ATTACHMENT 3

FINAL DESIGN SUBMITTAL ENGINEERING REPORT

MEMPHIS REGIONAL MEGASITE WASTEWATER TREATMENT PLANT

MEMPHIS REGIONAL MEGASITE
STATE OF TENNESSEE
STANTON, TENNESSEE

April 2022

PROJECT NUMBER 3679

Division of Water Resources Project No. - WPN22.0036

WAUFORD

60 Volunteer Boulevard
Jackson, Tennessee 38305
www.jrwauford.com

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Following the TDEC
Final Design Submission Requirements Checklist

A. Basis for Influent Flow Characterization

1. Normal Flows and Waste Loads

The announced development with the Ford Motor Company (Ford) assembly plant and the SK Innovations battery plant, included 5,600 jobs. Additionally, provisions are for the future inclusion of a supplier park, technical school, and approximately 600 acres remaining to be marketed by the State of Tennessee for additional industry. In order to develop design waste loads, data was provided from Ford that included their anticipated flows and waste loads for both the Ford plant and the SK battery plant based on their knowledge of the anticipated plants. Of the total design capacity of 5.1 MGD, the Ford/SK site has been allotted 3.2 MGD. The remaining 1.9 MGD is be reserved for the technical school and other developments onsite.

2. Peak Flow

There is no existing sewer collection system at the Megasite. Although no peak flow rate has been required by Ford and SK Innovations, the Megasite WWTP is designed to hydraulically pass a flow rate of 10.2 MGD to accommodate for the possibility of inflow and infiltration in an aged collection system. The forcemain to transport the treated effluent from the wastewater treatment plant to the Mississippi River is rated for a flow of 5.1 MGD. Since only 5.1 MGD can be transported to the Mississippi River, peak treated wastewater from rainfall events can be stored in the emergency effluent lagoon until it can be pumped to the Mississippi River. The emergency effluent lagoon has a holding capacity of 71.4 million gallons which is 14 days storage at a 5.1 MGD flow.

B. Characterization of Flows and Waste Loads

The Ford/SK plant will be pre-treated and required to meet the United States Environmental Protection Pretreatment Standards for Categorical Industrial Users. The Megasite Authority has begun the process of establishing the pretreatment program and has had talks with TDEC concerning the pretreatment limits. The waste data that Ford provided was used for the 3.2 MGD flow anticipated form the Ford/SK facilities. The 3.2 MGD flow from Ford/SK includes approximately 0.5 MGD of domestic flow. Traditional textbook values were used for the remaining 1.9 MGD capacity to be used for the technical school and remaining acreage for future development. This is the same design practice used for all municipal wastewater treatment plants as they are all designed with excess capacity for future growth. The resulting waste loads for the design of the wastewater treatment plant are summarized below on Table No. 1.

Table No. 1
Proposed Design Waste Load Conditions

Characteristic	Design
Average Flow (MGD)	5.1
5-day Biochemical Oxygen Demand (LB/DAY)	7,600
Total Suspended Solids (LB/DAY)	4,500
Total Kjeldahl Nitrogen (LB/DAY)	730

C. Unit Process Design Parameters

1. Preliminary Treatment Facilities

Below is a short description of the unit processes incorporated into wastewater treatment plant to serve the Memphis Regional Megasite. Attached in the appendix is a unit process schematic drawing.

a. Screening

The proposed screening facilities will consist of two mechanically cleaned bar screen with one-quarter inch openings. The mechanically cleaned bar screens will be located in open channels at the proposed headworks structure. Each bar screen channel is four feet wide and has a depth of five feet. Each of the fine screens will be designed to accommodate a 10.2 MGD hydraulic loading when the screen is 30% blinded without overflowing the screen channel. Isolation gates are provided such that each mechanically cleaned screen may be taken out of service for maintenance while the other screen remains in service. Screenings from the ¼-inch opening fine screens are estimated to be generated at a rate of approximately 7.5 ft^3/million gallons. The screening conveyance equipment will be adequate for the screenings generated. These screening facilities are considered protective of downstream unit processes based on the characterization of flows and waste loads presented at Section B.

b. Grit Removal

The proposed grit removal facilities will consist of one vortex-type grit removal unit capable of the following minimum grit removal efficiencies at flow rates reaching 10.2 MGD:

- 95 % of grit greater than 75 mesh in size

A bypass of the vortex-type grit removal unit process will be provided by means of manipulating a series of gates. The grit classification, washing and dewatering equipment will be adequate for the grit generated. These grit removal facilities are considered protective of downstream unit processes based on the characterization of flows and waste loads presented at Section B.

c. Flow Measurement and Sampling

The influent sampler is proposed to be located at the headworks structure and automatically vary the influent sampling rate in response to the influent flow rate. Influent flow is measured by a 12-inch Parshall Flume located just downstream of the grit removal unit.

2. Activated Sludge/Nitrification/Advanced Wastewater Treatment

A four-reactor basin sequencing batch reactor (SBR) system will be installed to provide secondary treatment, nitrification, and endogenous denitrification. The SBR Basins are proposed to utilize fine bubble membrane type aeration, submersible mixers, and floating decanters. Flow is split to the appropriate sequencing batch reactor via electronically operated plug valves. One SBR basin is in fill mode at all times. A PLC based control system is proposed which is capable of operating any number or combination of the SBR basins including single basin operation through a cycle consisting of the five proposed phases of anoxic fill, aerated fill, react, settle, and decant. The typical cycle length is six hours but is adjustable by the operator for treatment flexibility. The PLC will monitor the fill rate of the SBR to adjust cycle times in times of peak flows. Dissolved oxygen (DO) sensors are located in each aeration basin, allowing DO control of variable speed blowers. During each SBR basin decant cycle, an electrically operated butterfly valve located on the decant line of the SBR basin slowly opens and allows clear effluent to flow from the SBR basins to the effluent disc filters. The decant flow from the SBR is driven by the static hydraulics of the water surface in the SBR basin, so the decant will begin at its highest flowrate and decrease as the batch is emptied. The maximum flow rate for the proposed decanters is 8,900 gpm. A decant flow meter is provided and can be utilized to throttle the flow through each decant butterfly valve, reducing the flowrates to the effluent disc filters.

The SBR process will be designed to achieve the effluent quality targets listed at Table No. 2 when properly operated. Additionally, the SBR activated sludge system will be designed to provide biological nitrification/endogenous denitrification to reduce total nitrogen in the effluent. In addition to the total nitrogen removal achieved, the biological nitrification/endogenous denitrification capability of the SBR system will improve process stability by avoiding filamentous bulking, enhance removal of many recalcitrant pollutants and reduce energy consumption due to the oxygen credit associated with endogenous denitrification and higher oxygen transfer efficiency.

Table No. 2
Design Effluent Quality Targets for the Megasite
Wastewater Treatment Plant Improvements that
Comply with Requirements of Tennessee Department of
Environment and Conservation Rule Chapter
0400-40-03-.06 Antidegradation
Memphis Regional Megasite Wastewater Treatment Plant Improvements
Stanton, Tennessee
Wauford Project No. 3679

Effluent Parameter	Value
Dissolved Oxygen	1.0 mg/l (minimum)
pH	6.0 S.U. (minimum)
pH	9.0 S.U. (maximum)
Total Suspended Solids	30 mg/l (monthly average)
Total Suspended Solids	40 mg/l (weekly average)
Total Suspended Solids	45 mg/l (daily maximum)
Settleable Solids	1.0 ml/l (daily maximum)
Chlorine, total residual	2.0 mg/l (daily maximum)
E. coli	941/100 ml (daily maximum)
E. coli	126/100 ml (monthly geometric maximum)
BOD_5	25 mg/l (monthly average)
BOD_5	35 mg/l (weekly average)
BOD_5	40 mg/l (daily maximum)

The operational protocol for the four-basin SBR process proposed to achieve the design effluent quality targets listed at Table No. 2, along with nitrification/denitrification, is described hereinafter. The design and operational characteristics associated with this operational protocol at the design flow and waste loads listed at Table No. 1 and producing the effluent characteristics exhibited at Table No. 2 follow:

Total Reactor Volume (4 Basins)	:	5.1 MG at BWL
Individual Basin Length	:	200 feet
Individual Basin Width	:	50 feet
Length to Width Ratio in Reactor Compartment	:	4:1
Bottom Water Level Depth	:	18 feet
F:M Ratio	:	0.05
MLSS Concentration	:	3,384 mg/l
Sludge Production	:	5,740 lbs/day
Hydraulic Retention Time	:	24 hours
Aeration System Type	:	Perforated membrane, fine bubble diffused aeration
Mixing System Type	:	Submersible Mixers (Anoxic Phase) & Perforated fine bubble diffused aeration (Aerobic Phase)

Summer Mass Oxygen Required for Total Reactor Volume	:	8,530 lbs/day
Winter Mass Oxygen Required for Total Reactor Volume	:	8,180 lbs/day
Summer Inlet Cubic Feet per Minute (Air) @ 100°F, 75% RH and 14.33 PSI	:	1,915 ICFM/basin
Winter Inlet Cubic Feet per Minute (Air) @ 0°F, 75% RH and 14.33 PSI	:	1,508 ICFM/basin
Influent Wastewater $CBOD_5$: TKN Ratio	:	10.4:1

3. Effluent Filtration

Effluent disc filters are proposed to filter decant from the SBR basins and provide additional assurance that the Megasite WWTP will meet its effluent limitations. Additionally, the filtered effluent will be better suited for reuse, which Ford is requesting. There are three effluent filter units, each sized to handle 5,000 gpm each. This will allow the staff to have one unit out of operation and still easily handle the peak flow of 8,900 gpm with the other two units. The filters will have a 10-micron filter. Waste as a result of filter backwash cycles drains to the Local Pumping Station. Effluent from the disc filters flows to the Effluent Flow Equalization/Chlorine Contact Basin.

4. Disinfection

The Effluent Flow Equalization/Chlorine Contact Basins receive flow from the effluent disc filters. Operators may choose from two feed points for sodium hypochlorite. The feed point upstream of the effluent disc filters may be used continuously or periodically by the operators in order to prevent biological growth from occurring within the disc filters. The feed point downstream of the disc filters may be used by operators to feed the required sodium hypochlorite to achieve the chlorine residual required for disinfection. The sodium hypochlorite feed pumps are proposed to automatically vary the chemical feed rate in response to the flow rate measured by the decant flow meter. The effluent flow equalization/chlorine contact basins are each designed with a length to width ratio of approximately 30:1. Sufficient volume for the required contact time at peak and average flow rates is maintained within the basins by the effluent pumping station automatic control system. Isolation valves are provided such that one effluent flow equalization/chlorine contact basin may be taken out of service for cleaning and maintenance purposes.

Since the chlorine contact basins are also used for flow equalization, there is significant volume available. Maximum volume for each of the chlorine contact basins is approximately 440,000 gallons (0.88 MG total for both). Using the pump on elevation as the minimum volume for disinfection and one chlorine contact basin out of service, the basin will provide an approximate volume of 188,500 gallons.

The theoretical hydraulic detention time with only one chlorine contact basin in service will be as follows:

Design Flow Rate (5.1 MGD)	:	53 minutes
Peak Flow Rate (10.2 MGD)	:	26.6 minutes

The chlorine contact chamber will be directly connected to the effluent pumping station and can be used as an extended wetwell to hold entire decants if needed. This stored volume along with the variable frequency drives (VFD's) controlling the effluent pump speeds will allow the effluent pumps to operate at a near-continuous discharge rate even when decant discharges from the SBR basins are intermittent when normal influent flow rates are less than design influent flow rate.

At the effluent end of the chlorine contact chamber, there is the Effluent Retention Facility Transfer Pumping Station utilizes two variable speed vertical turbine pumps which have a peak capacity of 10.2 MGD each. Effluent flow is automatically diverted to a 71.4-million-gallon effluent retention facility by the Effluent Retention Facility Transfer Pumping Station when the water level in the effluent flow equalization/chlorine contact basin reaches an adjustable elevation. This flow is measured by an electromagnetic flow meter at the effluent retention facility transfer pumping station.

Dechlorination will be required to comply with the proposed 2.0 mg/l chlorine residual limitation. A chemical feed point for sodium thiosulfate is located on the effluent force main to the Mississippi River for dechlorination purposes. The sodium thiosulfate feed pumps are proposed to automatically vary the chemical feed rate in response to the flow rate measured by the Mississippi River effluent flow meter.

5. Effluent Pumping Station

The Effluent Pumping Station receives flow from the Effluent Flow Equalization/Chlorine Contact Basin. The Effluent Pumping Station also receives flow being returned from the effluent holding lagoon and directly from Ford's retentate from the reverse osmosis process. There are three sets of vertical turbine pumps in the effluent pumping station.

The first set is the Mississippi River effluent pumps. There are four variable speed vertical turbine effluent pumps provide a peak flow of 5.1 MGD effluent pumping capacity to the intermediate effluent pumping station (Covington) with two effluent pumps operating at full speed. Two pumps will always operate at the same time. This flow will be measured by the Mississippi River effluent electromagnetic flow meter.

The second set of pumps are the effluent transfer pumps to Ford's storage tank for further treatment prior to being used in the assembly plant. This set contains three variable speed vertical turbine pumps each is rated at 2,080 gpm (3MGD). The treated storage tank on Ford's site is 400,000 gallons. This flow will be measured by the Ford Effluent Transfer electromagnetic flow meter. Downstream of this flowmeter is a vault for sodium hypochlorite injection prior to leaving the site going to the Ford site.

The last set of pumps will be used for onsite use of treated effluent. This set will include two pumps with variable speed vertical turbine effluent pumps provide flushing water for various plant processes including the headworks equipment and sludge press equipment.

The effluent sampler is proposed to sample flow from the wetwell of the Mississippi River effluent pumps. This will include the plants effluent, any return flow from the storage lagoon, and any direct flow from Ford's retentate from the reverse osmosis plant. The sampler's rate which varies proportionally in response to the flow rate measured by the Mississippi River effluent flow meter. If effluent flow from the wastewater treatment plant exceeds the capacity of the effluent pumps (5.1 MGD) or if the effluent pumps or force main are shut down for maintenance, effluent flow is first stored in the effluent flow equalization/chlorine contact basins until they become full and is then automatically diverted to a 71.4-million-gallon effluent retention facility by the Effluent Retention Facility Transfer Pumping Station. Isolation valves are provided such that the Effluent Pumping Station can be taken out of service and all effluent flow can be directed to the Effluent Retention Facility Transfer Pumping Station.

6. <u>Effluent Storage</u>

The Effluent Retention Facility is an earthen basin with a holding capacity of 71.4 million gallons. This basin is being designed and constructed in a separate contract for this project.

The Effluent Retention Facility Return Pumping Station utilizes variable speed submersible pumps which have a peak capacity of 5.1 MGD each. At a time deemed appropriate by the operators, treated wastewater stored in the effluent retention facility can be returned to the effluent pumping station by the Effluent Retention Facility Return Pumping Station by manually initiating operation of one or both effluent retention facility return pumps. The pumps will automatically stop when the water level in the effluent retention facility reaches low level.

