	4.9 mg/L
Temperature	10°C – 25°C	NA
Fats, Oil & Grease	<25 mg/L	<15.0 mg/L
pH	6.0 – 9.0 S.U.	6.0 – 9.0 S.U.

NOTES:

1. The influent wastewater parameters have been provided to bioprocessH2O for the purpose of establishing the design basis for the proposed bioprocessH2O equipment and biological treatment process.
2. The influent pollutant loading rates are based on the calculation of the 95th percentile of sampling data provided to bioprocessH2O by Noble Environmental.
3. The bioFAS™ MBBR has been designed to produce the listed target effluent quality based on the enhanced biokinetics anticipated from a high-rate bioreactor system per in-house computer modeling programs and software.

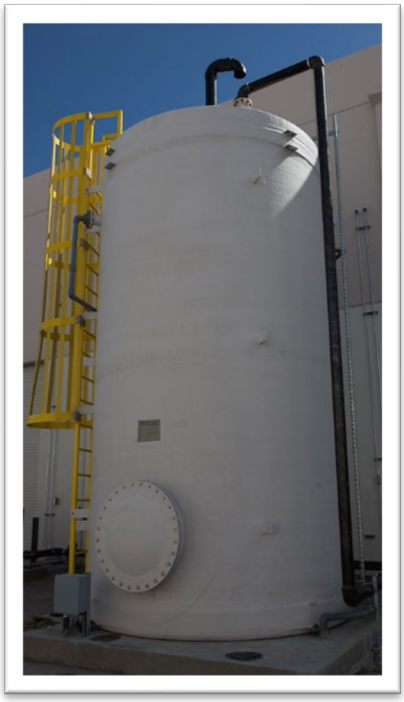
bioFAS MBBR SYSTEM DESCRIPTION

Screened and equalization leachate shall be pumped into the MBBR aeration tank where the leachate will be treated by a high-rate attached growth biofilm biological treatment process using free floating biofilm carriers to provide a self-sloughing biofilm treatment process. The proposed treatment process is a single pass bioFAS™ MBBR which employs bioprocessH_2O's mobile biofilm carriers that provide a high density of attached growth biomass and excellent mass transfer conditions. Air is applied to the bioFAS™ MBBR tank(s) using a positive displacement blower and coarse bubble aeration grid assembly. The neutrally buoyant biofilm carriers within the aeration tanks provide a stable base for the growth of a diverse community of microorganisms. The biofilm carriers have a very high surface-to-volume ratio, allowing for a high concentration of microorganisms to thrive within the internally protected areas of the media. BioFAS™ MBBR is a self-sustaining biological process, eliminating the need to recirculated sludge and periodically waste sludge to maintain a food-to-microorganism (F/M) ratio. The biomass continuously sloughs from the media and is discharged from the bioreactors along with the treated wastewater. Biological solids (TSS) are removed using a clarifier.

The bioFAS™ MBBR process is resilient to load fluctuations, assimilating toxic constituents and is capable of higher organic loading rates when compared to other aerobic biological treatment systems. The single-pass MBBR treatment process is easy to operate and maintain since the only process parameters that need monitoring include:

1) Maintaining the aeration tank dissolved oxygen (DO) concentration within the MBBR bioreactor at $\geq$3.0 mg/L. This is automatically accomplished via a DO control system using a DO Sensor that sends a conditioned signal to the PLC controller for the control of the VFD driven blowers.
2) Maintaining the aeration tank pH between 7.0 – 8.5 S.U.
3) Controlled Metering of Nutrients to aeration tank (if required) – Nutrients (N, P) are required at a minimum ratio of 100:5:1, (BOD5:N:P) to maintain a healthy biofilm.
4) Controlled Metering of Defoamer to aeration tank (if required) – Defoamer may be metered into the MBBR Bioreactor to control intermittent foaming events that are normally associated with startup and biological upset conditions.

MBBR Units Installed in Concrete and Fiberglass Tanks at Customer's Site



MBBR PROCESS DESIGN CALCULATIONS

In house computer modeling programs that utilize Monod based equations to predict biological kinetics have been used to verify the design and evaluate the MBBR's performance. The simulation model is based on calculating the BOD5 removal rate based on the BOD5/COD surface loading rate and associated effluent BOD5 concentration. The BOD5 media surface loading/removal rates are based upon conservative loading/removal rates at 20 °C. The pollutant media surface loading rates and removal rates for the design are determined for the minimum and maximum wastewater temperatures using the Van't Hoff-Arrhenius relationship and incorporating a temperature coefficient correction factor (theta=1.073). The removal rates used for the design are conservative and the predicted performance of the design has been verified through hundreds of pilot and full scale MBBR installations over the past 30+ years.

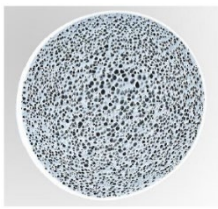
TABLE 2: bioFAS™ MBBR System Design Parameters

Parameter	PHASE I	Phase II
Flow	40,000 GPD	90,000 GPD
Total Media Required (biofilm carriers)	114 m^3	141 m^3
Media Fill Fraction	20%	45%
Minimum Working Volume of the Bioreactor	150,000 Gallons	150,000 Gallons
Hydraulic Retention Time	90 Hours	36 Hours
Total Air Requirement	627 SCFM @ 13.2 PSI	1,400 SCFM @ 13.2 PSI

bioFAS ™ B-3500 Biofilm Carriers
bioprocessH2O will supply (114) m^3 and (141) m^3 of bioFAS™ B-3500 Biofilm Carriers for Phase I and Phase II respectively. The carriers shall be delivered in 1.5 m^3 super sacks and installed in a 150,000-gallon aeration tank. This quantity of media has been calculated based on the influent and effluent criteria as outlined in Table 1.

Table 3: MBBR Media Specifications

B-3500 Biofilm Carrier	SI Units	US Units
Nominal Diameter	30 mm	1.18 inches
Nominal Length	1.1 mm	0.04 inches
Specific Gravity	0.95	
Active Surface Area	3500 m^2/m^3	
Materials of Construction	Polyethylene (PE)	



MBBR Loading Rates: The following surface area loading calculations are based on a single stage bioFAS™ MBBR designed to treat 40,000 GPD and 90,000 GPD of leachate. Note that the media fill fraction shall be increased from 20% in Phase I, to 45% in Phase II to meet the design conditions. As detailed below, an additional blower shall be provided in Phase II to accommodate the increased loading requirements. The aeration grid assembly shall be designed to function at both phases of operation and all required airflow rates.

Note that the system has been designed for the 95 percentile raw leachate pollutant values provided in the Noble Environmental data set. The system is designed to remove BOD, COD and ammonia in a single stage MBBR.

1) biodegradable COD and BOD loading:

- Plant Loading @ influent biodegradable COD concentration of 1,790 mg/L:
  - Flow = 40,000 GPD
  - BCOD Load = (0.04 MGD x 1,790 mg/L x 8.34) = 597 lbs/day (271 kg)

- Total Internally Protected Media Surface Area Provided for MBBR:
  - 114 m3 x 3500 m2 = 399,000 m2

- Overall media Surface Area Loading Rate (SALR) Calculation:
  - COD Surface Area Loading Rate = (271 kg/day x 1,000 g/kg) / 399,000 m2
    = 0.68 grams CBOD5/m2-day

Note: 17 m3 of the B-3500 media will be required to reduce the soluble biodegradable COD to <30 mg/L at a leachate temperature of 10°C, with a corresponding SALR of 4.5 grams COD/m2 media. The remaining media, 97 m3 of MBBR media will be provided to allow the growth of nitrifying microorganisms responsible for ammonia oxidation. The ammonia concentration after COD removal will be approximately 950 mg/L due to the biological uptake of nitrogen by the heterotrophic bacteria responsible for COD removal.

2) Ammonia loading:

- Plant Loading @ influent ammonia concentration of 946 mg/L:
  - Flow = 40,000 GPD
  - Ammonia Load = (0.04 MGD x 950 mg/L x 8.34) = 317 lbs/day (144 kg)

- Total Internally Protected Media Surface Area Provided for MBBR:
  - 97 m3 x 3500 m2 = 339,500 m2

- Overall media Surface Loading Rate Calculation:
  - Ammonia Surface Area Loading Rate = (144 kg/day x 1,000 g/kg) / 339,500 m2
    = 0.42 grams ammonia/m2-day

The selected SALR for ammonia is adequate to provide an effluent ammonia concentration to <4.9 mg/L at a leachate temperature of 10°C.

Media Retention Screens

One (1) flange mounted wedge wire media retention screen and drain screen assembly will be provided for the bioFAS™ MBBR.

The retention screen has a very high open area that provides excellent flow through capacity. The wedge wire screen shall have slot openings of approximately 10 mm (0.39") that continuously widen inwardly so that particles will pass through the screen and the media will be retained.

- One (1) Effluent Retention Screen: 6" diameter x 36" long mounted on an 8" ANSI flange. A retention screen support bracket assembly shall be provided if required. The surface of the vertically or horizontally mounted screen shall be constantly scoured by the bioFAS™ biofilm carriers. The selected screen area shall result in a conservative hydraulic rate flow rate of 20 GPM/ft2 of screen area at the Phase II design conditions of 90,000 GPD.

- One (1) 4" drain screen constructed of 304SS welded wire mesh disc inserted between two flanges shall be provided for retaining the biomass carriers during tank draining.