7. Sludge Processing and Disposal

a. Sludge Digestion

The Aerobic Sludge Digesters are designed to achieve 38% volatile solids reduction during the winter months. Biosolids are pumped from the SBR basins to the aerobic digesters utilizing constant speed submersible wastewater pumps which are located in each SBR Basin. Sludge wasting is automatically initiated by the SBR control system. The operator selects a desired volume of sludge to be wasted. The waste sludge pump operates until the desired total volume of sludge is wasted as measured by the waste sludge flow meter. A PLC based control system is proposed which provides for automatic aeration for the Aerobic Sludge Digesters. During each Aerobic Digester decant (manually initiated), an electrically operated telescopic valve located on the decant line of the Aerobic Digester slowly lowers and allows clear supernatant to flow from the Aerobic Digester to the Local Pumping Station.

b. Sludge Dewatering System

The Sludge Processing Building is proposed to house two sludge screw presses which results in a dewatered sludge having a target solids content of 20%. Wastewater from the sludge dewatering process drains to the Local Pumping Station. The final product of the dewatering process is a class “B” sludge for land application or landfill disposal. The current operations will be to landfill the dewatered sludge.

8. Effluent Force Main

Effluent from the Megasite wastewater treatment facilities is proposed to be pumped through a force main to a discharge point at river mile 768 of the Mississippi River. The Effluent Force Main, Intermediate Pumping Station, and Mississippi River Outfall have previously been approved by TDEC and are currently under construction.

D. Pump Hydraulics

1. On Site Pumping Station

The on-site pumping station will consist of a duplex submersible-type pumping station on the east side of the wastewater treatment plant. The purpose of the on-site pumping station is to transport on-site waste collected throughout the site including the administration/laboratory building, headworks, sludge dewatering, and basin drains. The collected wastewater is pumped to the headworks for treatment by the plant. The system head curve and the pump discharge capacity are depicted in Appendix.

2. Effluent Retention Facility Transfer Pumping Station

The Effluent Retention Facility Transfer Pumping Station utilizes two variable speed vertical turbine pumps which have a peak capacity of 10.2 MGD each. Effluent flow is automatically diverted to a 71.4-million-gallon effluent retention facility by the Effluent Retention Facility Transfer Pumping Station when the water level in the effluent flow equalization/chlorine contact basin reaches an adjustable elevation. The system head curve and the pump discharge capacity are depicted in Appendix.

3. Effluent Retention Facility Return Pumping Station

The Effluent Retention Facility Return Pumping Station utilizes variable speed submersible pumps which have a peak capacity of 5.1 MGD each. At a time deemed appropriate by the operators, treated wastewater stored in the effluent retention facility can be returned to the effluent pumping station by the Effluent Retention Facility Return Pumping Station by manually initiating operation of one of the effluent retention facility return pumps. The pumps will automatically stop when the water level in the effluent retention facility reaches low level. The system head curve and the pump discharge capacity are depicted in Appendix.

4. Effluent Pumping Station

The effluent pumping station will consist of four identical vertical turbine-type variable speed pumps. These effluent pumps will operate in tandem with the proposed 18-inch size effluent force main to pump disinfected effluent to the Mississippi River. Additionally, three variable speed vertical turbine pumps will pump through a 12-inch forcemain to provide treated effluent to the Ford reuse storage tank for further treatment prior to being used in the assembly plant. The Effluent Pumping Station will also have two variable speed vertical turbine effluent reuse pumps provide flushing water for various plant processes including the headworks equipment and sludge press equipment.

The four Mississippi River effluent pumps will be sized to pump 1,800 gpm each, this will allow the 5.1 MGD flow to be pumped with two pumps operating at full speed. This will leave two pumps for redundancy. The three Ford effluent reuse pumps are rated for 2,080 gpm each to provide the maximum desired flow of 3.0 MGD in a 12-hour time frame. The two remaining vertical turbine pumps will be rated for 300 gpm each to furnish chlorinated effluent for washdown and equipment wash water.

E. Chemical Feed Pump Selection

Chemical feed pumps will be required to administer dosages of sodium hypochlorite solution and sodium thiosulfate. It is proposed to use peristaltic metering pumps for both the sodium hypochlorite and sodium thiosulfate feeds. The feeds will be flow paced by magnetic flowmeters.

Preliminary determination of peak dosage rate for sodium hypochlorite solution (12.5 trade percent) is 0.19 gallons/minute.

Preliminary determination of peak dosage rate for sodium thiosulfate solution is 0.06 gallons/minute.

F. Chemical Storage

Chemical storage will be provided in a new totally enclosed, heated and ventilated chemical feed room. Space will be provided for the sodium hypochlorite solution and sodium thiosulfate:

Chemical	Storage Volumes
Sodium Hypochlorite	Sodium hypochlorite solution will be stored in one 6,000-gallon tank
Sodium Thiosulfate	Sodium thiosulfate solution will be stored in one 6,000-gallon tank

G. Reliability Levels for Equipment and Power Supply

The project described in this report will comply with the requirements for Reliability Class II for equipment and electric power systems published at Chapter 1, Sections 1.4 and 1.5 of *Design Criteria for Review of Sewage Works Construction Plans and Documents* effective November 1, 2017.

H. Energy Saving Solutions Considered

Energy saving features incorporated into the project described in this report include

- variable speed drives on all pumps and blowers,
- endogenous denitrification capability, and
- blower controls based on dissolved oxygen and oxidation-reduction potential conditions in the SBR basins to maximize the oxygen equivalence of the denitrification reaction.

I. Odor Control Consideration

Odor control considerations include the location of the influent screenings repositories as far as possible on the site from adjacent residences and the use of grit washing to minimize organic matter in the grit dumpster. Additionally, there is an odor control until at the headworks utilizing water and ozone.

J. Corrosion Control Consideration

Fiberglass, aluminum, and stainless steel (Type 304 and Type 316) and special coatings will be utilized where corrosive conditions could occur such as at unit operations providing processing of raw wastewater and in chemical storage spaces.

K. Not Applicable

L. Not Applicable

M. Flow Data

Flow data will be collected at the following locations in the project described at this captioned report:

• Influent Flow Rate and Totalized Flow Volume	Parshall Flume at the Headworks Structure
• SBR Decant Flow Rate	Magnetic Flow Meter located on the common pipeline transporting decanted flow from the Sequencing Batch Reactors to the Effluent Filtration and Chlorine Contact Basin
• Ford's Reverse Osmosis Retentate Flow to the Effluent Pumping Station	Magnetic Flow Meter located on the 6-inch proposed force main pipeline from Ford discharging to the Effluent Pumping Station
• Treated Effluent Transfer to the Storage Lagoon	Magnetic Flow Meter located on the 16-inch proposed force main pipeline discharging to treated effluent storage lagoon
• Treated Effluent Returned Flow from the Storage Lagoon	Magnetic Flow Meter located on the 16-inch proposed force main pipeline discharging to the Effluent Pumping Station

• Treated Effluent Transfer to the Ford Site	Magnetic Flow Meter located on the 12-inch proposed force main pipeline discharging to Ford's storage tank
• Effluent Flow Rate and Totalized Flow Volume to Outfall 001	Magnetic Flow Meter located on the 18-inch proposed outfall force main pipeline discharging to Mississippi River

N. Not Applicable

O. Potential Reuse

Ford has the goal of 100% reuse water for the non-domestic water needs for the assembly plant. The wastewater treatment plant will have separate effluent pumps to transfer treated effluent to the Ford site for further treatment prior to use in the assembly plant. Additionally, there will be onsite use of treated effluent for flushing water for various plant processes including the headworks equipment and sludge press equipment.

P. Status and Coverage of All Required/Anticipated Permits

1. National Pollutant Discharge Elimination System Permit (NPDES)

The current NPDES Permit No. TN0081906 has an effluent flow rate of 5.1 MGD.

2. Notice of Intent (NOI) for General NPDES Permit for Stormwater Discharges from Construction Activities (TNR 100000)

This NOI will be submitted after the construction contractor for the project described at this captioned report is selected.

Q. Tables Demonstrating Unit Process Conformance to the Appropriate *Design Criteria* Requirements

1. Nitrification

Design Criteria	Proposed Design
Use 4.6 pounds of oxygen per pound of Kjeldahl nitrogen to calculate oxygen requirements for nitrification. (Chapter 8.2.1.2a.)	Used 4.33 pounds of oxygen per pound of nitrogen oxygen demand. Nitrogen oxygen demand equals mass influent total Kjeldahl nitrogen minus 0.082 times the mass of biosolids generated minus the mass of effluent total Kjeldahl nitrogen.

Design Criteria	Proposed Design
Provide capability to maintain 2.0 mg/l or greater dissolved oxygen concentration in aeration basin (Chapter 8.2.1.2b.)	Capability to maintain 2.0 mg/l dissolved oxygen concentration in aeration basin is provided.
Provide 7.1 pounds of alkalinity as $CaCO_3$ per pound of NH_3-N oxidized (Chapter 8.2.1.2e.)	Alkalinity is sufficient in the raw wastewater to provide more than 7.1 pounds of alkalinity per pound of NH_3-N oxidized.
Provide means to maintain pH values within range of 6.5 to 8.4 standard units (Chapter 8.2.1.2d.)	Alkalinity is sufficient in the raw wastewater to maintain pH in the range of 6.5 to 8.4 standard units.

2. Disinfection

Design Criteria	Proposed Design
Dosage capacity for nitrified effluent shall be between 2 and 6 mg/l (Chapter 10.2.2.2)	Dosage capacity for 4 mg/l at peak flow rate is provided.
Mixing in pipe flow must provide for a Reynolds number of 1.9×10^4 or greater (Chapter 10.2.2.3a)	A 30-inch static mixer is provided after the injection quill to provide adequate mixing.
Pipes up to 30 inches in diameter must have chlorine solution injected into the center of the pipe (Chapter 10.2.2.3a)	A center-of-pipe injection quill will be used on the 30-inch size pipe.
Chlorine must be applied at least 10 pipe diameters upstream from inlet to chlorine contact tank (Chapter 10.2.2.3a)	Chlorine injection point is 60 feet upstream from inlet to chlorine contact tank in a 30-inch size pipe.
Chlorine contact tank shall provide a minimum of 30 minutes detention at average design flow and 15 minutes at daily peak flow (Chapter 10.2.2.5)	Chlorine contact with only one basin provides the following theoretical hydraulic detention times: Design Flow (5.1MGD)-53 minutes Peak Flow (10.2MGD)–26.6 minutes

3. Effluent Pumping Station

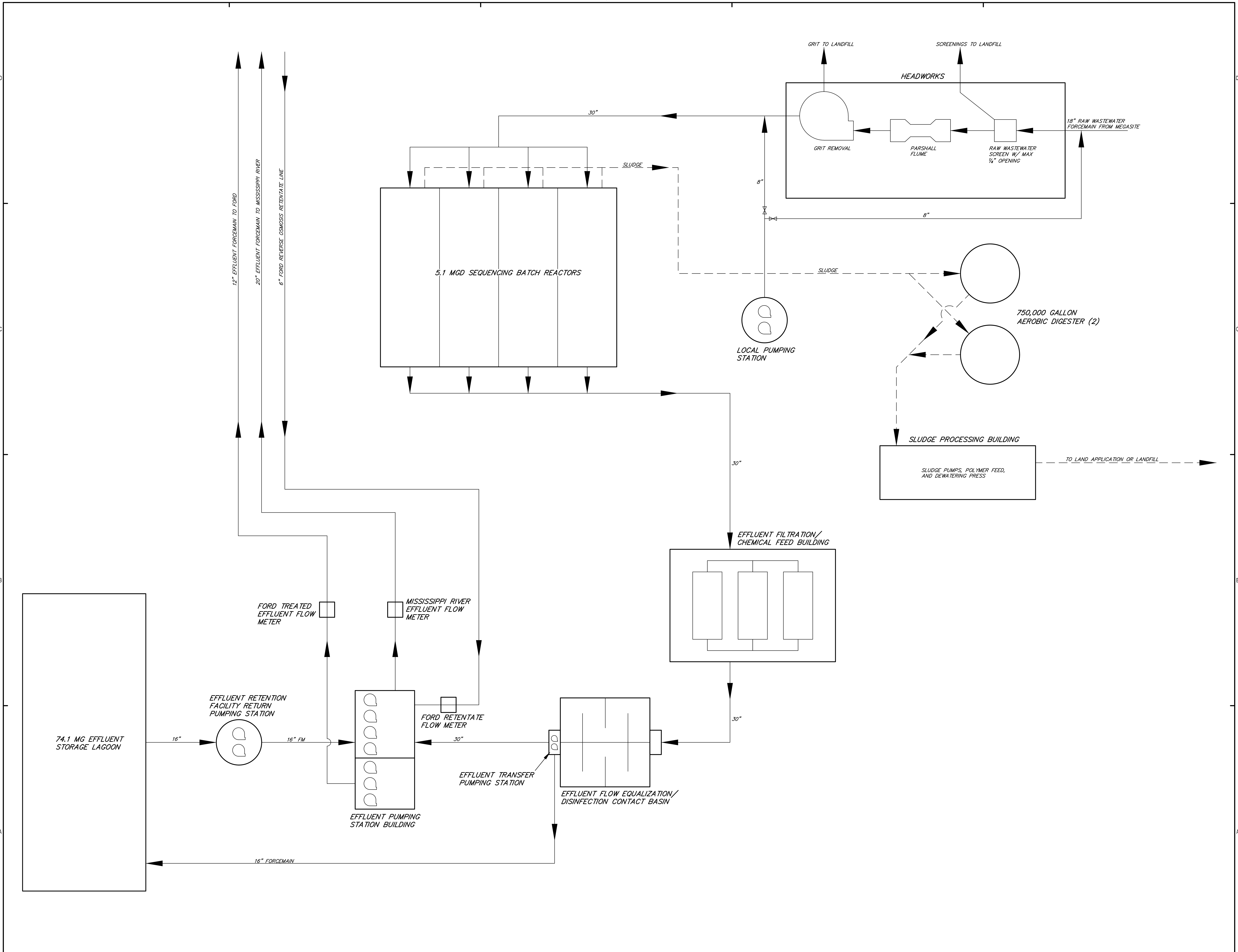
Design Criteria	Proposed Design
Protection from the 100-year flood for the station's operational components must be provided (Chapter 2.5.1)	All operational components are above the 100-year flood elevation
For three or more units the Division requires a design to fit actual flow conditions and must be of such capacity that, with any one unit out of services, the remaining units will have capacity to handle the maximum wastewater flow (Chapter 2.5.2)	Four identical pumping units are provided. Only two pumps are required to pump the required 5.1 MGD, thus with one unit out of service, the remaining pumps are

capable of handling the 5.1 MGD effluent flow.

R. Recommend Inclusion of Cut Sheets

Attached

APPENDIX



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CONSULTANTS:

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THE SEAL ON THIS DOCUMENT WAS AUTHORIZED BY:

SEAL ID:
DATE:

MEMPHIS REGIONAL MEGASITE

WASTEWATER TREATMENT AND DISPOSAL FACILITIES

STATE OF TN
SBC PROJ #
529/000-02-2010-04

CLIENT PROJECT NO:

NO.	DATE	SUBJECT
A	-	-

REVISION OR ISSUE

SSOE, Inc.
320 Seven Springs Way, Suite 350
Brentwood, TN 37027
T 615-661-7585

SSOE PROJECT NO:	012-02080-16
WAUFORD PROJECT NO:	3679
PROJECT MANAGER:	D. HIBDON
DESIGNED:	S. DANIEL
CHECKED:	G. DAVENPORT

DRAWING TITLE:
UNIT PROCESS SCHEMATIC
NO SCALE

DRAWING NO:
100-C-XXX

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DATE: Apr 18, 2022 - 3:28pm USER: Alan

DUPERON

Custom Application Table

Bar Screen Headloss & Channel Hydraulics

IMPERIAL (English) UNITS

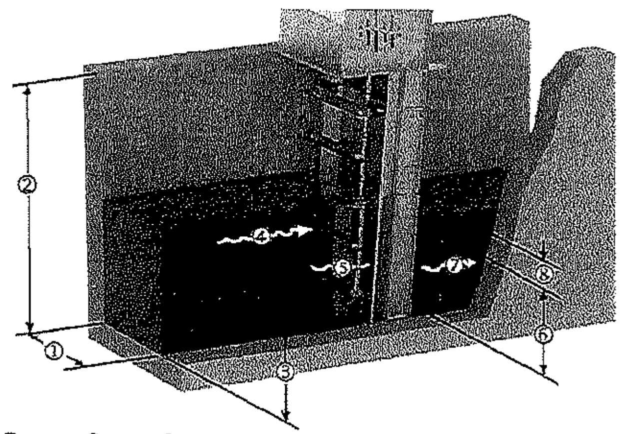
Date: 12/1/2021

Project: Memphis Regional WWTP, TN

DC #: 12191 R1

Notes: Channel Dimensions - 4.00 ft wide x 5.00 ft deep

Average Flow - 5.10 MGD
Peak Flow - 10.20 MGD



Case No.	Prod. Model	Flow Rate (MGD)	Opening Between Bars (in.)	① Channel Width (ft.)	Unit Width (ft.)	② Channel Depth (ft.)	Percent Blinding (%)	Bar thick-ness (in.)	Side Close-outs (ft.)	Base Plate Height (ft.)	Flow Coeff. ($1/C^2$)	③ Upstr. Water Level (ft.)	④ Upstr. Velocity (fps)	⑤ Slot Velocity (fps)	⑥ Downstr. Water Level (ft.)	⑦ Downstr. Velocity (fps)	⑧ Head Loss (in.)	Comments
1	FPFS	10.20	0.25	4.00	4.00	5.00	25%	0.25	0.58	0.23	0.99	3.00	1.31	4.13	2.76	1.43	2.83	10.20 MGD, 25% Blinding, USWL 3.00 ft
2	FPFS	5.10	0.25	4.00	4.00	5.00	25%	0.25	0.58	0.23	0.99	1.50	1.31	4.16	1.26	1.56	2.87	5.10 MGD, 25% Blinding, USWL 1.50 ft

Duperon requires a minimum of 1.00 ft water depth when the unit is in operation to keep the SSTL FlexLinks lubricated and ensure an optimal amount of screening area. This does not apply to LowFlow, FR IQ, and GTS units.

Head loss is calculated using Bernoulli equation: $HL=(1/C^2)*(V^2-v^2)/(2g)$. Flow coefficient $(1/C^2)=1.43$ should be used for general applications (FP,HD,SCT,FRIQ≥.62). $(1/C^2)=.99$ is used for teardrop bars (LF,FPFS, FPFS-M, FRIQ≤.5, GTS). ‡

At design average flow conditions, approach velocities should be no less than 1.25 fps, to prevent settling. ‡‡

Satisfactory designs have provided for velocities of 2 to 4 fps through the openings of mechanically cleaned screens.‡‡‡

References: ‡Hydraulic Similarity of Headloss Predictions (WEF abstract) 2010, L.Botero, M.Woodley. ‡‡Recommended Standards for Wastewater Facilities (10 States), 61.122 (2014). ‡‡‡WEF MOP 8 5th ed. 2010.

Model VMR Multi-Rake Screen

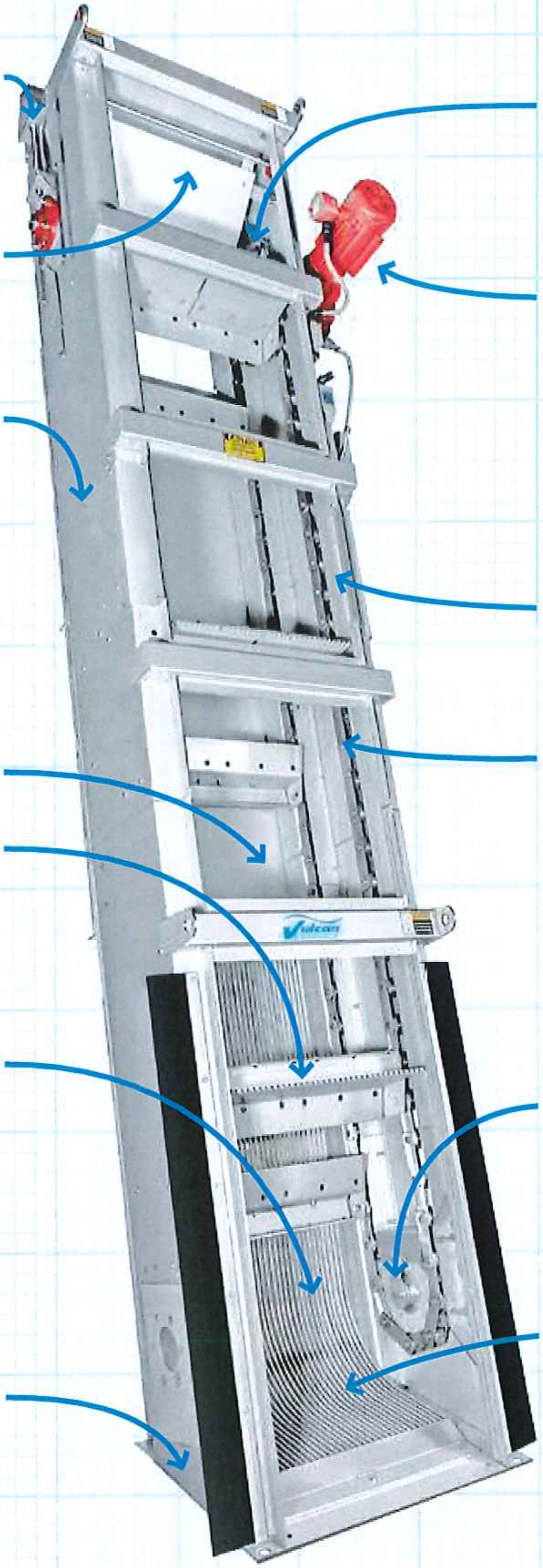
Product Information Guide

Find more product information at:

vulcanindustries.com

Vulcan
THE PROVEN SCREEN CHOICE

Model VMR Multi-Rake Screen



Chain Take-Up Mechanism

Wiper Mechanism

Internal to screen frame with no brushes or water required.

Stainless Steel Side Frame

Full Frame (as shown), and Spliced Frame (for installation in existing buildings) are available. Standard side frames are formed from 1/4" thick stainless steel plate with four engineered bends for rigidity creating a side frame width of 28" - the strongest frames in the industry.

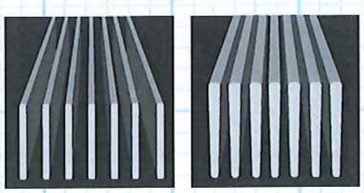
Dead Plate

Rake Heads

Multiple, large-capacity rake heads with deep tooth penetration and positive engagement of the bar rack.

Choice of Rectangular or Trapezoidal Bar Rack

Bar spacing from 1/4" to 3"+



Sized For Your Project

Channel widths from 18 inches to 8 feet, and depths to over 50 feet.

Upper Stainles Steel Drive Sprockets

Drive Options

TEFC and explosion-proof motors available with variable frequency drive (VFD) for soft start and flexible operating speed control.

Stainless Steel Chain Guides

Drive Chains

Heavy-duty stainless steel roller chains.

Lower Engagement System

With choice of guide rail bearings or sprockets.

Lower Curved Bar Rack Bars

Engineered for Capacity, Known for Reliability

Since 1978, Vulcan has been a leader in manufacturing quality wastewater equipment. The **VMR Multi-Rake Screen** continues this tradition of excellence, incorporating many of the same features found in our Mensch Severe Duty™ Bar Screen. Coupling these tried and true features with Vulcan's own UL approved fully automatic and multiple speed controls produces quick and efficient screenings removal.

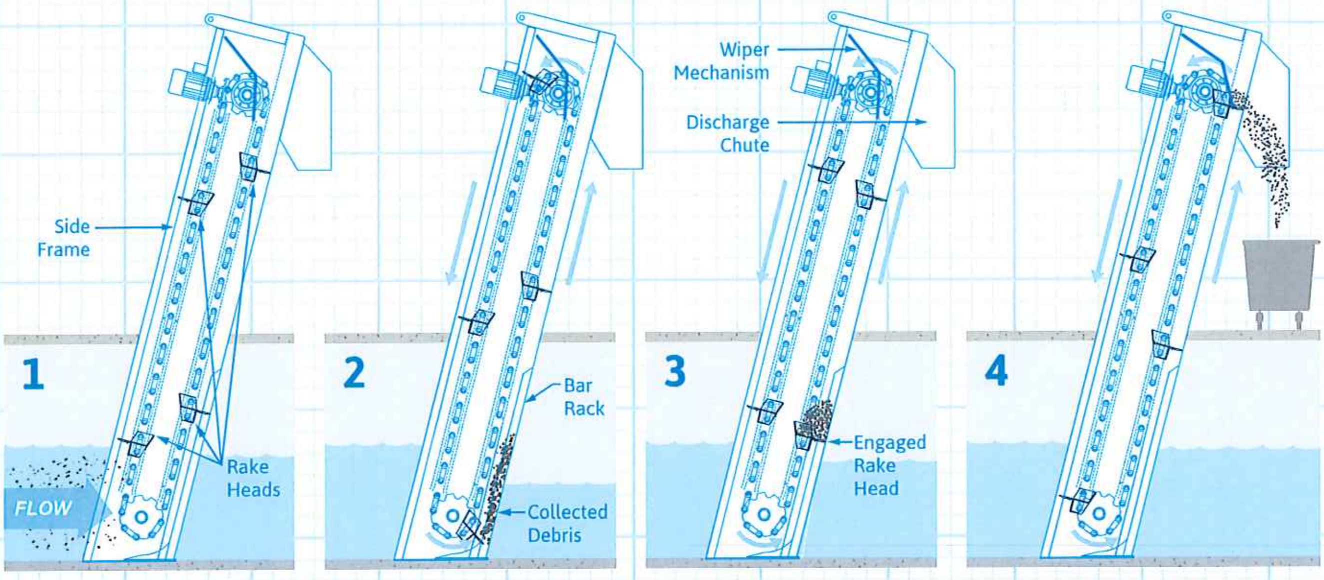
Designed for use in high screenings volume applications, the VMR Multi-Rake Screen can efficiently remove large amounts of screenings with continuous operation. The versatility of the VMR Multi-Rake Screen makes it ideal for special applications of extreme channel depth and severe screen blinding. Heavy duty components used in the VMR Multi-Rake Screen ensure a long and productive service life even under the most severe conditions.

The VMR Multi-Rake screen is an automatic, self-cleaning mechanical bar screen designed for tough primary and secondary screening applications.

The VMR Multi-Rake Screen can be customized for new construction as well as existing channels.

Electrical Controls

Each control panel we provide is designed and manufactured by highly skilled technicians in our own electrical facility to meet the specifications for the particular project. Our panels are UL Listed and can meet UL 508A or UL 698A standards. Prior to shipment, each panel is fully assembled and tested with the equipment. Panels can be installed as free standing, wall mounted or screen mounted. Control system design can include a variety of relay or programmable logic devices to interact with today's SCADA and HMI systems. Our standard control package includes timers with ultrasonic differential level control for starting and stopping the screen. Variable Frequency Drives (VFD) provide soft motor starts and a wide range of operating speeds to accommodate each particular application. Motor current is monitored to prevent damage to the screen drive system if something were to lodge into the bar rack. A reversing feature allows back cleaning of the bar rack to dislodge the object and then reverses again to continue screening.



▲ Sequence of Operations

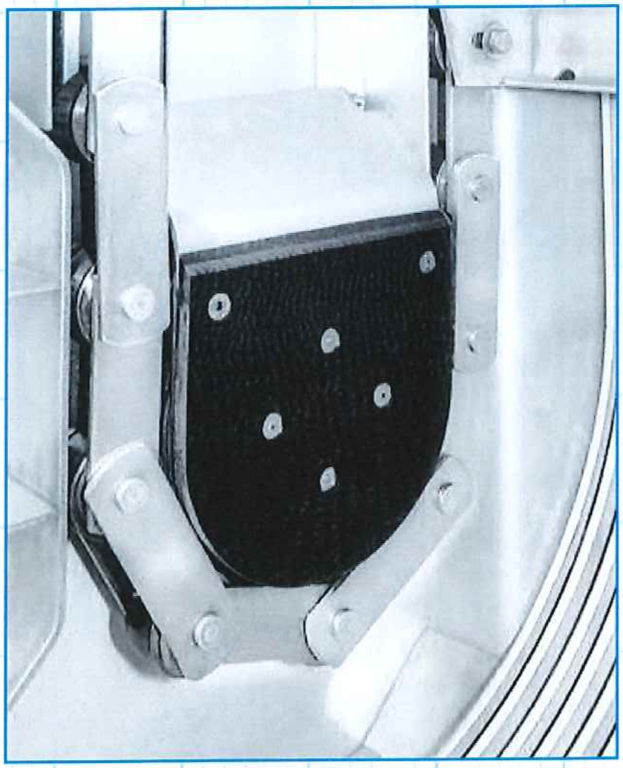
1 The bar rack begins to collect screenings while the bar screen is in the idle position.

2 As screenings collect and the bar rack blinds, the upstream water level rises which initiates a cleaning cycle.

3 One of the multiple rakes engages the bar rack, clearing up the debris and transporting it up the dead plate toward the discharge point.