MBBR AERATION REQUIREMENTS

Air shall be introduced into the MBBR using positive displacement blowers operating on VFD drives to conserve power and to optimize the DO of the biological treatment process. This allows the system to automatically respond to load variations and maintain the high rate biological treatment process under a wide variety of operating conditions.

Two (2) Positive Displacement Rotary Lobe Blowers (duty/standby) shall provide air to the bioFAS™ MBBR aeration grid assembly. The blower shall be complete with a factory installed sound enclosure to limit the sound level to 78 dB(A) at one meter.

- Type — Rotary Lobe/Positive Displacement
- Manufacture — Atlas Copco or equal
- Motor — 50 HP TEFC VFD Driven
- Blower Airflow: — 750 SCFM @ 13.2 PSI
- Power Requirements — 480 VAC/3Ø/60 Hz
- Material of Construction — Cast Iron Rotating

Note: Two (duty/standby) blowers operating with variable frequency drives (VFD's) shall be provided in Phase I so that one additional 50HP blower can be provided for Phase II operating conditions (2-duty / 1-standby).

Compressed Air Supply Dissolved Oxygen (DO) Control Logic:
A dissolved oxygen sensor provided in the MBBR shall send a 4-20 milli-amp signal to the PLC controller to adjust the system air flow by increasing/decreasing the motor speed of the VFD driven blower to maintain a dissolved oxygen concentration of 3.0 mg/L in the aeration tank.

The Coarse Bubble Diffuser assembly is sized and designed to provide oxygen for bacterial respiration and to ensure complete mixing. The construction of the aeration grid is 304SS drop-pipe and laterals furnished with 316SS/CPVC coarse bubble air diffusers.

MBBR Air Requirement Calculations: The total oxygen and airflow requirement is derived using actual and standard oxygen requirement (AOR and SOR) calculations for wastewater treatment based on the fact that 1.1 lbs. and 4.6 lbs. of oxygen are required to oxidize each pound of BOD_5 and ammonium respectively.

OTE is defined as the oxygen transfer efficiency and has been conservatively documented to be 1.20%/ft at a 27' side water depth for the band type coarse bubble diffusers. Standard engineering calculations for AOR, SOR and OTE for the coarse bubble diffusers have been used to determine the airflow requirements at a maximum leachate temperature of 35°C and the applicable site conditions.

1) Phase I total aeration requirements = 630 SCFM (duty/standby blowers)
2) Phase II total aeration requirements = 1,400 SCFM (2-duty/1-standby blowers)

Note: Each positive displacement blower is sized to provide 750 SCFM at 13.2 PSI.

SECONDARY CLARIFIER

bioprocessH2O shall provide one (1) 10' square epoxy coated carbon steel or stainless steel hopper bottom secondary clarifier to reduce the effluent TSS to <27 mg/L. The clarifier shall contain 60 degree V notch weirs, a scum baffle, scum pump, sludge removal pump, RAS and WAS valves. The RAS and WAS valves shall allow the system to operate with a RAS return to increase the biomass inventory within the MBBR to enhance treatment. The scum and sludge pumps shall be controlled using fully adjustable repeat timers via the PLC.

The following sizing criteria are proposed for Phase I:

- Clarifier length and width = 10 ft
- Clarifier Surface Area = 100 ft^2
- Feed Well Length = 10 feet
- Effluent Weir Length = 10 ft
- Surface Overflow Rate (SOR): 400 gpd/ft2
- Weir Overflow Rate (WOR) = 4,000 gpd/ft

The recommended SOR for conventional secondary clarifiers based on design average flow and peak flow is between 400-800 gal/day/ft^2 and 1000-1200 gal/day/ft^2 respectively (*EPA and Metcalf & Eddy).* Therefore, the SOR for the hopper bottom clarifier fall within the recommended ranges for design average and peak flow rates. The recommended peak daily WOR's are between 10,000 – 40,000 (gal/ft-day) with a typical value of 20,000 gal/day/ft *(Unit Operation and Processes in Environmental Engineering , Metcalf & Eddy).* Therefore, the WOR for the settling tank is significantly below the recommended ranges for design average and peak flow rates.

APPENDIX A

October 2025 (Proprietary & Confidential)

RE: bioprocessH2O Landfill Leachate Installation Reference List

Below is a partial list of bioprocessH2O's landfill leachate treatment system installations. bioprocessH2O is a water and wastewater treatment system integrator and supplier of a vast array of equipment & systems that span numerous processes and technologies and approximately 200 system installations throughout the United States. These include many forms of biological treatment (MBR, MBBR, IFAS, Activated Sludge, etc.) and membrane separation systems including MF, UF, Nano and RO used for wastewater treatment, recovery and water reuse applications.

bioprocessH2O provides customer support that this second to none. We have a full-service support group located at our headquarters in Portsmouth, RI as well as a regional office in Florida that include field service and control/automation engineering groups. bioprocessH2O provides PLC control systems with remote monitoring and control as a standard offering, and we remain available to assist remotely or in person to resolve issues that may arise. bioprocessH2O provides system commissioning, startup and operator training for all delivered systems.

All information contained in this document is proprietary and confidential and is not to be shared.

bioprocessH2O Landfill Leachate System Installations

	Customer & Location	Technology	Design Capacity	Year Installed
1	Golden Triangle, TX Republic Services	MBBR	0.05 MGD	2010
2	Seneca, PA County Landfill	MBBR	0.11 MGD	2013
3	Jefferson Davis, LA Republic Services	MBBR	0.05 MGD	2014
4	Clarion, PA Republic Services	MBBR	0.018 MGD	2015
5	TREE, NH Waste Management	MBR/RO	0.30 MGD	2016
6	McCarty, TX Republic Services	MBBR	0.02 MGD	2019
7	LRI, WA Waste Connections	MBR	0.11 MGD	2020
8	Grand Central, PA Waste Management	MBR	0.11 MGD	2021
9	Outer Loop Landfill, KY Waste Management	MBBR & MBR	0.72 MGD	2022
10	Bethel, VA Waste Management	MBBR	0.05 MGD	2022
11	Charles County, MD County Landfill	MBBR	0.03 MGD	2023
12	Cherokee, AL County Landfill	MBBR	0.03 MGD	2024
13	Morehead, KY Waste Management	MBBR	0.039 MGD	2024
14	Sandy Run, PA County Landfill	MBBR	0.023 MGD	2024
15	Cumberland County, PA Waste Management	MBBR	0.125 MGD	2025
16	Twin Bridges, IN Waste Management	MBBR	0.03 MGD	2025
17	Sampson County, NC GFL	Super Filtration/RO	0.37 MGD	In Fabrication
18	Fairless, PA Waste Management	MBR/RO	0.40 MGD	In Design

American Structures, Inc.
Bolted Stainless Steel Tanks
P.O. Box 409
MENOMONIE, WI 54751
ameristruc.com
Phone: 715-235-4225
Fax: 715-235-6212

Quote # 120924-1438-R1

December 9, 2024

Revised to Update Nozzles

Andrew Thomas
635 Toby Road
Cell: 814-771-4402

Noble Environmental
Kersey, PA 15846
Email: athomas@nobleenviro.com

RE: Revised Budgetary Quote for a Biotower Tank for Sandy Run Landfill in Hopewell, PA

Dear Mr. Thomas:

Thank you for the opportunity to provide you with a revised budgetary quote for the subject project. Based on your specifications, we have calculated the following tank to meet your needs:

One (1), 27.69' diameter x 25' high tank of 304-stainless steel with a working capacity of 105,000 gallons at a liquid depth of 23.5 feet, a self-supported stainless steel roof, a reinforced concrete foundation and floor of 4,000 psi concrete and 60 ksi rebar, an embedded starter ring, and the following appurtenances:

- (1)-32" Stainless steel side manway
- (1)-Self-supported stainless steel roof
- (1)-17 ½" Stainless steel roof vent
- (1)-24" x 16" Stainless steel roof hatch
- (1)-Hot-Dipped Galvanized (HDG) ladder, cage, lockout, and step-off platform
- (1)-HDG roof walkway to the center vent
- (4)-4" Stainless steel, double, 150# flanged nozzles
- (1)-4" Stainless steel, double, 150# flanged hillside nozzle
- (2)-6" Stainless steel, double, 150# flanged nozzles
- (1)-6" Stainless steel, double, 150# flanged hillside nozzle
- (1)-8" Stainless steel, double, 150# flanged nozzle
- (1)-American Structures, Inc. Tank Logo
- P.E. Stamp for the State of Pennsylvania
- Freight to the job site is included
- Labor to build the tank is included
- Concrete, concrete labor, and design are included (2,500 psf soil bearing capacity will be assumed unless a Geotech report is provided)
- Hydro test is included (owner to supply and dispose of the water)

American Structures, Inc.
Bolted Stainless Steel Tanks
P.O. Box 409
MENOMONIE, WI 54751
ameristruc.com
Phone: 715-235-4225
Fax: 715-235-6212

Quote # 120924-1438-R1

- Includes 3" high-density foam sidewall insulation and steel cladding in the owner's choice of color
- Includes a five-year warranty on the tank and appurtenances, only manufactured by American Structures, Inc.
- Quote is based on a non-prevailing wage

We propose to supply, deliver, and erect the above-described tank and appurtenances, for a total of **$275,493.00.**

Note: This quote is valid for 14 days following the date of this quote.

EXCLUSIONS TO THIS REVISED QUOTE: site work, excavation, backfill, process piping, electrical, state and local taxes, permits, and off-loading.

Our Payment Terms:
40% due with the purchase order
30% due upon delivery
30% due upon completion
Net 10 days for all invoices

If you have any questions or concerns regarding the information presented in this revised budgetary quote, please feel free to call or email me at asi.estimating2@ameristruc.com. Thank you for contacting American Structures, Inc. with your storage needs.

Sincerely,

Chris T. Buff
Estimator

CTB/esh

Note: The prices quoted on this date may be adjusted for any increase or decrease after this date at the time of order and do not include any fees, permits, duties, or applicable taxes. A tax-exempt certificate is required upon ordering and the customer shall pay any fees, permits, duties and sales or use tax due.

APPENDIX E

EQUIPMENT INFORMATION: DISSOLVED AIR FLOTATION UNIT

Westmoreland Sanitary Landfill DAF Rental

Belle Vernon, Pennsylvania

Owner

WESTMORELAND SANITARY LANDFILL

Engineer

NOBLE ENVIRONMENTAL

Contact: Michael Zucatti, P.E.
mzucatti@nobleenviro.com
(717) 448-5613

Contact: Nicholas Stork
nstork@nobleenviro.com
(508) 816-5861

Contacts

Tim LeTourneau
tletourneau@westech-inc.com
(801) 290-1474

Ellie Siddoway
esiddoway@westech-inc.com
(801) 290-1260

Representative

LEARCO Equipment Company

Pittsburgh, Pennsylvania
Contact: Kevin McDevitt
Kmcdevitt@learco-inc.com
(412) 221-4888 / (412) 215-6158

WESTECH®

Proposal Number: 2310159_RENT_Rev1
May 31, 2023

SYSTEM CERTIFICATION ISO 9001 SGS

WesTech Engineering, LLC appreciates the opportunity to provide the enclosed proposal for your project. We are confident we can help you achieve your process goals. By selecting WesTech, you can look forward to the following benefits:

- **Mobility:** WesTech Rental equipment is designed with mobility in mind. Quick and easy start up alongside placement flexibility is at the core of our temporary equipment design.

- **Proven performance:** For nearly 50 years, WesTech has delivered exceptional results for diverse industry requirements. As a market leading company with a customer-oriented mindset, we support you and your process until completion of your project.

- **Superior service:** We pride ourselves on delivering superior service on every project. We are committed to addressing the customer's needs for every step of the project. All of our customers can expect reliable equipment and process solutions delivered with professional confidence.

- **Comprehensive industry experience:** Our team members draw from decades of combined experience to deliver solutions to facilities with treatment challenges like yours. Having resolved countless complex challenges, we are eager to apply that experience to your project.

- **Honesty and integrity:** Our founders ensured that honesty and integrity became part of our company's DNA. We stand behind our work and embrace our responsibility to provide the best service possible to our customers.

We look forward to discussing our proposal as the project progresses and hope the enclosed information proves beneficial. Please do not hesitate to contact us with any questions for further discussion.

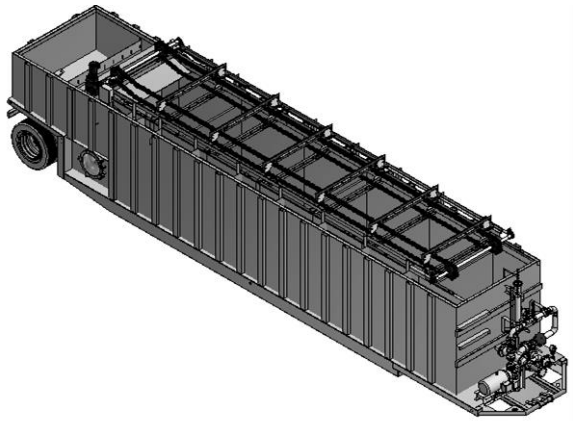
Technical Proposal

Customer Furnished Water Characteristics	
Parameter	**Value**
Process	Landfill Leachate
Max Flow Rate	70 gpm
Average Influent TSS	75 mg/L
Influent COD	1741
Influent pH	7.5
Influent Temperature	Above ambient

It is the customer's responsibility to ensure these values and assumptions are accurate. Additional specifications or effluent requirements should be disclosed before the purchase order is issued.

Item A – Mobile Dissolved Air Flotation (DAF) Unit

WesTech's mobile DAF is a portable unit designed around the industry standard frac tank for ease of setup and portability. An air induction pump is included. The unit operates by floating solids which are collected and removed off the top of the water with a chain and flight skimmer. Effluent is discharged via gravity by flow.



Standard Features

- Flotation tank with collection box
- On-board air induction system
- Chain and flight float removal system with variable speed adjustment
- Pre-wired local control panel

Mobile DAF Trailer Details

Description	Unit	Dimension/Capacity
Number of Mobile DAFs	-	1
Max Hydraulic Flow Rate per Trailer	gpm	300
Min Hydraulic Flow Rate per Trailer	gpm	50
Design Flow Rate per Trailer	gpm	70
Design Recycle Flow Rate per Trailer	gpm	220 (non-adjustable)
Trailer Dimensions		
Shipping	ft.-in.	47'-6" L x 8'-6" W x 13'-2" H
Operating	ft.-in.	47'-6" L x 8'-6" W x 11'-4" H
Trailer Weight		
Shipping	lbs.	31,200
Operating	lbs.	316,100
Connection Sizes	150# ANSI RF Flange	6" Influent 6" Effluent 4" Float 3" Drain
Material of Construction	-	Painted Carbon Steel
Power Requirement per Trailer	Voltage/Hertz/Phase/Amps	460/60/3/42

*Chemicals may be necessary to meet effluent requirements. Chemicals supplied by others.

APPENDIX F

EQUIPMENT INFORMATION: PENTAIR PACKAGE: BAG FILTERS, VMAX SEPARATOR, PREFILTER TO HRT (PROCESSOR), & HYDROCARBON RECOVERY TECHNOLOGY (HRT)

HIGH PERFORMANCE SEPARATION SYSTEMS

Westmoreland Sanitary Landfill

Quotation for Leachate Filter & Coalescing Elements, and Vessel Closure Seals

December 1, 2023 REV 1

PENTAIR
Oil & Gas Separations
4301 West Davis, Conroe, Texas 77304

(936) 788-1000 • Fax (936) 788-1220
www.pentairseparations.com

4301 West Davis
Conroe, TX 77304

T (936) 788-1000
www.pentairseparations.com

CUSTOMER Westmoreland Sanitary Landfill LLC – Belle Vernon, PA

ATTENTION Andrew Thomas / Noble Environmental Inc.

SUBJECT Price Quote December 1, 2023 REV 1 for Replacement:
- Filter and Coalescer Elements
- Vessel Closure Seals

NOTE This equipment serves to remove contaminants from leachate prior to the Evaporator. **Revision 1 corrects the Stage 3 Filter Element to the 1-micron version as used for PA DEP approval, and adds recommended alternatives for Stage 2 to improve protection of Stage 3.**

FILTER & COALESCER ELEMENTS

Item	Stage	Element Part Number	Used in Vessel Model Number Serial Number	# Vessels	# Elements per Vessel (# per change-out)	Price Per Element
1	**V-Max Pre-Filter Stage 1** 40" Length Duraform coarse - Dual layer epoxy coated wire screen	FMV1904H031V-PRE	FMV2406GFF-NCS Serial RD-15348 Serial RD-15349	2	6	$85.00
2	**V-Max Filter Stage 2** 26" Length Polyester Medium	FMV1904H031V	FMV2406GFF-NCS Serial RD-17931 Serial RD-17932	2	6	$85.00
3	**V-Max Filter Stage 2 Alternate** 26" Length Nexcel 150	FMV1904H031V-150 [recommended to better protect Stage 3]				$55.00
4	**V-Max Filter Stage 2 Alternate** 26" Length Nexcel 70	FMV1904H031V-70 [recommended to better protect Stage 3]				$55.00
5	**HRT Pre-Filter Stage 3** Microform 1 µm	FMC1904H031V-MB	SYS-FFH3625GGG-NCS Serial 144366-6	1	25	$130.00
6	**HRT-Organic Separator Stage 4** Coalescing Element	FCA1904H031V	SYS-FLH3627GGG-NCS Serial PES-671-03	1	22	$290.00

Recommended for HRT system operation: Items 1, 3, 5 & 6, or 1, 4, 5 & 6

4301 West Davis
Conroe, TX 77304

T (936) 788-1000
www.pentairseparations.com

For reference, the quantities of elements that were supplied when the project was initiated included:

- 24 V-Max Pre-filter Stage 1
- 300 V-Max Filter Stage 2
- 125 HRT-PS Pre-Filter Stage 3 (20-micron)
- 66 HRT-OS Coalescer Stage 4

No spare vessel closure seals have been ordered to date for this project.