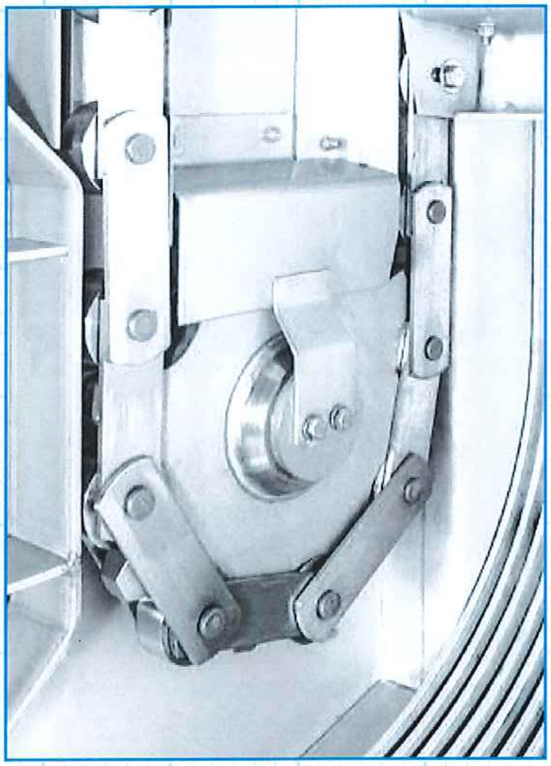
4 When the rake reaches the discharge point, a wiper assembly cleans the rake and directs the screenings to a receiving device (i.e. conveyor, screenings press, dumpster).

Model VMR Multi-Rake Screen



Option 1

Heavy-duty stainless steel chain and lower guide rail engagement system



Option 2

Heavy-duty stainless steel chain and lower sprocket engagement system

Lower Curved Bar Rack

Find more product information at:

vulcanindustries.com

212 S. Kirlin Street
Missouri Valley, Iowa 51555 USA
712-642-2755 Fax 712-642-4256

Vulcan THE PROVEN SCREEN CHOICE

Item B – One (1) Vortex Grit Separator Model GVSP12F-270

General Design Criteria (Each)

Description	Dimension/Capacity	Units
Application	Domestic Sewage Screening	
Inlet/Effluent Orientation	270	Degrees
Upper Chamber Floor	Flat	
Rated Capacity	12.0	MGD
Grit Capture Rating, Rated Capacity	95	% grit > 50 mesh
Grit Capture Rating, Rated Capacity	85	% grit >70 mesh, < 50 mesh
Grit Capture Rating, Rated Capacity	65	% grit >100 mesh, < 70 mesh
Grit Specific Gravity	2.65	
Chamber Diameter	12	Feet
Inlet Width	30	Inches
Effluent Width	60	Inches

Utility Requirements (Each)

Vortex Motor	0.5 HP, 460/3/60	Suitable for use in a Non-Hazardous location
Grit Pump Motor	7.5 HP (Min) 460/3/60	Suitable for use in a Non-Hazardous location

Grit System Detailed Scope of Supply (EACH)

Description	Material
10 inch torque tube	Carbon Steel
Impeller	Carbon Steel
Collar	Carbon Steel
1.5 inch water scour piping	Carbon Steel
4 inch grit lift piping	Carbon Steel
Fabricated steel support base for drive housing	Welded Steel
Turntable with annular bearing raceway, drive shaft fastened to gear hub, and ball bearings protected by elastomer seal	High Carbon Chrome Alloy Steel
Helical gear reducer directly connected to motor	High Carbon Chromium Bearing Steel
Pinion	Heat Treated Alloy Steel
Solid external main gear	Alloy Hardened Steel
Precision gear/bearing set with fully contoured raceways for drive unit	Forged Steel, Hardened to 58-60 RC
Motor and directly coupled reducer	
Drive supplied with paint system	
One (1) 1.5 inch ball valve to control water scour line	Brass

Process Design

Design Summary

Parameter	One Unit Off	All Units Operating
Number of Units and Redundancy	2	3
WesTech System Model	SuperDisc™ TD 2420-18 Tank Mounted	
Disc and Cassette Properties		
Nominal Pore Size	10 micron	
Installed Discs / Disc Capacity per Unit	18 / 20	
Filter Disc Diameter	2.4 m	
Cassettes per Disc	10	
Total Effective / Submerged Surface Area	1,666.2 ft^2	2,499.2 ft^2
Hydraulic Loading		
Maximum (Peak Condition)	5.4 gpm/ft^2	3.6 gpm/ft^2
Maximum Total Head Loss	16 – 18 in	
Estimated Backwash Frequency	Intermittent, Estimated 30% of Time	
Estimated Backwash Cycle Time	30 sec	
Operating Flow Rates		
Average Gross Flow Rate	5,000 gpm	
Peak Gross Flow Rate	9,000 gpm	
Maximum Backwash Flow Rate	590 gpm	590 gpm
Backwash Pressure	109 psi	109 psi
Approx. Total Treated Flow Per Day	13.0 MGD	13.0 MGD
Approx. Total Waste Volume per Day	254,783 gpd	382,175 gpd
System Recovery (Peak Flow)	≥98%	≥97%
Estimated Chemical Clean Frequency	Every 3 - 6 Months	

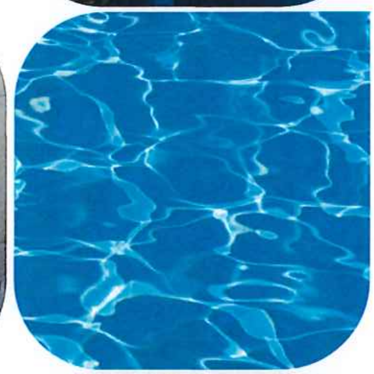
Process Description

The feed water flows via gravity into the SuperDisc filter. The water passes in an inside-out flow path through the filter media. Using a small micron pore size, suspended solids and particulate are retained on the inside of the discs. Filtered water is directed into the internal level tank. During the filtration process, headloss across a disc is increased through build-up of suspended solids and particulate, which translates to increased headloss and a rise in inlet channel water level. A backwash cycle is initiated once the liquid level reaches a high-level probe in the inlet channel.

During a backwash, the drum rotates and a high-pressure oscillating spray is applied to the discs. A centrifugal pump is used to draw filtrate from the level tank as the backwash supply. Level probes on the unit serve as backwash pump protection. The drum is rotated using a drive assembly consisting of a carbon synchronous belt, stainless steel sprocket, and a small motor. The backwash continues until the liquid level decreases to below the low-level sensor for an adjustable time delay (typically 20 seconds).

If the suspended solids loading and/or hydraulic loading exceeds machine capacity, an emergency overflow condition occurs in which influent water overflows the bypass weirs located at the inlet box. When this bypass event occurs, water flows over the bypass weir, around the level tank, and out the effluent nozzle or into the concrete channel to avoid cross contamination. With a static rotor, the filter cassettes can tolerate a differential pressure of up to 16 inches for up to 48 hours.

Parkson™
Treating Water Right



EcoCycle **SBR**™

Sequencing Batch Reactor

The EcoCycle SBR™ from Parkson is an activated sludge secondary treatment process that operates in a batch treatment mode. All treatment steps occur within the same reactor, eliminating the need for separate clarifiers and associated yard piping. The batch process inherently creates the environments necessary for oxidation of organic material, solids separation and biological nutrient removal.

EcoCycle SBR™ Applications

Municipal Treatment

- BOD and TSS <10 mg/l
- Ammonia <1.0 mg/l
- Total nitrogen <3.0 mg/l
- Phosphorous <1.0 mg/l

*Lower limits achieved with filtration.

Industrial Pre-Treatment or Direct Discharge

- Food and beverage
- Landfill leachate
- Refinery and chemical processing
- Pulp and paper
- Manufacturing

SBR Advantages

- Deep tanks and internal clarification reduce overall footprint and yard piping
- Cyclic operation inherently provides anaerobic, anoxic and aerobic conditions for enhanced nutrient removal
- Flexibility of time based control
- Fits within any tank geometry
- Easily expandable
- Energy efficiency of batch processing

What Parkson Offers

- Choices of aeration type
  - VariOx™ jet aeration
  - RetrievOx™ retrievable diffusers
  - Fixed diffusers (fine and coarse bubble)
- Decanter with no in-basin motors or drives
- Dynamic control that preserves aeration and settle steps better than systems with pre-programmed storm modes
- Choice of batch fill or continuous fill operation

Aeration System Options

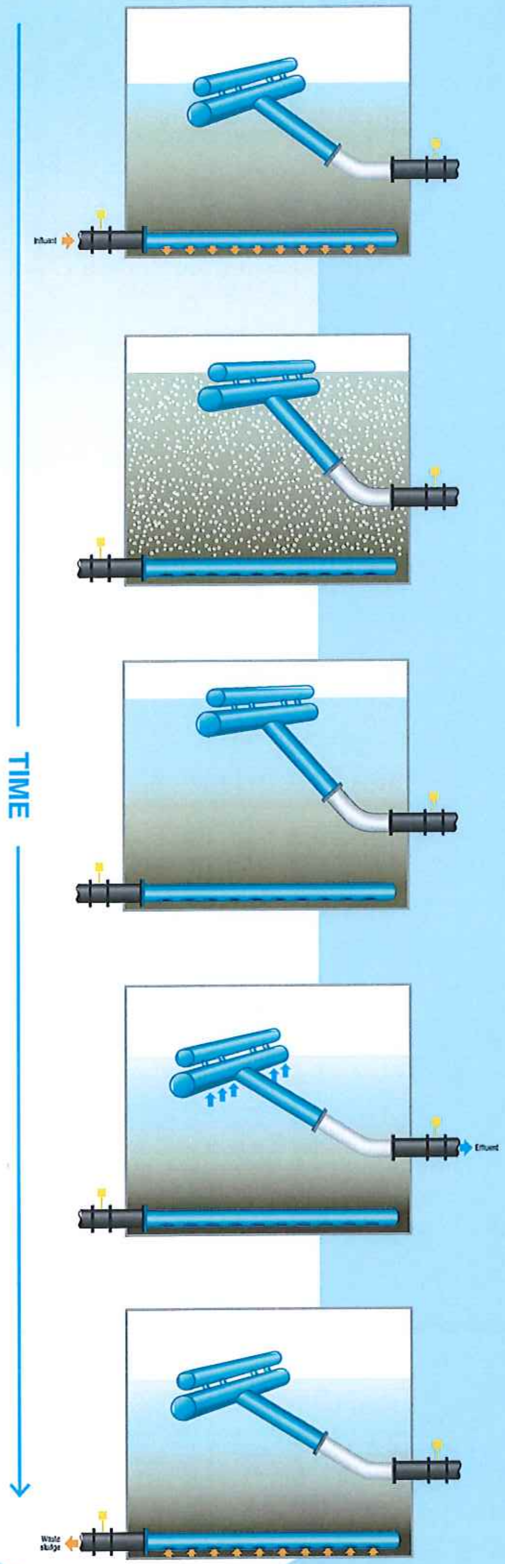
Parkson offers a number of aeration system options. The VariOx™ jet aeration system is a combination aeration and mixing device. Air can be varied or turned off and the jet motive pump will continue to maintain a complete mix condition in the reactor. The jet aeration components are manufactured utilizing FRP with stainless steel supports so maintenance is minimal and operating life is >25 years without loss of aeration efficiency through the jets. Submersible or dry pit jet pumps can be utilized. Parkson also offers fine bubble aeration systems which can be either fixed or retrievable. The RetrievOx™ system allows the operator to access the fine bubble diffusers for cleaning or replacement without taking the reactor out of service. Coarse bubble aeration is also available and can be ideal for smaller facilities where low maintenance and low capital cost are a priority. Floating or submersible mixers can be utilized with the diffusers for nitrogen and phosphorous removal applications.

VariOx™ Jet Aeration

RetrievOx™ Fine Bubble Aeration

Fixed Diffused Aeration

The EcoCycle SBR™ Sequence of Operation



Anoxic Fill

- Influent enters the SBR basin
- No aeration occurs, creating anoxic conditions which promote the growth of well settling bacteria
- Residual nitrate is removed
- Phosphorous Accumulating Organisms (PAOs) release stored phosphorous

React

- Flow is diverted to another SBR basin
- Aeration is turned on
- High oxygen uptake rate during early part of react creates aerated anoxic condition, promoting simultaneous nitrification and denitrification
- Degradation of organic matter occurs
- Ammonia is converted to nitrate
- Aeration can be cycled on and off to drive denitrification process
- Luxury uptake of phosphorous occurs

Settle

- No influent enters the basin
- Aeration and mixing are turned off to create perfect quiescent conditions
- Entire reactor becomes a clarifier allowing solids to settle to the lower portions of the reactor

Decant

- Effluent valve is opened
- Aeration and mixing remain off
- Treated effluent is withdrawn from the upper portion of the reactor
- Floating decanter design maximizes distance between withdrawal point and settling sludge blanket

Idle

- Reactor waits for start of next cycle
- Sludge is wasted from the reactor to maintain desired microbe population

DynaCanter™ Floating Decanter

The Parkson DynaCanter™ floating solids excluding decanter was designed to provide reliable operation without utilizing electromechanical components inside the basin. The decanter utilizes a series of solids excluding check valves that withdrawal effluent from below the surface to preclude floating material from entering the unit. A standard valve is provided in the effluent piping to control decanter operation. When the valve is open, hydraulic force opens the check valves to allow treated effluent to enter the decanter. The floating design maximizes the distance between the decanter intake ports and the settling sludge blanket.

DynaPhase Controls™

The Parkson DynaPhase Controls™ use constant level measurement analysis to determine rate of influent flows and adjust treatment steps accordingly. During high flow events, this unique feature allows the system to dynamically adjust treatment steps based on actual flow rather than toggling between a normal mode and a storm mode. This maintains integrity of aeration, settle and decant steps while addressing the higher hydraulic flow through the SBR. The DynaPhase Controls™ also include a first response feature in which the control system will automatically take a tank offline in the event of a primary equipment failure. Dissolved oxygen control is a standard feature which optimizes power consumption as load conditions vary throughout each day. Blower operation is controlled by high and low D.O. setpoints so that D.O. levels are maintained within a specified band during the aeration steps. Other instrumentation packages can be incorporated for monitoring and / or control. PC based SCADA systems are also available, which incorporate graphic screens showing treatment steps, setpoints, equipment run times, alarms, and trending. Remote monitoring is also available.

Years of Experience

With over 100 years of combined experience, the SBR team at Parkson is an ideal partner with a strong focus on providing reliable and responsive support throughout the project design, execution and startup phases. Parkson Corporation - a recognized worldwide leader in the wastewater industry for over 55 years and with historical and successful projects in municipal and industrial applications - is dedicated to the development, design, installation, service and management of a wide array of innovative biological solutions.