VESSEL CLOSURE SEALS

	Stage	**Closure Seal Part Number**	**Used in Vessel** Model Number Serial Number	**# Vessels**	**# Closure Seals per Vessel**	**Price Per Seal**
bag filters	**V-Max Pre-Filter Stage 1** Coarse Pre-filter	SE-O-.313-25576-V	FMV2406GFF-NCS Serial RD-15348 Serial RD-15349	2	1	$55.20
VMAX	**V-Max Filter Stage 2** Medium Filter	SE-O-.313-25576-V	FMV2406GFF-NCS Serial RD-17931 Serial RD-17932	2	1	$55.20
ProcessOR	**HRT-PS Pre-Filter Stage 3**	SE-O-.375-360-V	SYS-FFH3625GGG-NCS Serial 144366-6	1	1	$96.44
HRT	**HRT-OS Coalescer Stage 4**	SE-O-.375-360-V	SYS-FLH3627GGG-NCS Serial PES-671-03	1	1	$96.44

Standard Lead-time: **Elements:** Please allow 7 – 10 business days for manufacturing after receipt of order. Current production runs Mon – Thurs, so thank you for not counting Fridays or weekends in lead time.

Closure Seals: Stock items. Lead time ranges from immediate to 3 weeks.

Terms: Exworks Conroe, TX. Net 30-day payment terms.

4301 West Davis
Conroe, TX 77304

T (936) 788-1000
www.pentairseparations.com

Expedited Shipping: Please provide specific instructions if applicable.

Thank you for submitting orders to: Energyorders@Pentair.com

We appreciate the opportunity to support the Westmoreland Sanitary Landfill's operation. Please contact us any time assistance is required.

Sincerely,

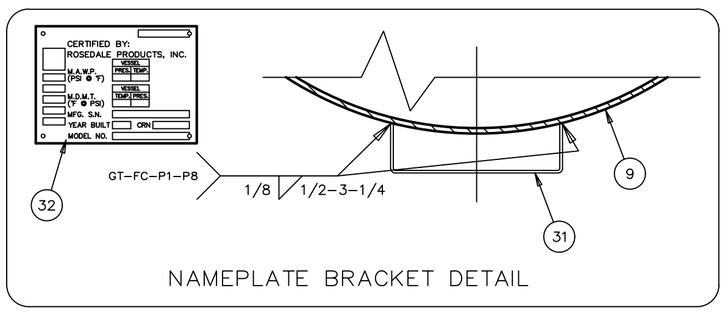
Pete Swanson
Regional Account Manager
M 612-213-7785
pete.swanson@pentair.com

cc: Energyorders@pentair.com

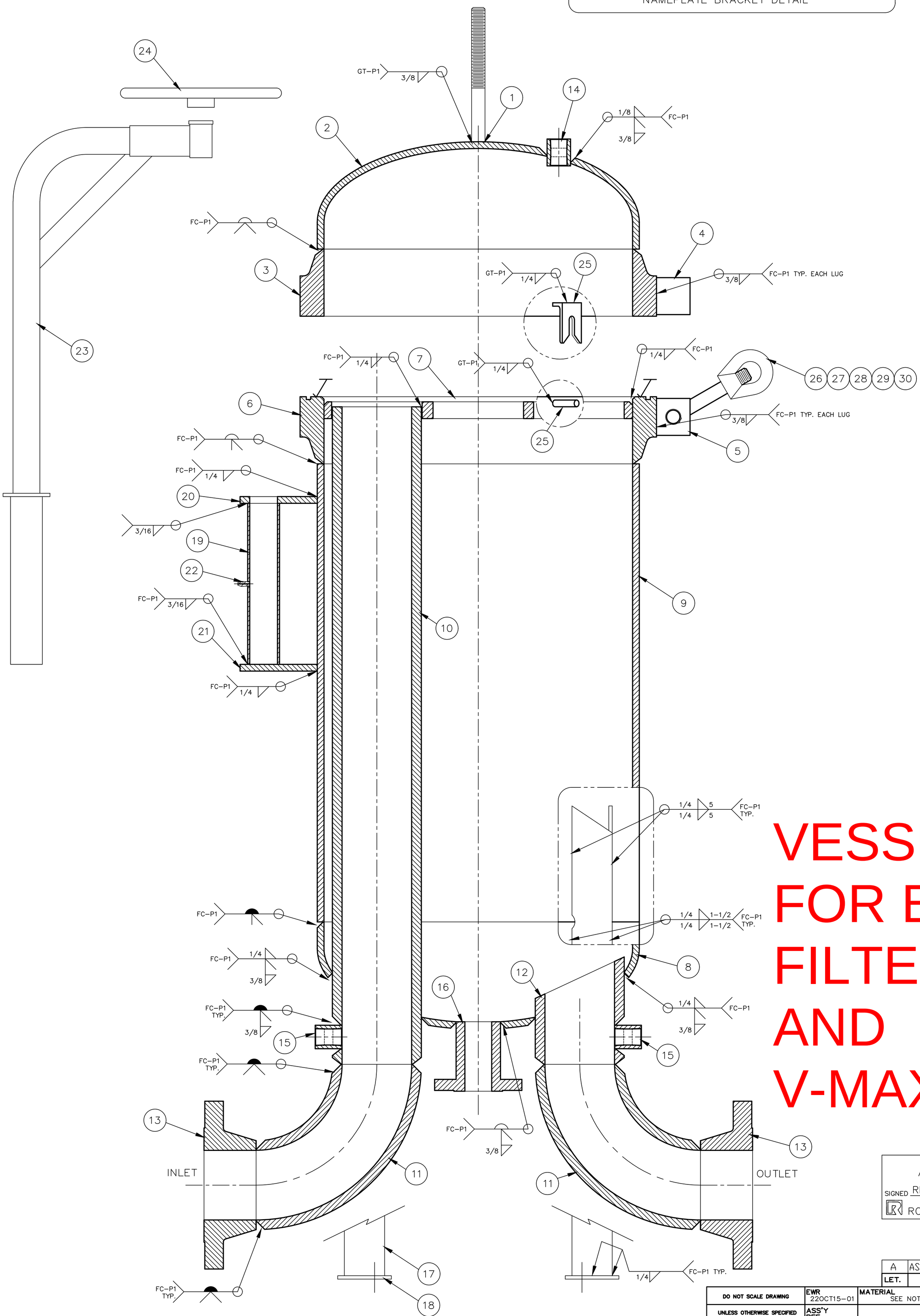
BILL OF MATERIAL			
PART	DESCRIPTION	QTY	MATERIAL
1	LIFTING ROD	1	SA-36
2	24" TOP HEAD (2:1 ELLIPSE, 2" SF); tn=1/2, tmin.=.490 AFTER FORMING	1	SA-516-70
3	24" TOP SEAL RING	1	SA-105
4	TOP LUG, 2-3/4"x2-1/2"x5/8" THK.	24	SA-516-70
5	BOTTOM LUG, 2-3/4"x2-1/2"x5/8" THK.	24	SA-516-70
6	24" BOTTOM SEAL RING	1	SA-105
7	23" NOM. BASKET RETAINER PLATE, 1-1/4" THK.	1	SA-516-70
8	24" BOTTOM HEAD (2:1 ELLIPSE, 2" SF); tn=5/8, tmin.=.490 AFTER FORMING	1	SA-516-70
9	24" BODY SHELL SCH.XS NOM.; tn=1/2", tmin.=.438" THK.	1	SA-106-B
10	6" SCH.160 PIPE SPOOL, INLET RISER	1	SA-106-B
11	6" 90° LR SCH.160 ELBOW, INLET-OUTLET	2	SA-234-WPB
12	6" SCH.160 PIPE SPOOL, OUTLET	1	SA-106-B
13	6" CLASS 300 ANSI RFWN SCH.160 BORE FLANGE; INLET-OUTLET	2	SA-105
14	1" FULL NPT CLASS 3000#; VENT	1	SA-105
15	1" FULL NPT CLASS 3000#; CLEAN-DIRTY DRAIN	1	SA-105
16	2" CLASS 300 ANSI RFLWN FLANGE; DRAIN	1	SA-105
17	SUPPORT LEG, 3"x3"x1/4" ANGLE	4	SA-36
18	FOOTPAD 4"x4"x1/4" w/ 7/8" DIA. HOLE	4	SA-516-70
19	DAVIT ARM VERTICAL SLEEVE	1	SA-106-B
20	DAVIT ARM SUPPORT BRACKET, UPPER	1	SA-36
21	DAVIT ARM SUPPORT BRACKET, LOWER	1	SA-36
22	GREASE FITTING	1	PVQ MATERIAL (NOT WELDED TO VESSEL)
23	*DAVIT ARM ASSEMBLY	1	C.S.(NOT WELDED TO VESSEL)
24	*HANDWHEEL	1	E-COATED C.S. (NOT WELDED TO VESSEL)
25	COVER ALIGNMENT ROD AND BRACKET	1	SA-36
26	1"-8 RODEND	12	SA-193-B7
27	1" CLEVIS PIN W/ GROOVE	12	SA-193-B7
28	1"-8 EYENUT	12	SA-194-2H
29	1" WASHER	12	ZINC PLT. C.S.
30	1" RETAINING RING	24	ZINC PLT. C.S.
31	NAMEPLATE BRACKET	1	SA-240-316
32	ASME CODE NAMEPLATE AND CUSTOMER NAMEPLATE	2	SA-240-304

NOTES:

1. CONSTRUCTION
   ALL WELDED CONSTRUCTION,
   PER ASME CODE SEC. VIII, DIV.1; LATEST EDITION AND ADDENDA
   ASME "U" STAMP, NATIONAL BOARD REGISTRATION
   CORROSION ALLOWANCE: 1/8"
   HYDROTEST: 455 PSI
2. MATERIALS OF CONSTRUCTION
   ALL WETTED PARTS TO BE CARBON STEEL
   ALL WELDED ATTACHMENTS TO BE CARBON STEEL
   CLOSURE ASSEMBLIES TO BE SWING BOLT TYPE
3. DESIGN PRESSURE
   350 PSIG
4. DESIGN TEMPERATURE
   250°F (MDMT=-20°F)
5. O-RING MATERIAL
   VITON
6. MODEL NUMBER
   24306WN1350C-V-N-NB-C-SPECIAL



NAMEPLATE BRACKET DETAIL



VESSEL FOR BAG FILTERS AND V-MAX'S

AS BUILT
SIGNED RLK DATE 21JAN16
ROSEDALE PRODUCTS, INC.

LET.	REVISION	BY	DATE
A	AS-BUILT	RLK	21JAN16

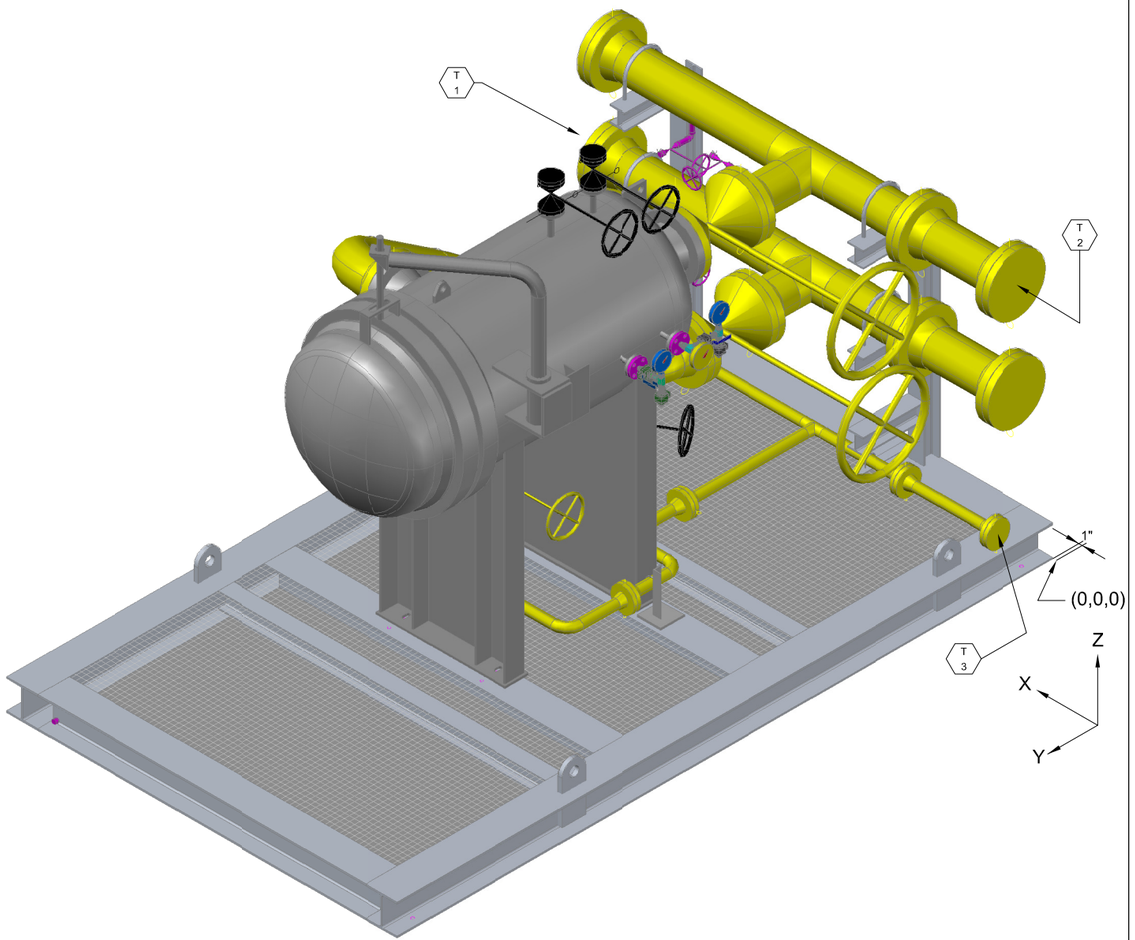
DO NOT SCALE DRAWING	EWR 22OCT15-01	MATERIAL SEE NOTES	TITLE MODEL 24 24306WN1350C-V-N-NB-C -SPECIAL WELDMENT
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	ASS'Y REF. D25867.10	Pentair	
TOLERANCES: 3 PLACE DEC ±; 2 PLACE DEC ±; OTHER ± 1/4; ANGULAR ±	DR. RLK; DATE 30OCT15		ITEM NO.
MACHINED SURFACES; DEBURR ALL EDGES; FILLET RADIUS:	CH. DATE		SHEET 1 OF 1
	SCALE 1/4		DRAWING NO. D25867.11; REV. A

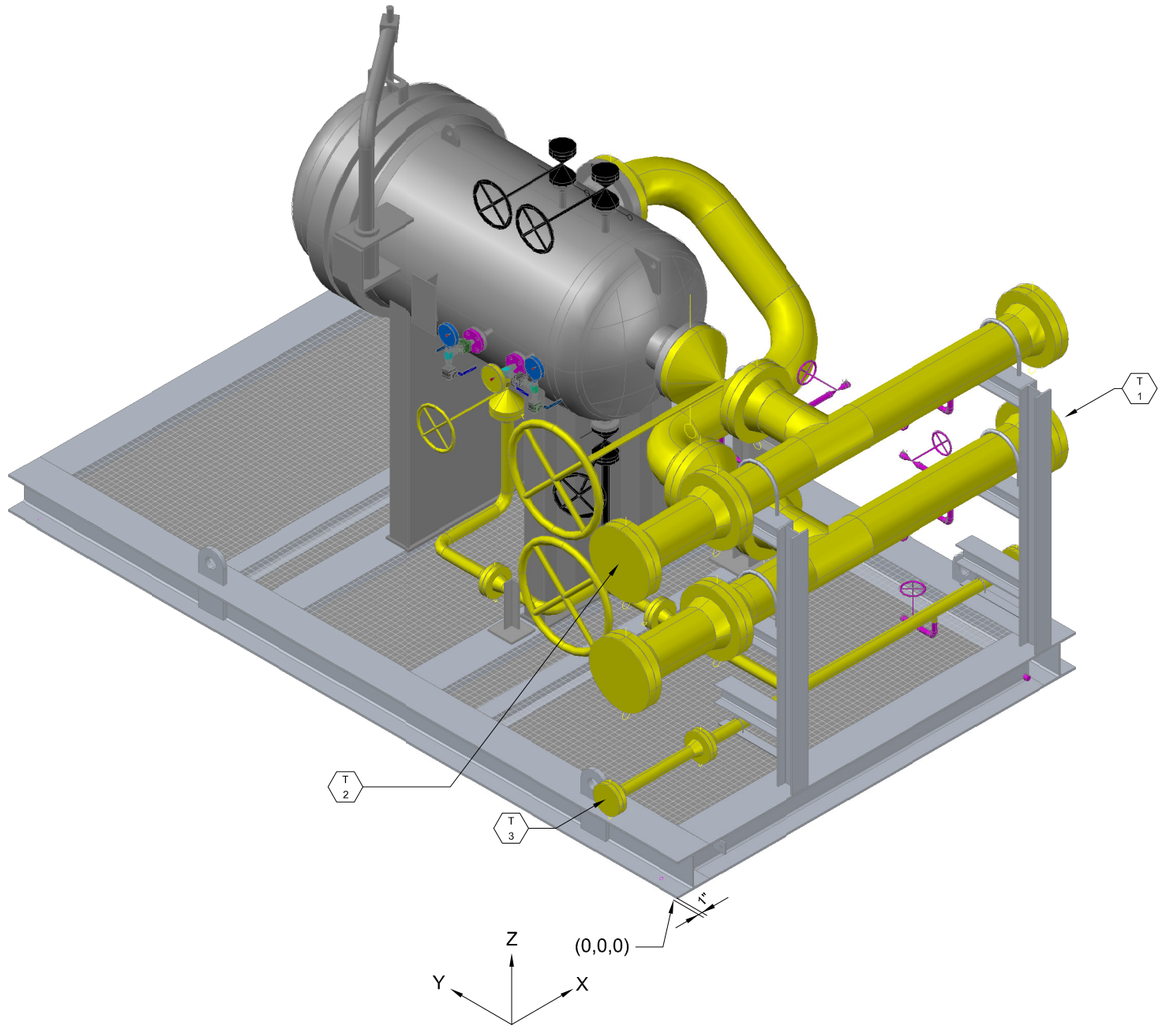
NOTE: REFER TO ASSEMBLY DRAWING FOR ALL LAYOUT DIMENSIONS AND ORIENTATION, TYPICAL

REV. A

DRAWING NO. D25867.11

ProcessOR





TIE IN SCHEDULE AND COORDINATES

TI	SIZE	RATING	SERVICE	X	Y	Z
1	8"	300#	INLET	8'-6"	1'-0"	3'-8"
2	8"	300#	OUTLET	0'-0"	1'-0"	5'-8"
3	2"	300#	DRAIN	0'-0"	1'-4"	1'-2 7/16"