Parkson™
Treating Water Right

Fort Lauderdale
Chicago
Kansas City
Denver

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www.parkson.com

SBR

SBR - WASTE SLUDGE PUMPS

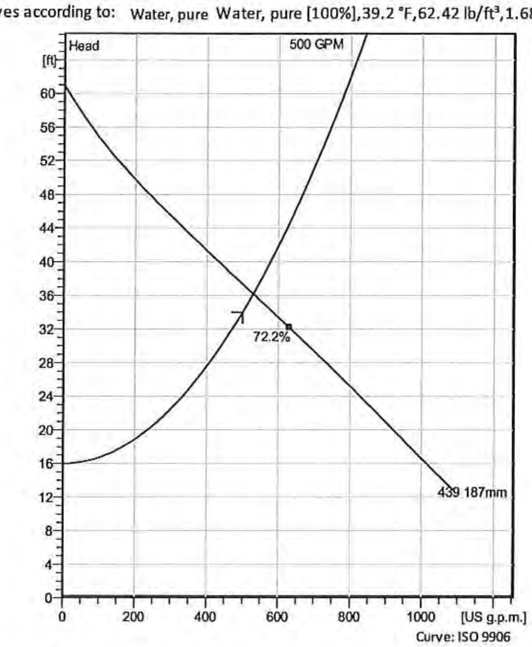
NP 3127 MT 3~ Adaptive 439

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

FLYGT
a xylem brand

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
N3127.060 21-12-4AL-W
10hp

Impeller diameter
187 mm

Installation type
P - Semi permanent, Wet

Discharge diameter
6 inch

Pump information

Impeller diameter
187 mm

Discharge diameter
6 inch

Inlet diameter
150 mm

Maximum operating speed
1745 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Stator housing material
Grey cast iron

Project		**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

NP 3127 MT 3~ Adaptive 439

Technical specification

Motor - General

Motor number N3127.060 21-12-4AL-W 10hp	**Phases** 3~	**Rated speed** 1745 rpm	**Rated power** 10 hp
ATEX approved No	**Number of poles** 4	**Rated current** 13 A	**Stator variant** 12
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 060			

Motor - Technical

Power factor - 1/1 Load 0.86	**Motor efficiency - 1/1 Load** 86.5 %	**Total moment of inertia** 1.25 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.84	**Motor efficiency - 3/4 Load** 88.3 %	**Starting current, direct starting** 69.9 A	
Power factor - 1/2 Load 0.77	**Motor efficiency - 1/2 Load** 88.8 %	**Starting current, star-delta** 23.3 A	

Project		**Created by**	George Peart		
Block	0	**Created on**	2/2/2022	**Last update**	2/2/2022

NP 3127 MT 3~ Adaptive 439

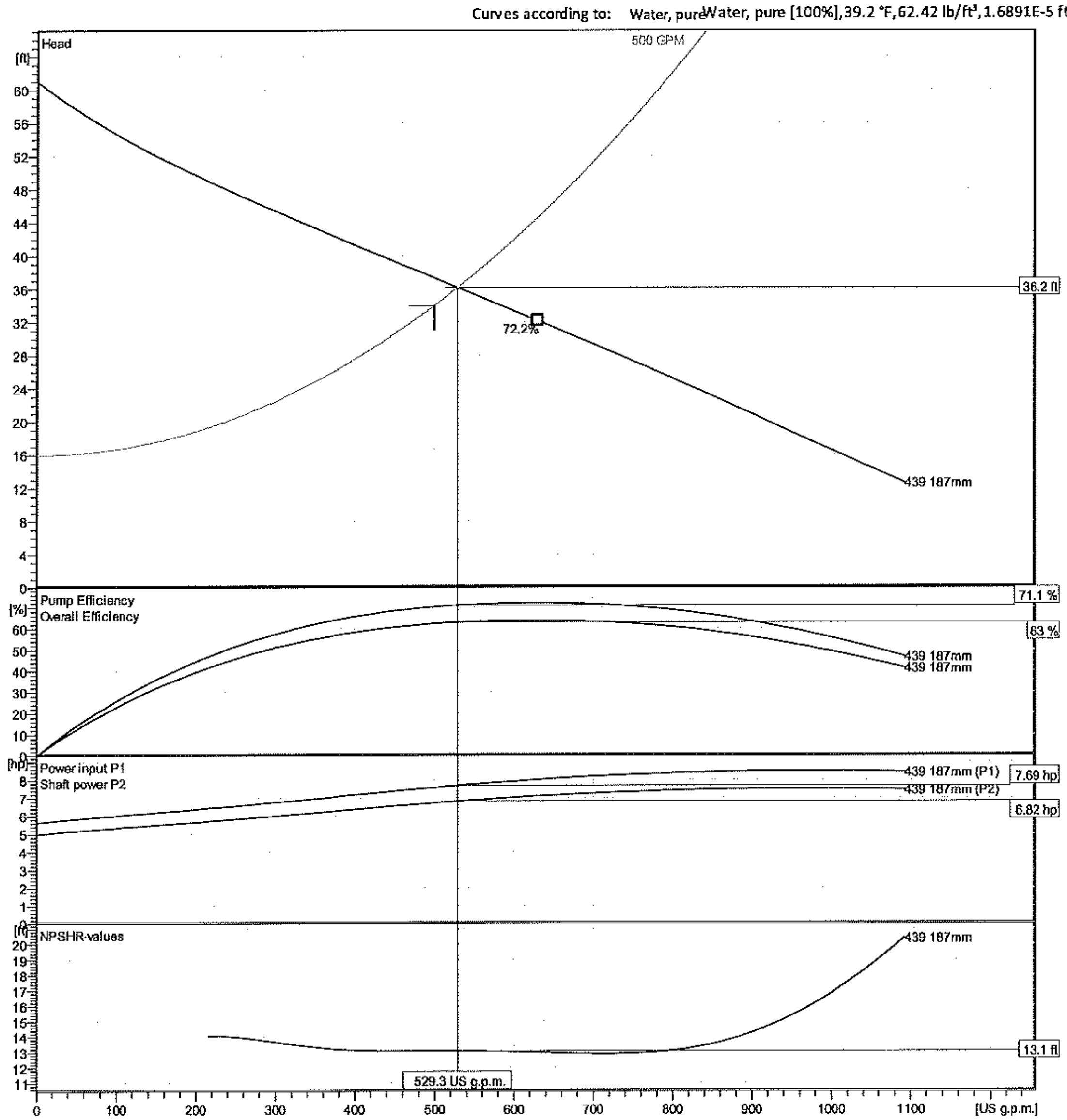
Performance curve

FLYGT
a xylem brand

Duty point

Flow	Head
529 US g.p.m.	36.2 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

Project		Created by	George Peart		
Block	0	Created on	2/2/2022	Last update	2/2/2022

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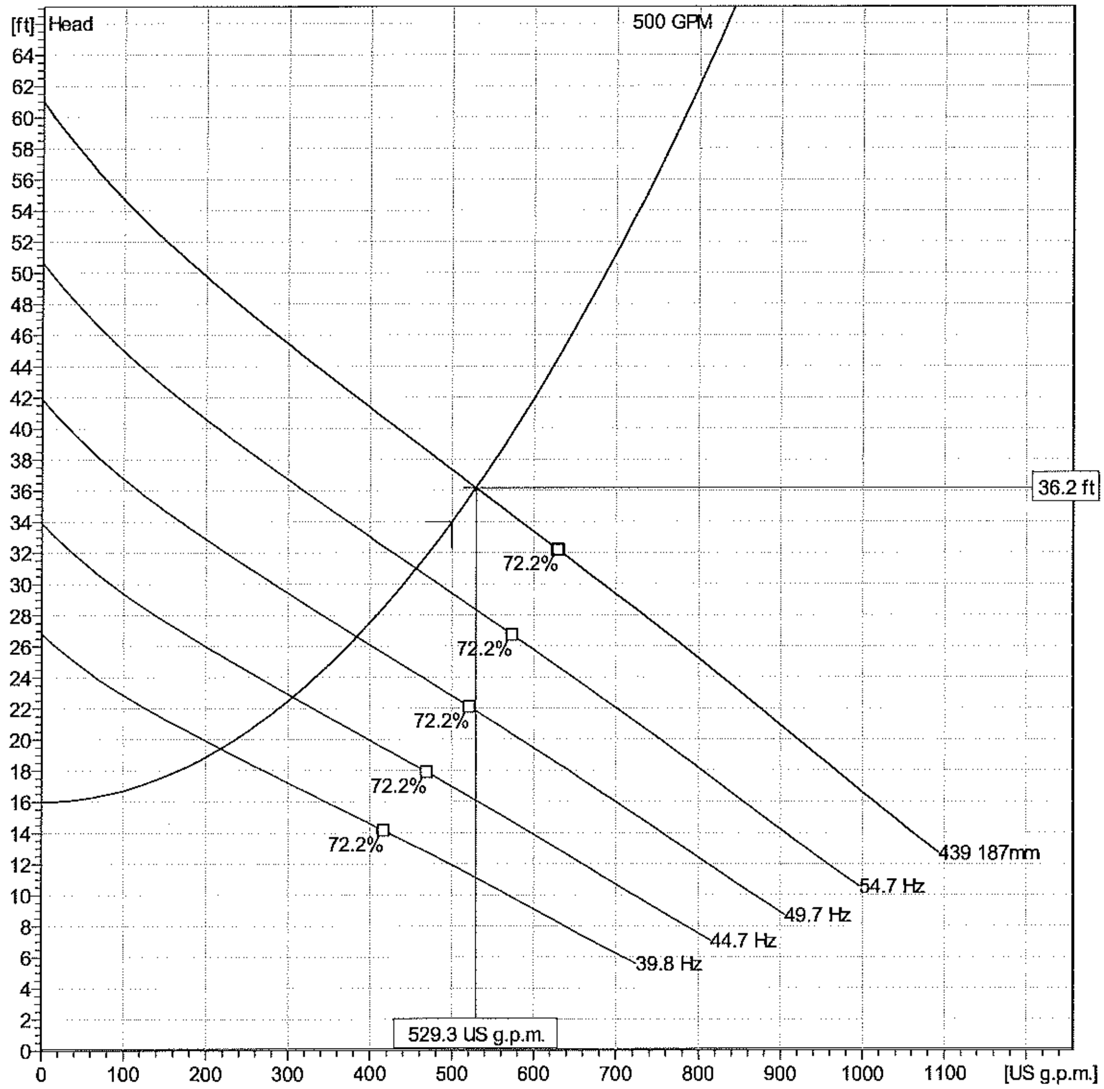
Duty Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

Pumps / Systems	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Spec. Energy kWh/US MG	NPSHre ft
500 GPM	529	36.2	6.82	529	36.2	6.82	71.1 %	181	13.1

Project		Created by	George Peart		
Block		Created on	2/2/2022	Last update	2/2/2022

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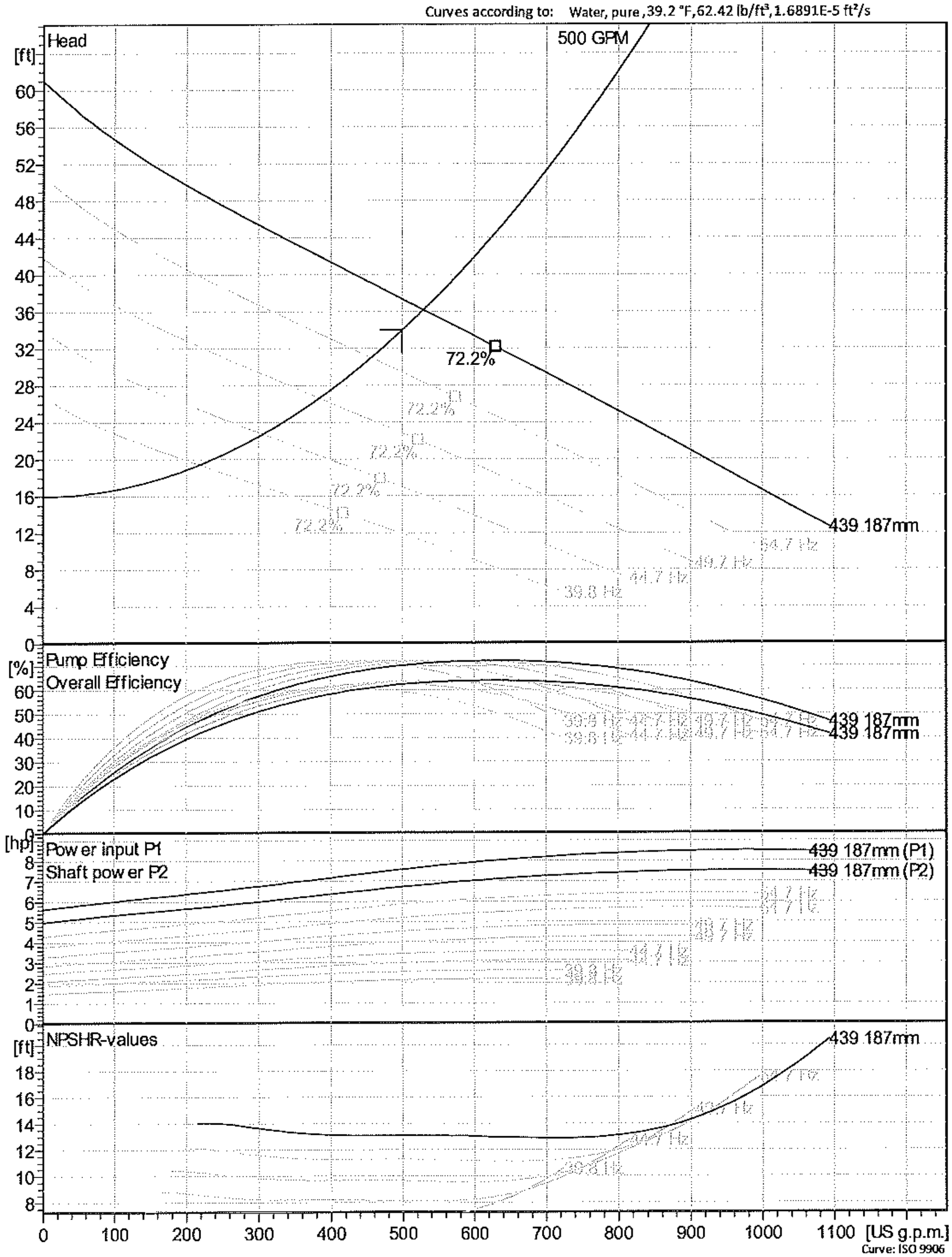
VFD Curve

FLYGT a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Project

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Created on 2/2/2022 **Last update** 2/2/2022