NOTES:

NO.	DATE	REVISION DESCRIPTION	DRW	CHK	APR
0	11/03/14	INITIAL RELEASE	JLU	JLU	JBK

DWG NO.	REFERENCE DRAWINGS TITLE
SP1X0GG-A01	P&ID HRT PARTICLE SEPARATOR

ISSUED FOR BID PURPOSES ONLY

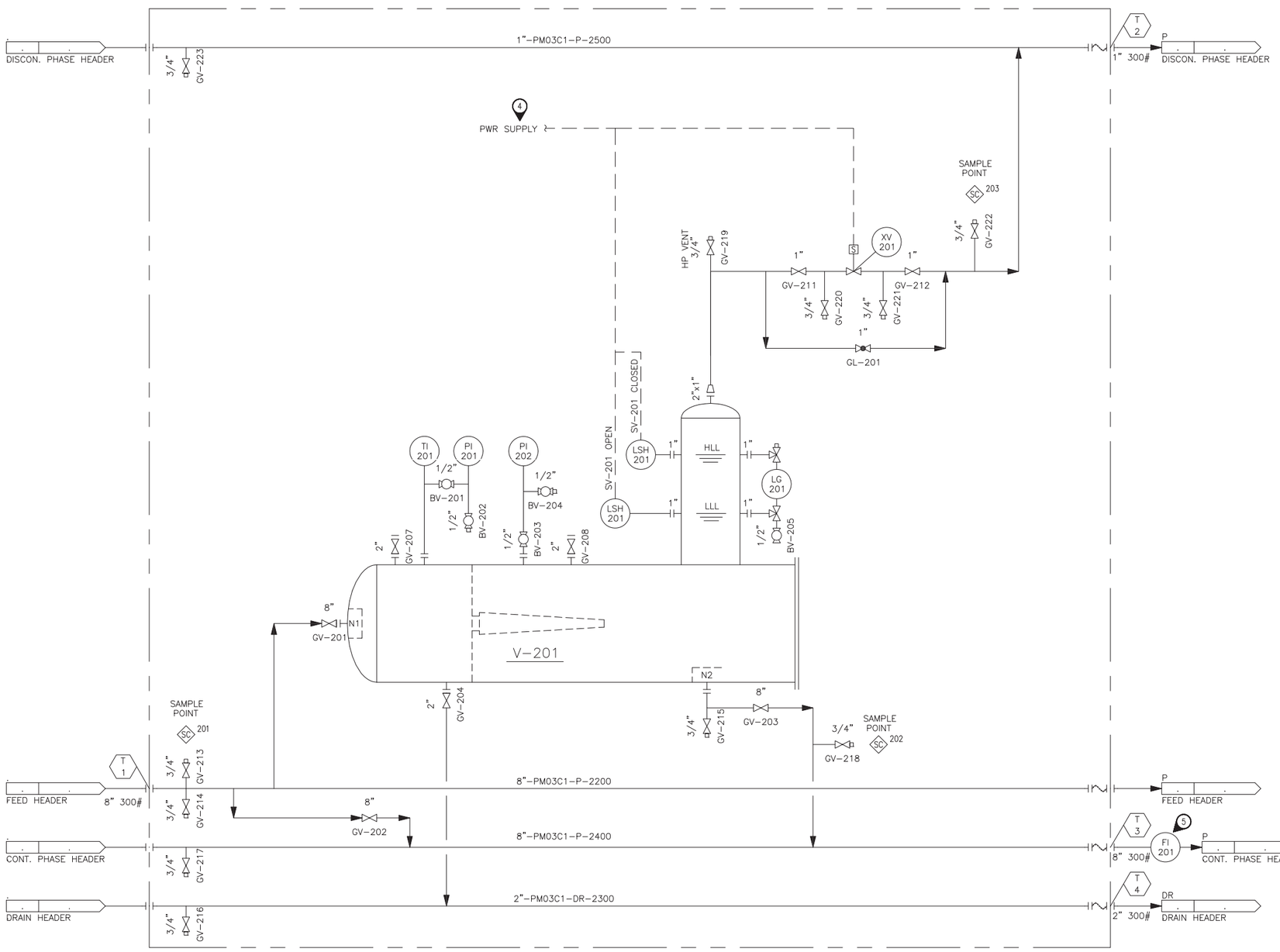
PENTAIR POROUS MEDIA®
4301 West Davis, Conroe, TX 77304
936-788-1000 www.porous.com

GENERAL ARRANGEMENT HRT PARTICLE SEPARATOR PERSPECTIVE VIEW

DRAWN: JLU	DATE: 11/03/14	DRAWING No.	SHEET/OF	REV
CHECKED: JLU	SIZE: D	SP1X0GG-B01	1/5	0
APPROVED: JBK	SCALE: NONE			

HRT

V-201
Organic Separator (HRT-OS)
36" OD x 78" S/S
600 psig @ 490 °F



NOTES:

1. THIS P&ID IS PRESENTED AS A GUIDE FOR CONFIGURING HRT SYSTEMS AND SHOWS PENTAIR'S STANDARD DESIGN FOR PRODUCED WATER APPLICATIONS. A MINIMUM OF TWO HRT-PS VESSELS IS RECOMMENDED. ADDITIONAL VESSELS MAY BE REQUIRED DEPENDING ON INLET TSS LEVELS.
2. ELECTRICAL AREA CLASS IS ASSUMED TO BE ZONE 2, GRP 11A & 11B
3. INSTRUMENTATION SHOWN IS THE MINIMUM RECOMMEND. ALTERNATIVE INSTRUMENTATION CAN BE PROVIDED ACCORDING TO CUSTOMER REQUEST.
4. POWER SUPPLY IS SITE SPECIFIC. PENTAIR RECOMENDS 120 VAC
5. FLOWMETER BY CUSTOMER.

NO.	DATE	REVISION DESCRIPTION	DRW	CHK	APR
C	08/0614	INSTRUMANTATION CHANGED	JLU	JLU	JBK

DWG NO.	REFERENCE DRAWINGS TITLE
A-0001	LEGEND SHEET

ISSUED FOR BID PURPOSES ONLY

PENTAIR POROUS MEDIA®
4301 West Davis, Conroe, TX 77304
936-788-1000 www.porous.com

PIPING & INSTRUMENT DIAGRAM HRT MODULAR SYSTEM ORGANIC SEPARATOR

DRAWN: JLU	DATE: 04/25/14	DRAWING No.	SHEET/OF REV
CHECKED: JLU	SIZE: D	LiquiSep HRT P&ID	1/1 C
APPROVED: JBK	SCALE: NONE		

1404R004-A02-01.dwg

APPENDIX G

EQUIPMENT INFORMATION: KINETIC DEGRATION FLUXION (KDF) & GRANULAR ACTIVATED CARBON (GAC)

ESTIMATE

All Filtration Consulting Group LLC
2807 SW Beaumont Ave
Palm City, FL 34990-5466

wayne@afcgroupus.com

ALL FILTRATION
Consulting Group

Bill to

Mr. Andrew Thomas
NOBLE ENVIROMENTAL
6000 Town Center Blvd #145
Canonsburg, PA 15317 USA

Ship to

Mr. Andrew Thomas
NOBLE ENVIROMENTAL
6000 Town Center Blvd #145
Canonsburg, PA 15317 USA

Shipping info

Ship via: Best way

Estimate details

Estimate no.: CW8578913
Estimate date: 08/29/2024
Expiration date: 09/30/2024

#	Product or service	Description	Qty	Rate	Amount
1.	**21x62 Triplex KDF 2"**	21 x 62 TRIPLEX Progressive flow with KDF 36gpm max each tank	1	$36,918.926	$36,918.93
2.	**3672 Triplex Carbon**	36X72 TRIPLEX progressive flow Carbon 36 gpm max each tank @ 5 gpm sqft.	1	$32,321.873	$32,321.87

Total **$69,240.80**

Expiry date 09/30/2024

Note to customer

Thank you for your order. Please let me know if you will need any assistance on install as we can assist with that as well.

Accepted date

Accepted by

H2K Technologies, Inc.

7550 Commerce Street
Corcoran, MN 55340
Office: 763-746-9900
Fax: 763-746-9903

September 4, 2024

To: Andrew Thomas
Noble Environmental
814-771-4402
athomas@nobleenviro.com

Project Name: Media Vessels
Project Location: PA
Quote No.: 6719

Dear Andrew,
Below is our quote for the above referenced project. The quote is based on the specifications we received for the site with exceptions as noted. We appreciate the opportunity to bid on this project, please call or email with any questions.