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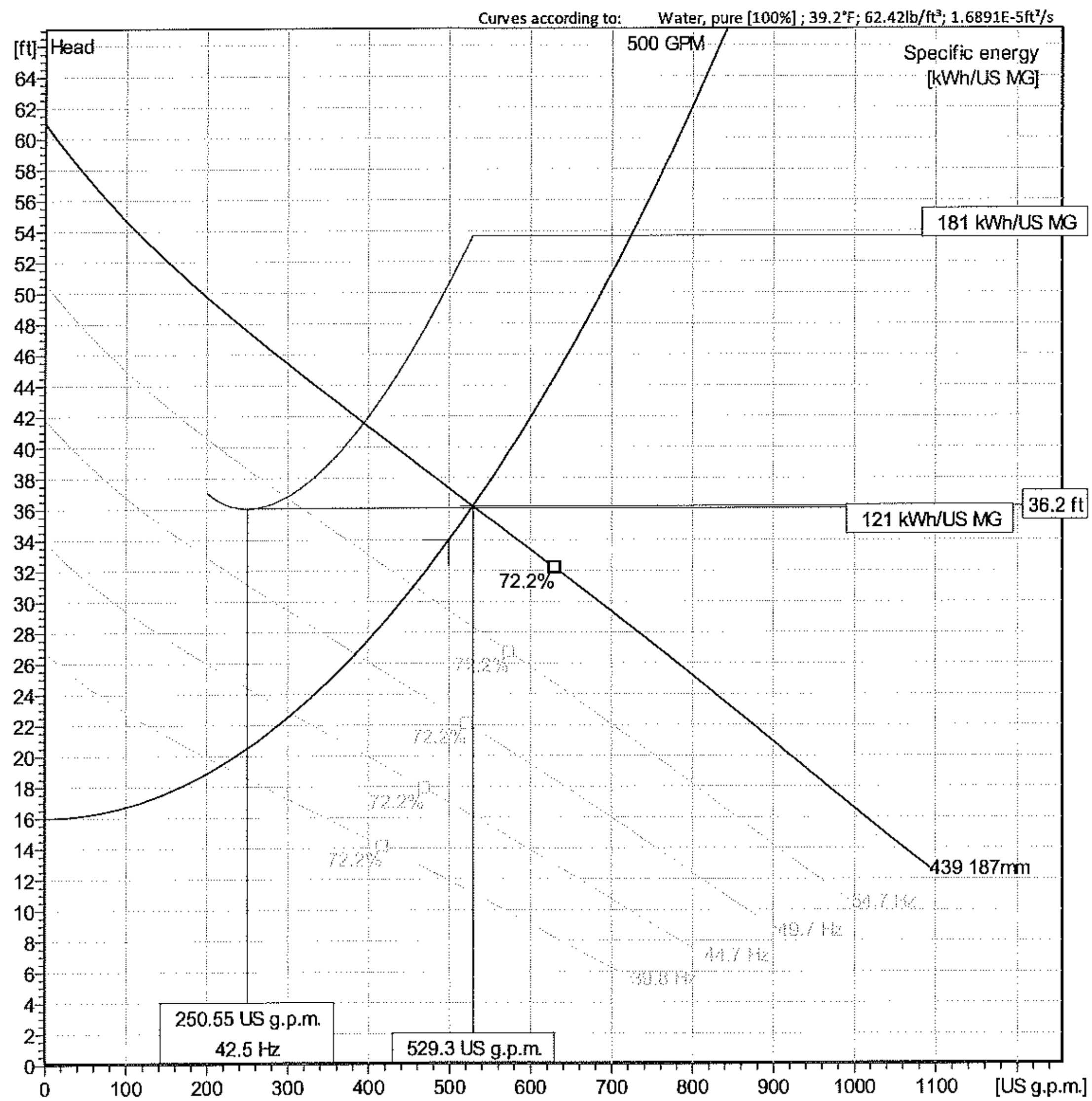
VFD Analysis

FLYGT a xylem brand



Operating Characteristics

Pumps / Systems	Frequency	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Specific energy kWh/US MG	NPSHre ft
500 GPM	60 Hz	529	36.2	6.82	529	36.2	6.82	71.1 %	181	13.1
500 GPM	54.7 Hz	438	29.8	4.73	438	29.8	4.73	70 %	151	10.9
500 GPM	49.7 Hz	367	25.7	3.48	367	25.7	3.48	68.5 %	134	9.32
500 GPM	44.7 Hz	289	22	2.46	289	22	2.46	65.5 %	123	7.92

Project

Block 0

Created by George Peart

Created on 2/2/2022 **Last update** 2/2/2022

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VFD Analysis

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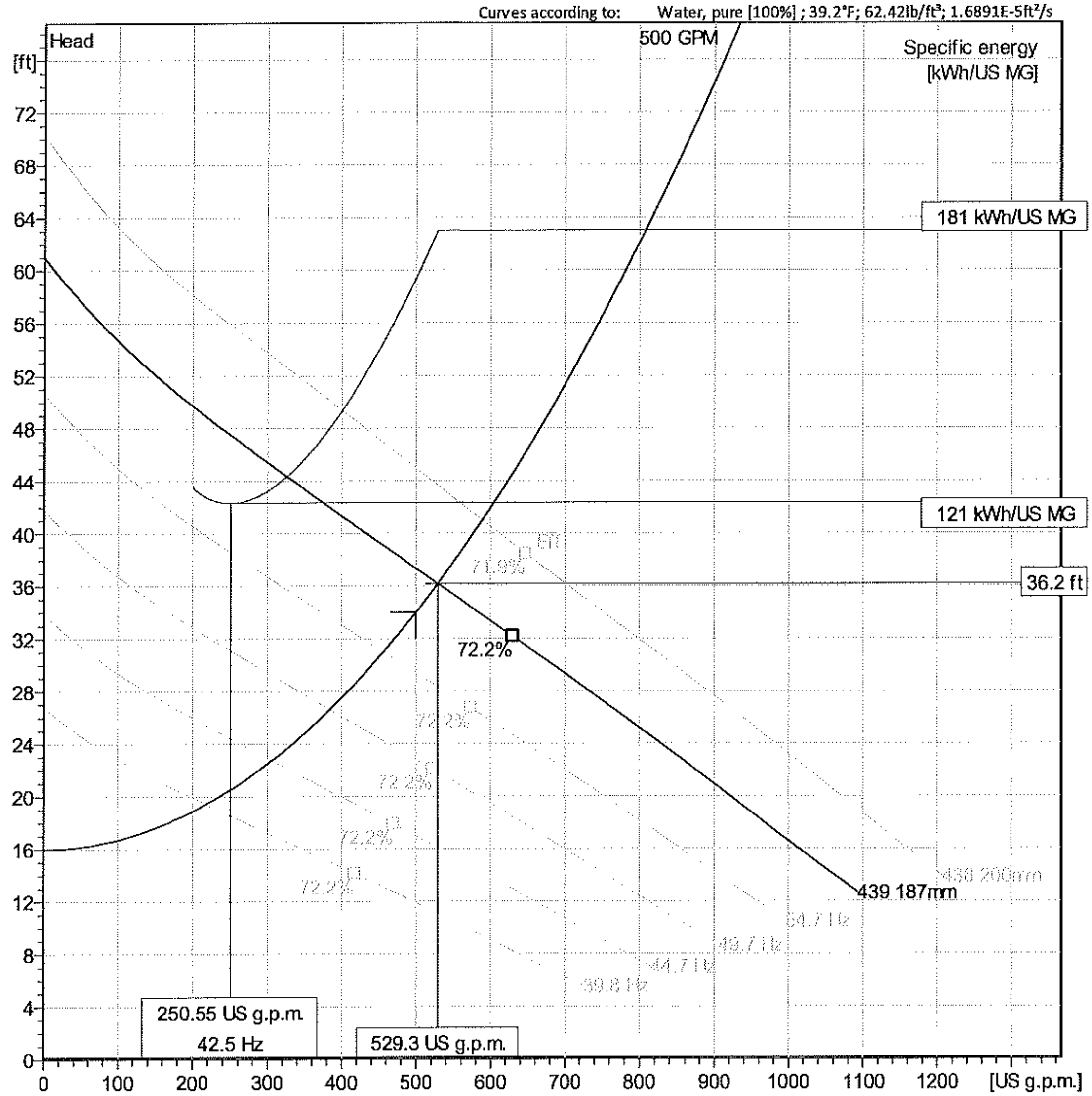
Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
500 GPM	39.8 Hz	201	18.9	1.64	201	18.9	1.64	58.5 %	125	6.78

Project		Created by	George Peart		
Block	0	Created on	2/2/2022	Last update	2/2/2022

Program version 61.0 - 12/1/2021 (Build 144)
Data version 1/12/2022 15:59 A1P1
User group(s) XylemUSA-EXT

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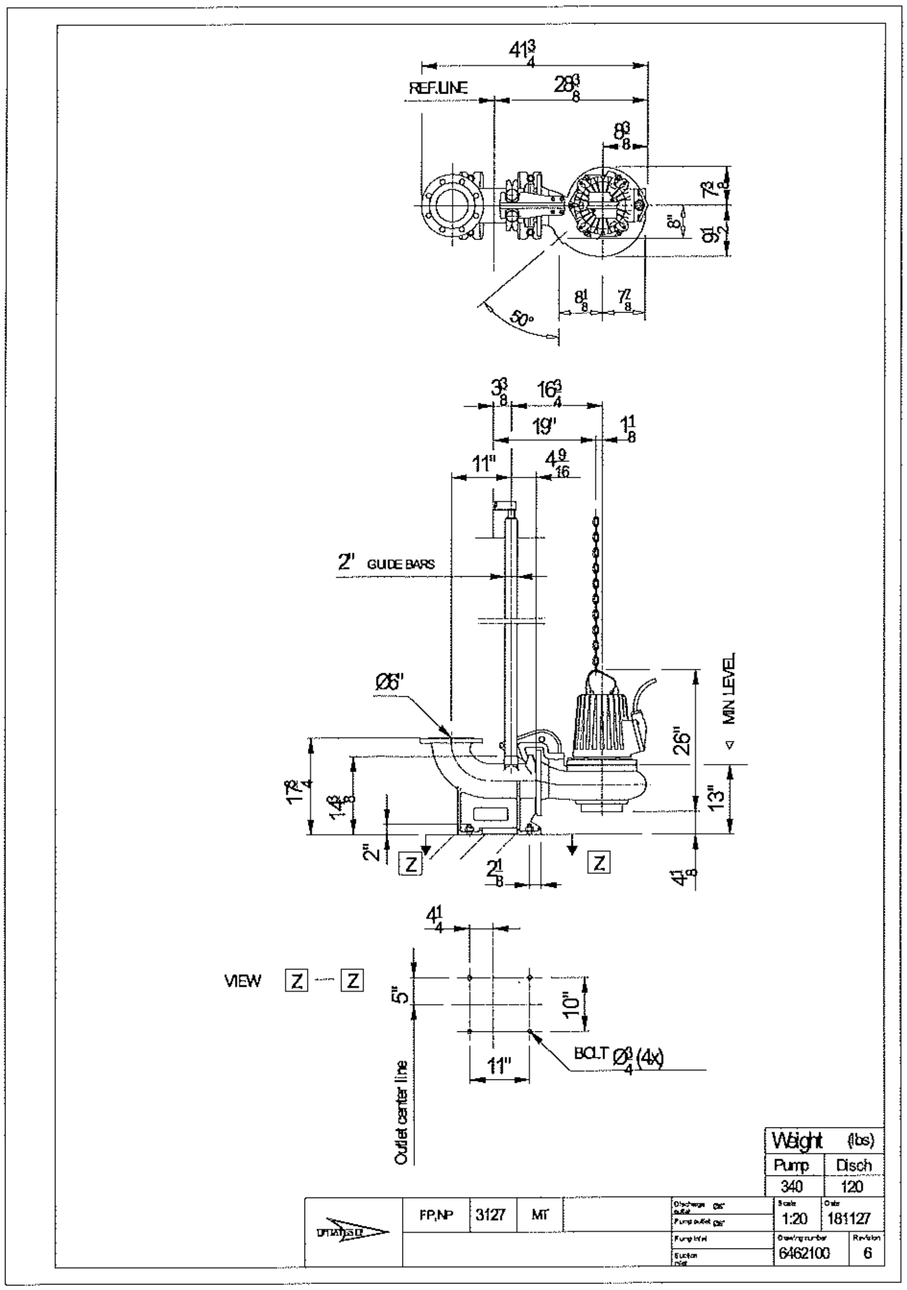
Dimensional drawing

a xylem brand



Project		**Created by**	George Peart	
Block	0	**Created on**	2/2/2022	**Last update** 2/2/2022

SuperDisc™

ISO 9001 WesTech CERTIFIED QUALITY SYSTEM

WesTech®

SuperDisc™

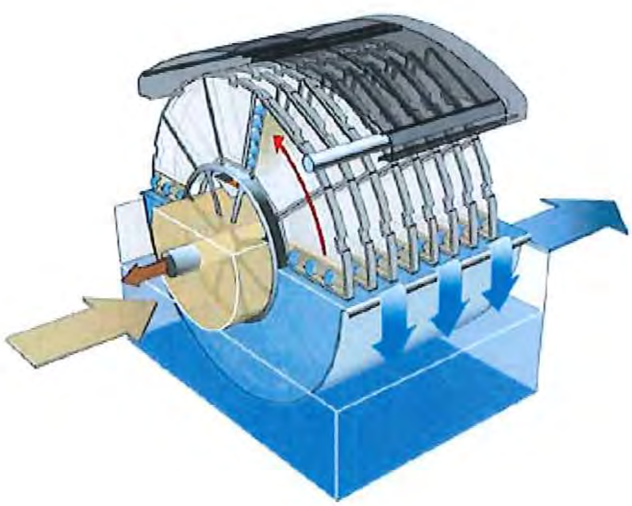
From raw water screening to wastewater polishing, the SuperDisc™ filter delivers superior filtration performance for water, wastewater, and water reuse applications.

Intelligent Design

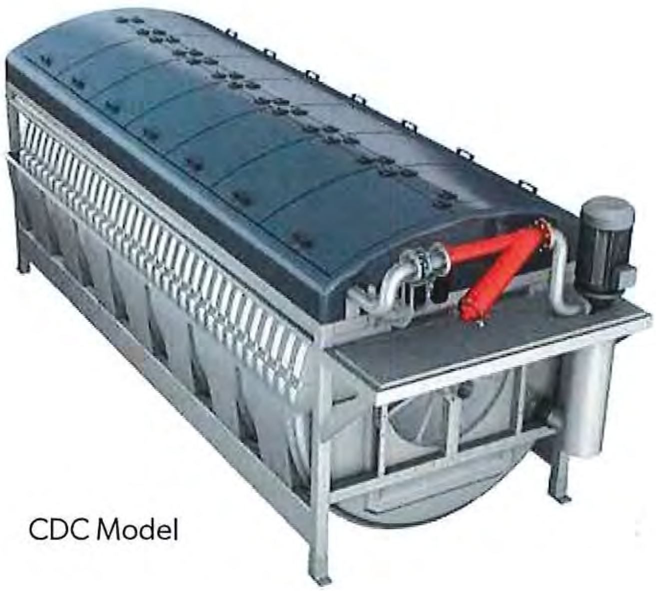
Consisting of multiple rotating filter discs, the SuperDisc™ filter features a well-proven system that uses fine-woven filter media. This sophisticated design produces a highly effective filtration process that can achieve high filtration efficiencies.

How it Works

Water to be filtered is guided into the rotor drum and flows by gravity into the filter discs through openings in the drum, and passes through the filter media on the sides of the discs. Suspended solids are separated and accumulated on the inside of the filter disc panels.