Equipment Description

Liquid Phase Carbon

(2) H2K model LC-028 Liquid Phase filter vessels, to include:
- 72" outside diameter, 6' side sheet, approx 11'6" OAH
- 5,000 lb. carbon capacity in each vessel
- Welded carbon steel construction
- Interior sandblasted with epoxy finish
- Exterior finish sandblasted with polyurethane finish
- 75 PSI pressure rated, inverted head, non-ASME design
- Vertical lifting lugs on each vessel
- Fork pockets at base of each vessel, with mounting tabs
- (2) 14" X 18" Access manways – top & side of each vessel
- (2) 4" 150 lb flanges – filter inlet & outlet
- (1) 2" 150 lb flange - pressure relief
- (1) 2" 150 lb. flange – air bleed
- (1) 2" NPT fitting – drain
- Influent piping header - 6" 304SS header w/ drop overdrain internals
- Underdrain collector - 6" 304SS header piping with 2" 304 SS screened laterals

(5,000 lb) Virgin-grade 8x30 mesh liquid phase carbon in each vessel

(1) Equipment mounting skid for carbon vessels
- Welded steel construction, industrial enamel finish
- Welded 6" channel base with 3/16" top plate
- Dimensions 8' W x 15' L x 6" H

(1) Lead/Lag piping header, to include:
- Schedule 80 PVC construction
- (10) 4" PVC butterfly valves
- Sample port & pressure gauge on inlet & outlet of each vessel
- Mounting & support rack, bolted to skid base

Pricing Summary

Price for (2) LC-028 carbon vessels	**$**	**93,000.00**
Price for (10,000 lb.) 8x30 mesh virgin-grade carbon	**$**	**29,000.00**
Price for (1) skids & lead-lag headers	**$**	**24,000.00**
Est. freight to PA	**$**	**9,000.00**

Notes:

. Sales tax is not included in pricing and will be added to invoices unless an exempt cert. is provided.

General Conditions

1. Terms of payment to be 30% upon order, 40% with submittal approval, before shipment, balance NET 30 days after shipment.

2. Proposal and pricing valid for 30 days from the date of this proposal.

3. This proposal and pricing are based on our interpretation of the specifications & P&ID's provided at the time of bid only. We reserve the right to review any and all written specifications and drawings that may apply to this equipment before accepting or stating that the equipment meets specifications at time of order, otherwise equipment is bid as quoted only.

4. H2K Technologies will not initiate work without a fully executed contract or purchase order. Fabrication will not be initiated until complete submittal approvals have been received.

5. Submittals will be provided within two weeks of receipt of a fully executed contract or P.O.

6. Equipment can generally be shipped within 20-25 weeks after receipt of completely approved submittals. Lead time will be updated at the time of order execution.

7. Shipping charges are not included in the prices quoted unless explicitly stated in the proposal. Actual freight costs will be pre-paid and added to the invoice.

8. The process quoted does not include sales tax. State and local sales and use tax will be added to the invoice, unless a valid sales/use tax exemption certificate is supplied with the contract or purchase order for this project. Exemption certificates must be supplied at the time of order.

If you have any questions or comments concerning this information, please feel free to give me a call at 763-746-9900. Thank you for the opportunity to bid on this project.

Sincerely,

Joe Udvari

Liquid Phase Granular Activated Carbon (GAC) Vessels

H2K manufactures industrial carbon filters for removal of dissolved organics such as benzene (BTEX), naphthalene, MTBE, TCE/PCE, and more.

Data Sheet for LC Series Series Carbon Vessels

Data Sheet for LCA Series Series Carbon Vessels

Data Sheet for LCF Series Series Carbon Vessels

General Description

Carbon filters are used in water treatment for removal of dissolved organic compounds in contaminated water sources. LGAC vessels are used for treatment of ground water, storm water, municipal water and wastewater treatment. Activated carbon media uses an array of pores for dissolved organic removal. Contaminated water is pumped through the vessel containing granular activated carbon to adsorb the contaminants. Dissolved organic compounds are removed from the process flow as they are caught in pores on the carbon surface.

efficiently as possible.

Typical Treatment Applications

- Storm water filtration
- Industrial water filtration
- Municipal water

carbon vessels
- Waste water filtration
- Rental water treatment
- Industrial pressure filters
- Groundwater remediation
- Dissolved chlorinated compound removal
- ASME stamped pressure vessels
- Dissolved pesticide filtration
- Construction dewatering
- Industrial wastewater filters
- Temporary water treatment systems
- Potable water filtration
- Irrigation water filtration
- Water park features
- Gasoline range organics – GRO removal
- Diesel range organics – DRO removal
- Pool water filters

GAC Only

- Naphthalene
- Phenol
- Methyl-ethyl-ketone (MEK)
- Polynuclear-aromatic-hydrocarbons (PNAs)
- Pesticides
- Herbicides
- Atrazine
- Alachor
- Metalachor
- Polychloro-biphenyls (PCB's)
- Methyl-isobutyl-ketone (MIBK)

GAC or Air Stripping

- Chlorobenzene
- Chloroform
- Ethylenedibromide(EDB)
- Methyl-tert-butyl ether
- Freon 12
- Dibromochloropropane (DBCP)

Depending on concentration, flow and other water quality characteristics, pre-treatment options may be required in addition to GAC treatment.

:imedia Filtration – if high inorganic solids loading is present

Oil water separators – if free phase product is present

Design Considerations

H2K manufactures carbon vessels with many design options to accommodate a large variety of water treatment applications. We provide performance modeling to determine carbon filter sizing and bed life based on provided sampling data. Water flow rate, contaminants & concentrations, discharge pressure, and discharge criteria are all factors in designing proper carbon vessel size.

Contaminants & concentrations: LGAC vessels provide satisfactory adsorption performance so long as the activated carbon has sufficient time / capacity to adsorb contaminants. Treatment process through the carbon bed is commonly referred to as Empty Bed Contact Time (EBCT) which equals the water residence time in a carbon vessel. Larger diameter vessels will provide longer EBCT for a given water treatment system. Generally, larger contaminants will use up media more quickly and require more frequent carbon change-outs. Our carbon modeling considers all the parameters to determine a recommended filter size, carbon quantity and predicted carbon bed life.

Process flow rate: As flow rate through a carbon filter increases, carbon will be used more quickly and filter pressure drop will increase. The proper balance between vessel size and flow rate must be considered to avoid over or under sizing the vessels.

Discharge criteria: Depending on the destination of treated water, different types and grades of activated carbon are available for use. A high quality regenerated activated carbon is commonly used in applications with non-potable industrial discharge locations while virgin activated carbon is required in most potable water applications.

Design Options Available

Fiberglass carbon vessels are lightweight and very portable. These filters can handle up to 120 GPM and hold up to 1,250 Lbs. of carbon.

Lead/lag and backwash piping headers – Carbon filters can be set-up with a PVC or steel valve header which allows easy toggling of lead and lag vessels. Carbon backwash headers are also available which allows reverse flow through the vessels to remove surface fouling from the carbon bed.

Transfer pumps and instrumentation – H2K Technologies offers a full line of centrifugal and positive displacement pumps to feed water through LGAC vessels. Safety switches and p s are available if automation and telemetry are a desired part of your system.

Project Examples

Portable carbon treatment system

This project includes a portable carbon vessel trailer to treat multiple dewatering ponds. Activated carbon was used to treat benzene and gasoline range organics. H2K constructed a portable, easy to use fiberglass GAC assembly to effectively treat up to 100 GPM for sewer discharge.

Benzene carbon treatment

H2K Technologies supplied a turnkey water treatment system including ASME-stamped liquid phase carbon vessels. These vessels filtered 200 GPM for BTEX for discharge to sewer. The carbon filters feature a lead/lag piping header, carbon slurry lines for ease of carbon change-out, and backwash piping to mitigate fouling.

Rental Water Treatment

H ffers a large rental
p ergency response, pilot testing, and construction dewatering applications. Vessels are available as single units or packaged skid complete with lead/lag piping and controls. Rental vessels are available in sizes up to 8’ diameter for flows up to 400 GPM.

H2K TECHNOLOGIES, INC.

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Corcoran, MN

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CARBTROL®

HIGH PRESSURE ACTIVATED CARBON WATER PURIFICATION ADSORBERS

FEATURES:

- Corrosion-resistant filament wound fiberglass construction
- High activity activated carbon
- 25% freeboard for backwashing carbon
- 12″ x 16″ top manway for bed access
- Side connections for ease of maintenance
- Tank is factory pressure tested with 10 year warranty
- Optional side access way and sight glass are shown

SIZES:

MODEL	DIA	CARBON QUANTITY	FLOW CAPACITY
HP-600	2′-6″	600 lbs.	35 gpm
HP-800	3′-0″	800 lbs.	50 gpm
HP-1100	3′-6″	1100 lbs.	75 gpm
HP-1400	4′-0″	1400 lbs.	90 gpm
HP-1900	4′-7″	1900 lbs.	125 gpm
HP-2500	5′-3″	2500 lbs.	165 gpm
HP-3400	5′-11″	3400 lbs	220 gpm
HP-4100	6′-7″	4100 lbs.	270 gpm
HP-5200	7′-4″	5200 lbs.	325 gpm
HP-5800	7′-9″	5800 lbs.	375 gpm
HP-6500	8′-3″	6500 lbs.	425 gpm
HP- 9300	9′-10″	9300 lbs.	600 gpm
HP-12700	11′-6″	12700 lbs	825 gpm

AT-00/#6

CARBTROL® CORPORATION

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ATTACHMENT 25-8

LANDFILL LEACHATE TRIAL PROJECT

Exhibit 25-8.1
Treatment Residuals Sampling and Contingency Plan

INTRODUCTION

This Treatment Residuals Sampling and Contingency Plan (Residuals Plan) has been prepared to set forth procedures for managing the disposal of residual wastes and/or filter media generated during the leachate pre-treatment process. It is estimated that wastes may consist of sludges from the DAF and OWS, media from the DAF and GAC and filters from the HRT system. The volume and concentration of the sludges will vary according to quantity and quality of leachate being processed. Based on a review of vendor documentation and literature on these processes, it is estimated that there will be approximately 300 gallons of sludge per day.

A vacuum truck or roll-off truck with a sealed roll-off container will the load the residual sludge and filter media from the pre-treatment area. The vacuum truck may utilize the truck's pump or a sludge pump to be placed within the collected sludge captured from each process. It is currently anticipated that one full load (~4,500-gallons) will be removed from the treatment plant for every two weeks of operation. The loaded vacuum truck or roll-off box will be hauled to the solidification pit by landfill personnel for solidification as-needed. Solidification will be performed in accordance with the approved Form 14 and Form P. Following solidification, a sample will be collected for Form U testing. The waste will then be loaded into a waste box and will be transported to the entrance where it will pass through the fixed portal radiation detectors in accordance with the facility's Form X. In the event that radiation is detected at levels exceeding 10 uR/hr above background, the appropriate response set forth in the approved Form X will be implemented. Additionally, exceedances above background will be tracked as required by the TENORM Monthly Disposal Balance for the facility. In the event that Monthly Source Term Allocation (MSTA) would be reached, the procedures set forth below will be followed.

Once the box meets the Form X requirements for disposal, the loaded box will then be transported to an area within the lined disposal footprint where it will be staged awaiting Form U approval. Initially, every box will be tested. However, once sufficient data has been collected to establish the quality and consistency of the residual material, a reduced testing frequency may be proposed to the PADEP for approval. The disposal of these sludges will not include the payment of PADEP disposal fees since these sludges are by-products removed from the landfill waste mass.

in the event the Monthly Source Term Allocation (MSTA) would be reached. As outlined in Attachment 25-8, residuals generated from the evaporation process will be discharged into a dual-contained frac box where they will then be loaded into a vacuum truck or sealed roll-off container and hauled to the solidification pit. Once solidified, a sample will be collected for Form U testing and the solidified waste will be loaded into a waste box and transported through the fixed portal radiation detectors in accordance with Form X. If the box does not set off the fixed portal alarms as a result of the reading being less than 10 uR/hr above background, the

box will be staged within the lined disposal footprint awaiting Form U approval as summarized below. Should the box exceed 10 uR/hr above background, Form X and the procedures outlined below will be followed.

WASTE HANDLING PROCEDURE

Pre-treatment residuals will be staged within the lined disposal area prior to PADEP's receipt or approval of the analytical testing. Following solidification, the following waste handling procedures will be utilized.

- The solidified residuals will pass through the scales where a certified scale house attendant will process each load. The scale house attendant shall maintain a log of all residual waste loads. The following records will be maintained on site prior to PADEP waste approval: radiation pass or fail (radiation reading if the alarm sounds), a unique container identification number and gross vehicle weight. Scale house personnel shall generate a magnetic or adhesive "NOT APPROVED FOR DISPOSAL" label which shall include the date of solidification / processing of the load and the container identification number. Each label shall be affixed to the unapproved residuals containers so that it is clearly visible while in the staging area.

- Gross vehicle weights prior to staging and disposal will be recorded but all containers will be reweighed prior to disposal. The container identification number shall be utilized to track the load. Weights recorded at the time of initial processing of the container for staging will be recorded but not utilized as the disposal weight. All loads will be reweighed following PADEP approval of the material for disposal and a waste disposal ticket will be completed. If a unique identification number is not located on the waste container, scale house personnel shall assign an identification number which will be added to the container.

- The initial gross vehicle weight will be also be utilized to estimate load source term if the fixed portal alarms are sounded to anticipate if there is potential for reaching the MSTA. Should there be any concern for reaching the MSTA, the alternative disposal procedure presented below may be followed.

- Several types of containers may be present within the staging area at one time. All containers shall be equipped with lids or tarps. All tarps and lids will be designed to prevent water infiltration during staging. All containers will require a sealed tail gate and designed to be water tight.

- The loaded container shall be staged within non-closed portions of the lined landfill disposal area. Staging within the landfill area may include container placement at the edge of the active disposal area or within in-active portions of the landfill.

- The loaded containers shall remain staged until the analytical lab testing is completed and the material is approved for disposal by Westmoreland Sanitary Landfill and the PADEP. If the chemical analysis of the waste stream equals or exceeds a constituent(s) permit limit, then the waste stream shall be subject to further chemical analysis of at least four (4) samples. A determination shall be made for the analytical results assuming a normal distribution and performing a 90% one-tailed confidence interval of the mean for the regulated constituent(s). If the material is not approved for disposal, the alternative disposal procedure presented below may be followed.

- Upon PADEP approval for disposal of the residuals, the containers will be visually inspected for free liquids, if possible. During the staging period, liquids may separate from the solids. If required, the load may be re-mixed within the container to re-incorporate free liquid, solidification agents may not be added during the mixing in the staging area, the liquid will be drained from the container into a solidification vessel, or the entire load will be transferred to a solidification vessel for proper processing.

- The load shall then be removed from the staging area (processed for solidification, if needed) and re-processed through the landfill entrance area with radiation monitoring, recording of the radiation levels if the alarms are sounded, recording of a gross weight and the creation of a landfill scale ticket. After this, the manual ticket previously created shall be discarded and the container shall be removed from the staged container list maintained at the scale house. If an alarm is sounded, the radiation level shall be recorded and the load shall be tracked with the TENORM Monthly Disposal Balance spreadsheet for the facility. Should there be any concern for reaching the MSTA, the alternative disposal procedure presented below may be followed. Under normal circumstances, with the exception of waste loads which may exceed the MSTA, staged loads shall be removed from the staging area within five working days from approval for disposal.

ALTERNATIVE DISPOSAL PROCEDURE

The following waste handling procedures may be followed in the event that staged residual boxes are required to be counted towards the MSTA.

Scenario A – MSTA Remaining, Normal Disposal

All residual loads which sound the radiation alarm by exceeding 10 uR/hr above background will be tracked in the Monthly Disposal Balance Spreadsheet for the facility. If the spreadsheet determines that there is more than 1,000 MSTA after disposal of the load, the load may be disposed of in the landfill and no additional measures are taken.

Scenario B – Less than 1,000 MSTA

If the Monthly Disposal Balance Spreadsheet determines that there will be less than 1,000 MSTA after disposal of the load, the load may be disposed of in the landfill. The remaining operating days in the calendar month will be evaluated as well as the number of currently staged boxes. Estimated load source terms recorded during initial processing prior to staging for currently staged boxes will be utilized to evaluate if the current staged boxes may be disposed of in the current calendar month.

1. If there is not an anticipated concern with reaching the MSTA, no further actions required.
2. If there is a concern for reaching the MSTA for the current calendar month but it is anticipated that all loads may be disposed of the in following calendar month, disposal of additional loads will continue as allowed by the MSTA and once the MSTA is reached, loads may be kept in the staging area following Form U approval until the following calendar month.
3. If there is an immediate concern for reaching the MSTA for the current calendar month as well as the following calendar month, the landfill facility will begin to look at alternative appropriately permitted facilities for disposal. Once the facility reaches the MSTA, the procedures listed in Scenario C and D should be followed.

Scenario C – MSTA Reached

If the Monthly Disposal Balance Spreadsheet determines that the MSTA limit has been reached after disposal of the load, the load may be disposed of in the landfill. However, the remaining operating days in the calendar month will be evaluated as well as the number of currently staged boxes. Estimated load source terms recorded during initial processing prior to staging for currently staged boxes will be utilized to evaluate concerns with disposal of currently staged boxes.

1. If the MSTA for the current calendar month has been reached but it is anticipated that all loads may be disposed of in the following calendar month and there are less than 10-calendar days left in the month, loads may be kept in the staging area following Form U approval until the following calendar month.

2. If the MSTA for the current calendar month has been reached and it is anticipated that not all loads may be disposed of in the following calendar month or there are more than 10-calendar days left in the month, alternative appropriately permitted facilities will be evaluated for disposal. If new residuals which have the potential to be counted towards the MSTA are being staged, any staged box that receives Form U approval that would be counted towards the MSTA should be hauled offsite to an appropriately permitted facility within five working days of Form U approval.

Scenario D – MSTA Exceeded

If the Monthly Disposal Balance Spreadsheet determines that the MSTA limit would be exceeded after disposal of the load, the load should be directed back to the staging area to evaluate currently staged boxes.

1. If it is anticipated that this load returned to staging as well as all loads currently in the staging area may be disposed of in the following calendar month and there are less than 10-calendar days left in the month, loads may be kept in the staging area following Form U approval until the following calendar month.

2. If it is anticipated that this load returned to staging combined with all loads currently in the staging area may NOT be disposed of in the following calendar month OR there are more than 10-calendar days left in the month, alternative appropriately permitted facilities will be utilized for disposal. Any load which receives Form U approval that would be counted towards the MSTA should be hauled offsite to an appropriately permitted facility until the following calendar month restarts the MSTA.

Scenario E – Non-Approval of Form U

In the event that a staged waste box is not granted Form U approval, regardless of the remaining MSTA, the box shall be hauled to an appropriately permitted facility within five working days of non-approval of the Form U.

The DEP shall be notified of any residuals waste boxes required to be hauled offsite. At a minimum, information provided should include; the reason for being hauled offsite (Form U or MSTA), date the box was hauled from the site to an appropriately permitted facility, the name and permit ID of the disposal facility.