When the water level inside the filter rotor increases to a pre-set point, the filter rotor starts rotating and the backwash of the filter media starts. The high pressure backwash spray removes the accumulated suspended solids into the reject flume inside the filter. The suspended solids are then discharged via the reject pipe. The discs are submerged to approximately 65% and the water level of the filtrate is maintained by an integral outlet weir.



CDC Model

Two Versions, One Method

The SuperDisc™ filter is available as a freestanding unit with filter discs contained in a stainless steel tank and a version for installation in a concrete tank. The two versions have the same design regarding drive system, backwash system, outlet weir, disc cassettes, etc. The effective filter area can be up to 1,620.5 ft² per filter.

TDC Model

Superior Performance

Combining intelligent engineering with sophisticated technology, the SuperDisc™ filter offers a distinct advantage when it comes to filtration applications. Our unique design enables professionals in the water treatment industry to get maximum performance and reliability day-in and day-out.

The filter cassettes are easily replaceable with only a minimal amount of downtime.

The oscillating spray bar backwash system and the integrated level tank are some of the specific design details that make the SuperDisc™ a reliable and low-maintenance filtration unit with more operational control.

The rotation of the filter discs is driven by a long-life synchronous cog belt, which is carbon fiber-reinforced, corrosion resistant, and lubrication and maintenance free.

- 10 - 60 µm Screen Size (larger openings are available)
- Durable Lightweight FRP Frames
- Recyclable EVO Filter Cassettes

SuperDisc Benefits

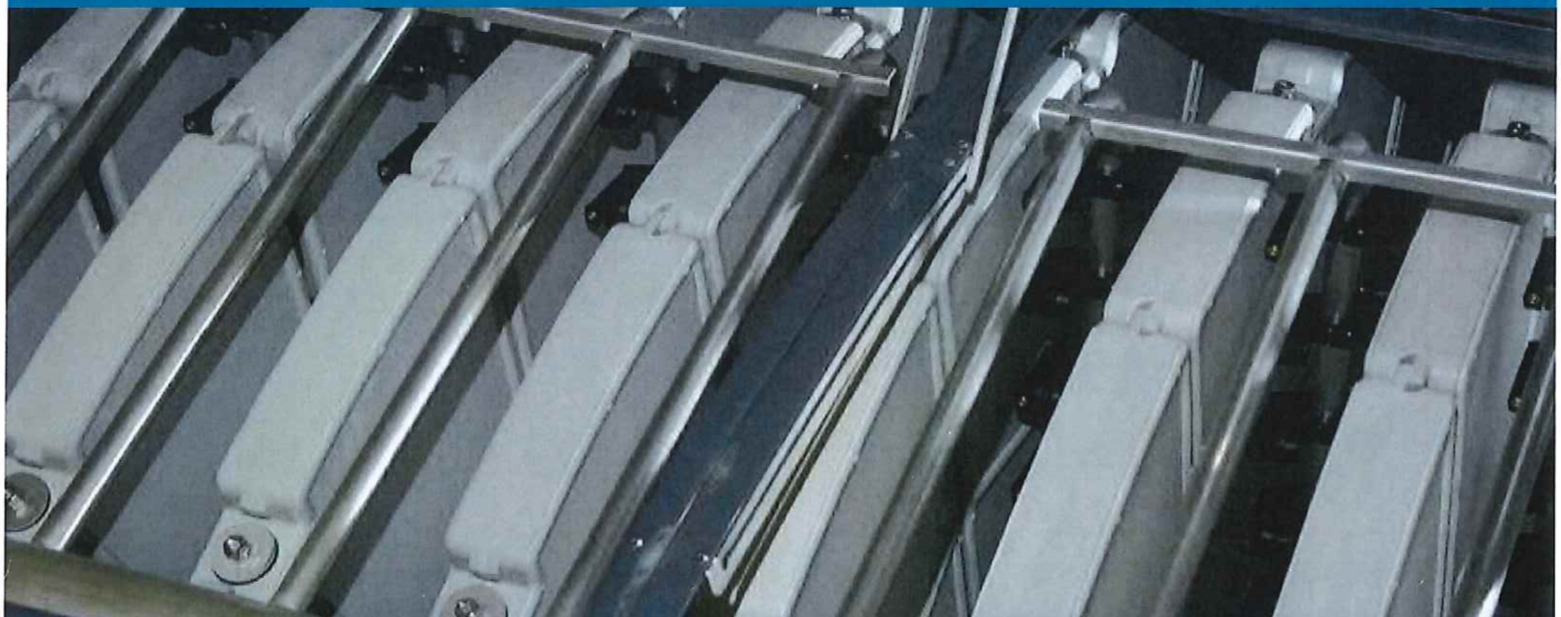
- **Compact design, small footprint**
- **Quick replacement; fewer parts per disc**
- **The largest amount of filter area with up to 35 discs in one unit**
- **Level tank with long weir minimizes headloss and avoids need for outlet weirs in the civil construction**
- **Nozzles do not clog because backwash water is pulled directly from the filtered water level tank**
- **Fully automated operation**
- **Operates efficiently with 12-18 inches of headloss**

Filtration Applications

- **Effluent polishing of wastewater**
- **Phosphorus removal**
- **Raw water filtration**
- **Water reuse - Title 22 approved**
- **Process water filtration**
- **Cooling water filtration**

Streamline Your Operation

WesTech provides start-to-finish system configurations with its line of proprietary products. These proven configurations can meet stringent requirements while increasing water recovery--ideal for municipalities and industrial facilities requiring complete water and wastewater package solutions.



Tel: 801.265.1000
westech-inc.com
info@westech-inc.com
Salt Lake City, Utah, USA

MISS. RIVER EFFLUENT

13H Quotation Curve

PENTAIR FAIRBANKS NIJHUIS™

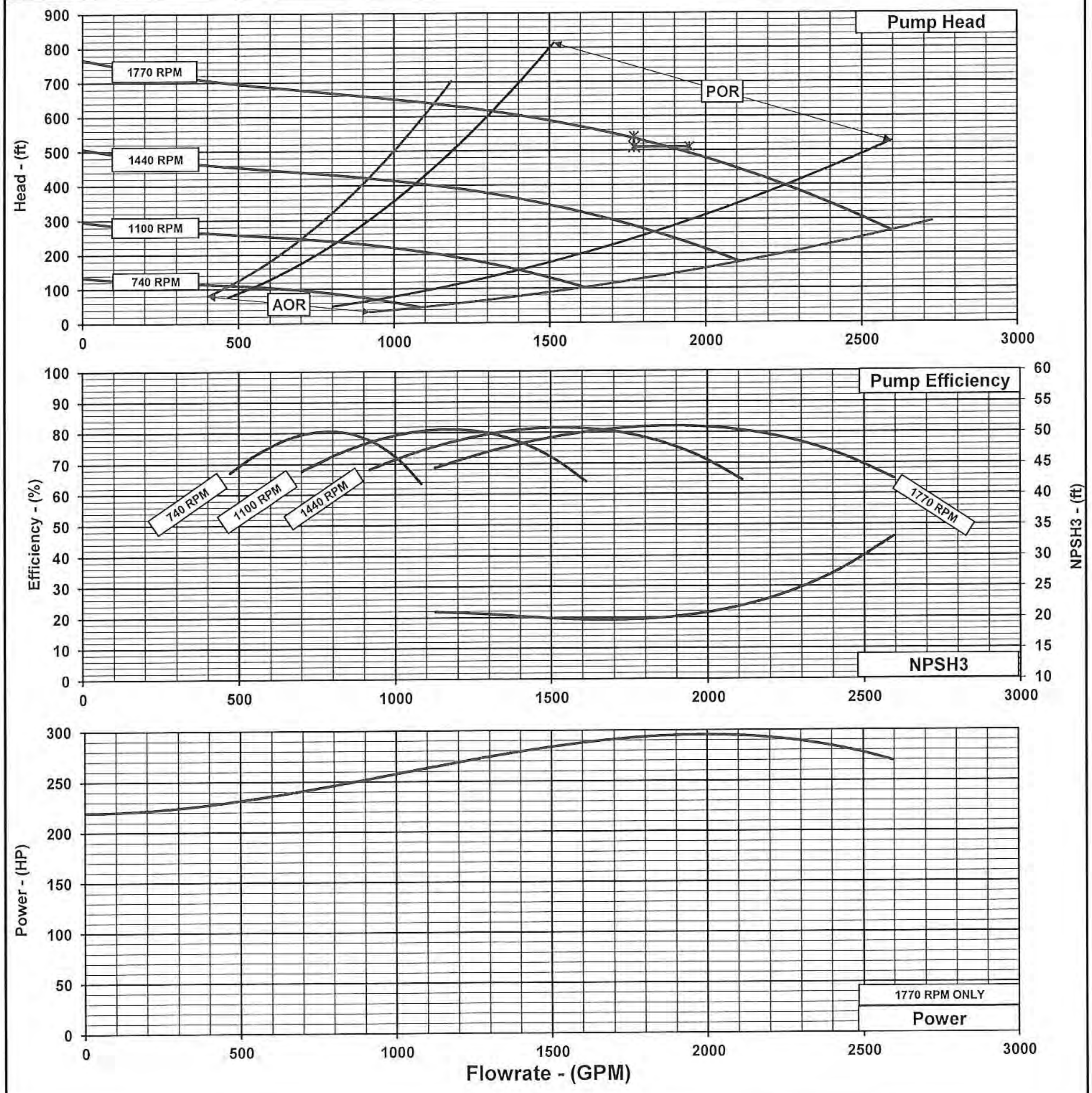
CURVE NUMBER:	C-N212881C
REV.	1

THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

SPEED	DRIVER	DIAMETER	SPHERE
1770 RPM	300 HP	AS REQ'D	1.00"
STAGES	IMPELLER	DATE	BY
9	AS REQ'D	3/21/2022	DAR

Impeller diameter selected to maximize head while non-overloading driver

GUARANTEED VALUES			
FLOW	HEAD	PUMP EFF	HP
1770	510	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----



FORD - TREATED EFFLUENT TRANSFER

PENTAIR

Customer : Guthrie Sales & Service Co Inc

Project name : Default

Pump Performance Datasheet

Encompass 2.0 - 22.1.0

Item number	: 001	Size	: 15H-SS
Service	:	Stages	: 6
Quantity	: 1	Based on curve number	: 15_TURB_3010_1800_SS Rev 190418
Quote number	: 243486	Date last saved	: 14 Apr 2022 3:45 PM

Operating Conditions

Flow, rated	: 2,100.0 USgpm
Differential head / pressure, rated (requested)	: 221.0 ft
Differential head / pressure, rated (actual)	: 219.7 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1180 rpm
Impeller diameter, rated	: 9.90 in
Impeller diameter, maximum	: 9.90 in
Impeller diameter, minimum	: 8.00 in
Efficiency (bowl / pump)	: 81.97 / - %
NPSH required / margin required	: 10.76 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 63 / 172 Metric units
Minimum Continuous Stable Flow	: 1,200.0 USgpm
Head, maximum, rated diameter	: 320.0 ft
Head rise to shutoff (bowl / pump)	: 45.61 / - %
Flow, best eff. point (bowl / pump)	: 1,901.7 / - USgpm
Flow ratio, rated / BEP (bowl / pump)	: 110.43 / - %
Diameter ratio (rated / max)	: 100.00 %
Head ratio (rated dia / max dia)	: 100.00 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Near miss

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 1.31 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

Material selected	: Cast Iron bowl Std impeller

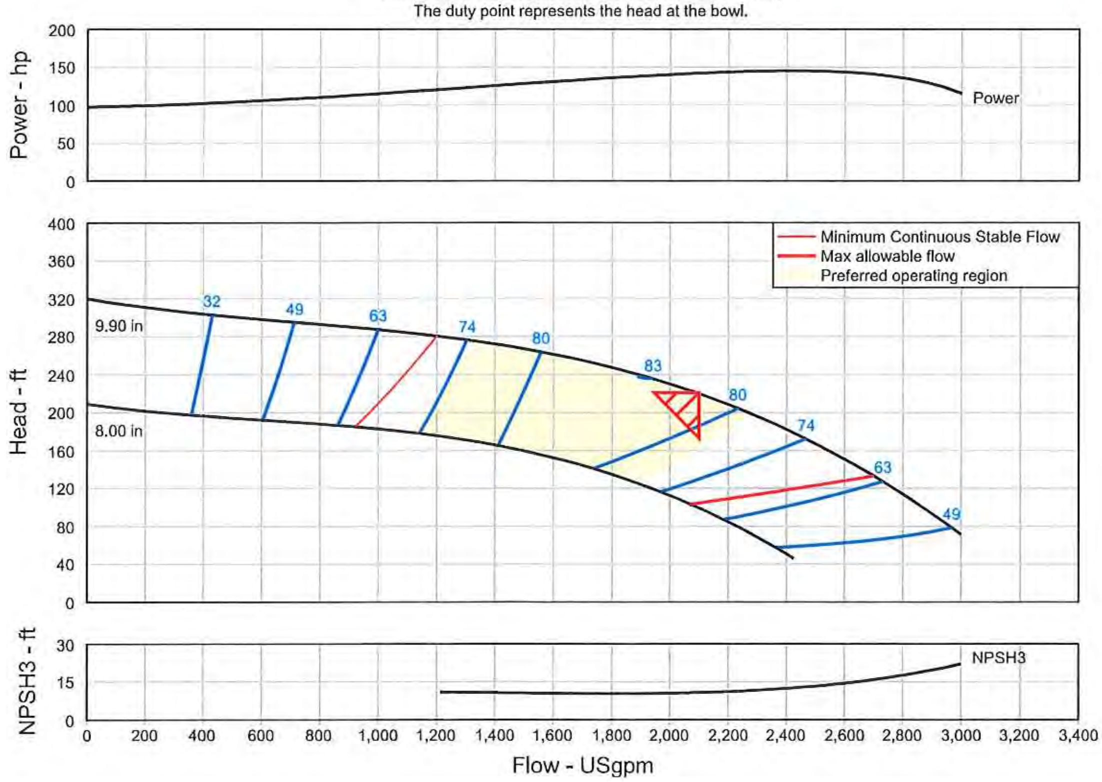
Pressure Data

Maximum working pressure	: See the Additional Data page
Maximum allowable working pressure	: See the Additional Data page
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: See the Additional Data page

Driver & Power Data (@Max density)

Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 117 hp
Power (bowl / pump)	: 142 / - hp
Power, maximum, rated diameter	: 145 hp
Minimum recommended motor rating	: 150 hp / 112 kW

Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.



PENTAIR

GUTHRIE SALES AND SERVICES INC
7003 CHADWICK DRIVE STE
300 · BRENTWOOD, TN 37027
JTGUTHRIE.COM

PHONE: 615-377-3952 · FAX: 615-373-2701

TREATED EFFLUENT TRANSFER PUMP TO LAGOON

27M Quotation Curve

PENTAIR FAIRBANKS NIJHUIS™

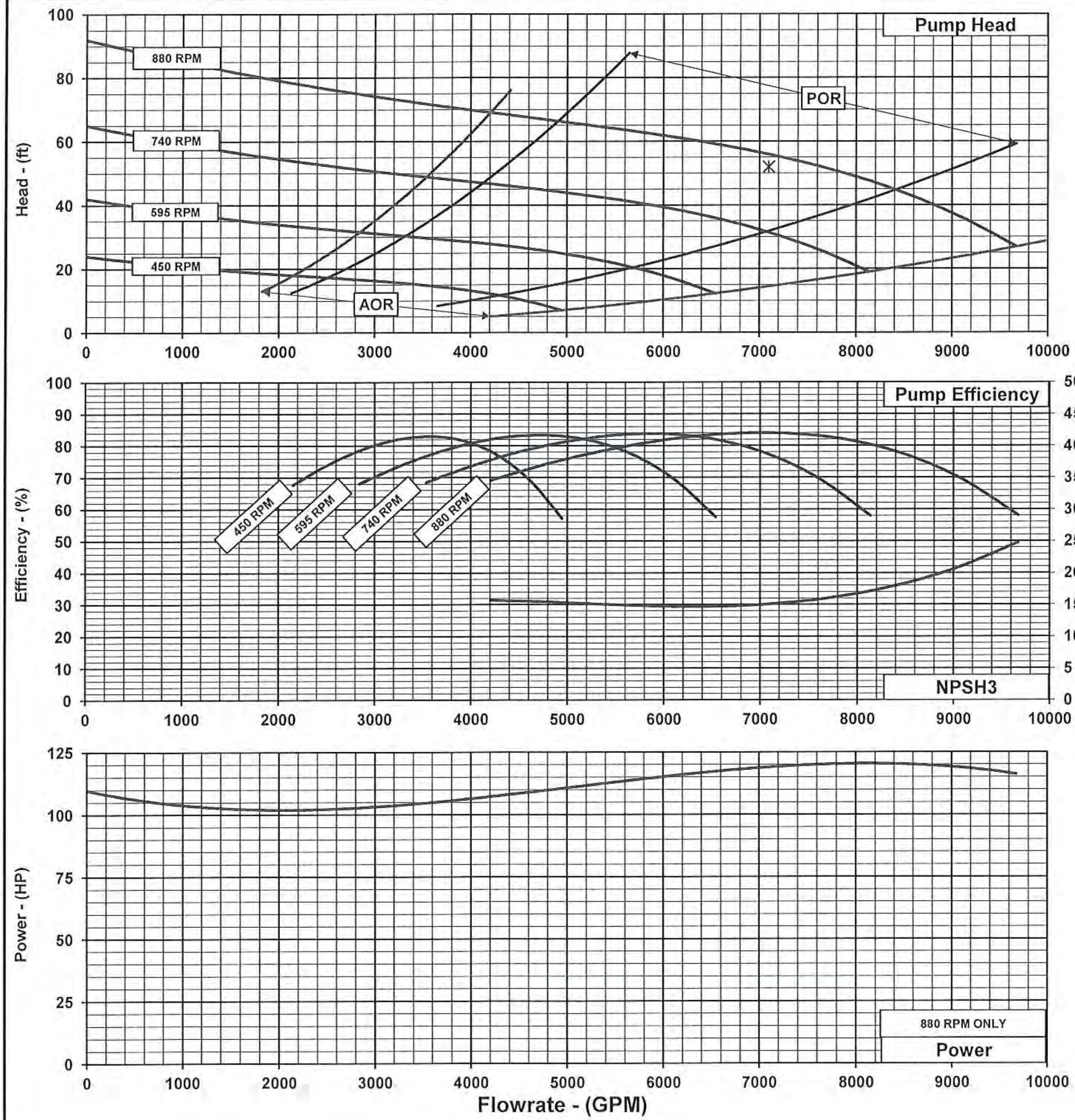
CURVE NUMBER:	C-N212881F
REV.	1

THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

SPEED	DRIVER	DIAMETER	SPHERE
880 RPM	125 HP	AS REQ'D	2.75"
STAGES	IMPELLER	DATE	BY
1	AS REQ'D	3/22/2022	DAR

Impeller diameter selected to maximize head while non-overloading driver

GUARANTEED VALUES			
FLOW	HEAD	PUMP EFF	HP
7100	52.0 MIN	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----



LAGOON RETURN SPS

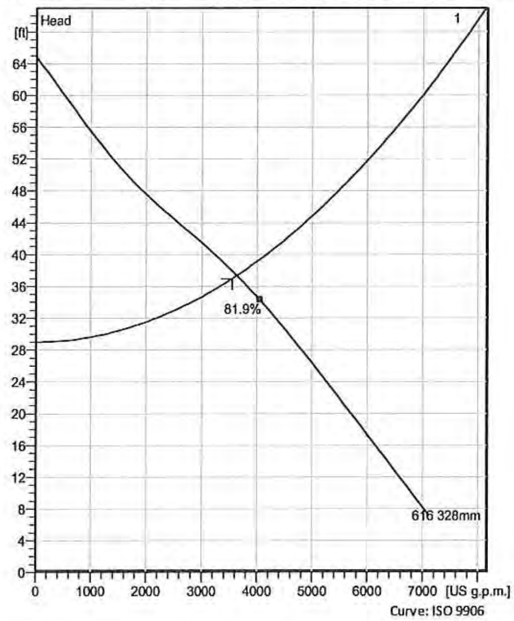
NP 3202 LT 3~ 616

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

FLYGT
a xylem brand

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
N3202.185 30-23-6AA-W
45hp

Installation type
P - Semi permanent, Wet

Impeller diameter
328 mm

Discharge diameter
12 inch

Pump information

Impeller diameter
328 mm

Discharge diameter
12 inch

Inlet diameter
300 mm

Maximum operating speed
1170 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project		**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

NP 3202 LT 3~ 616

Technical specification

Motor - General

Motor number	Phases	Rated speed	Rated power
N3202.185 30-23-6AA-W 45hp	3~	1170 rpm	45 hp
ATEX approved	**Number of poles**	**Rated current**	**Stator variant**
No	6	55 A	1
Frequency	**Rated voltage**	**Insulation class**	**Type of Duty**
60 Hz	460 V	H	S1
Version code			
185			

Motor - Technical

Power factor - 1/1 Load	Motor efficiency - 1/1 Load	Total moment of inertia	Starts per hour max.
0.85	89.5 %	12.7 lb ft²	30
Power factor - 3/4 Load	**Motor efficiency - 3/4 Load**	**Starting current, direct starting**	
0.82	90.0 %	330 A	
Power factor - 1/2 Load	**Motor efficiency - 1/2 Load**	**Starting current, star-delta**	
0.73	89.5 %	110 A	

Project
Block 0

Created by George Peart
Created on 2/2/2022 **Last update** 2/2/2022

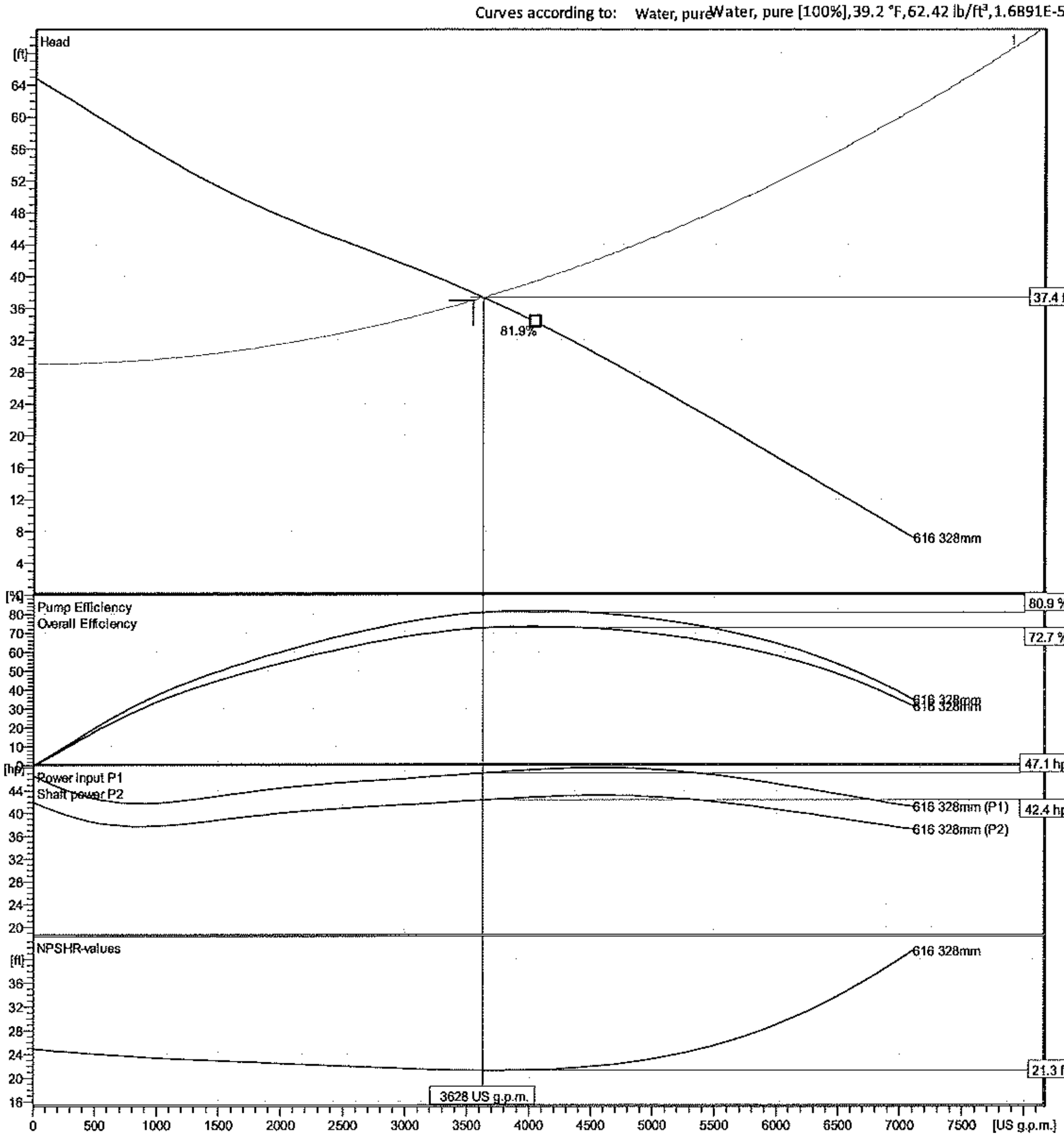
NP 3202 LT 3~ 616

Performance curve

Duty point

Flow	Head
3630 US g.p.m.	37.4 ft

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

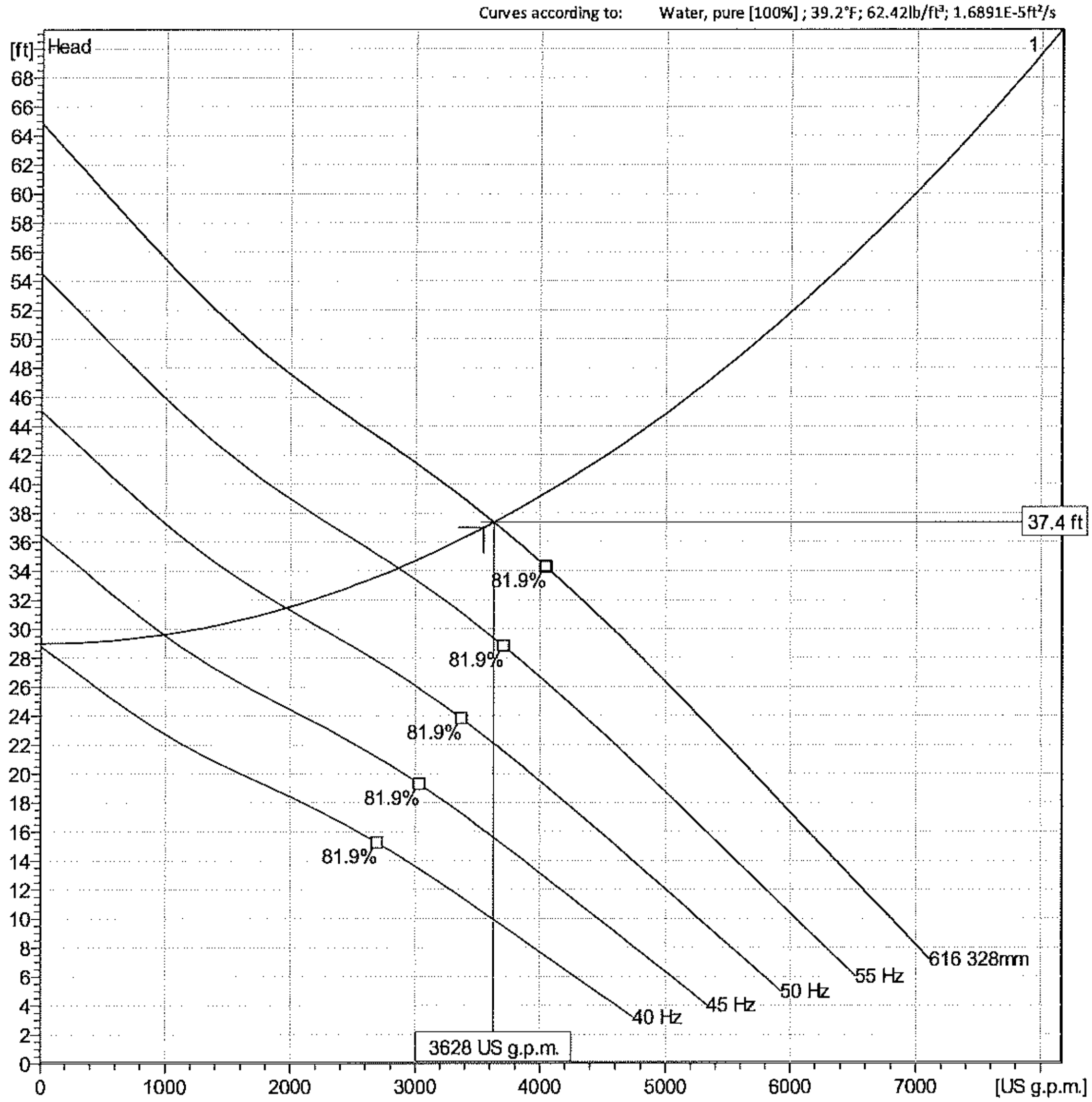
Project		**Created by**	George Peart		
Block	0	**Created on**	2/2/2022	**Last update**	2/2/2022

NP 3202 LT 3~ 616

Duty Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

Pumps / Systems	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Spec. Energy kWh/US MG	NPSHre ft
1	3630	37.4	42.4	3630	37.4	42.4	80.9 %	161	21.3

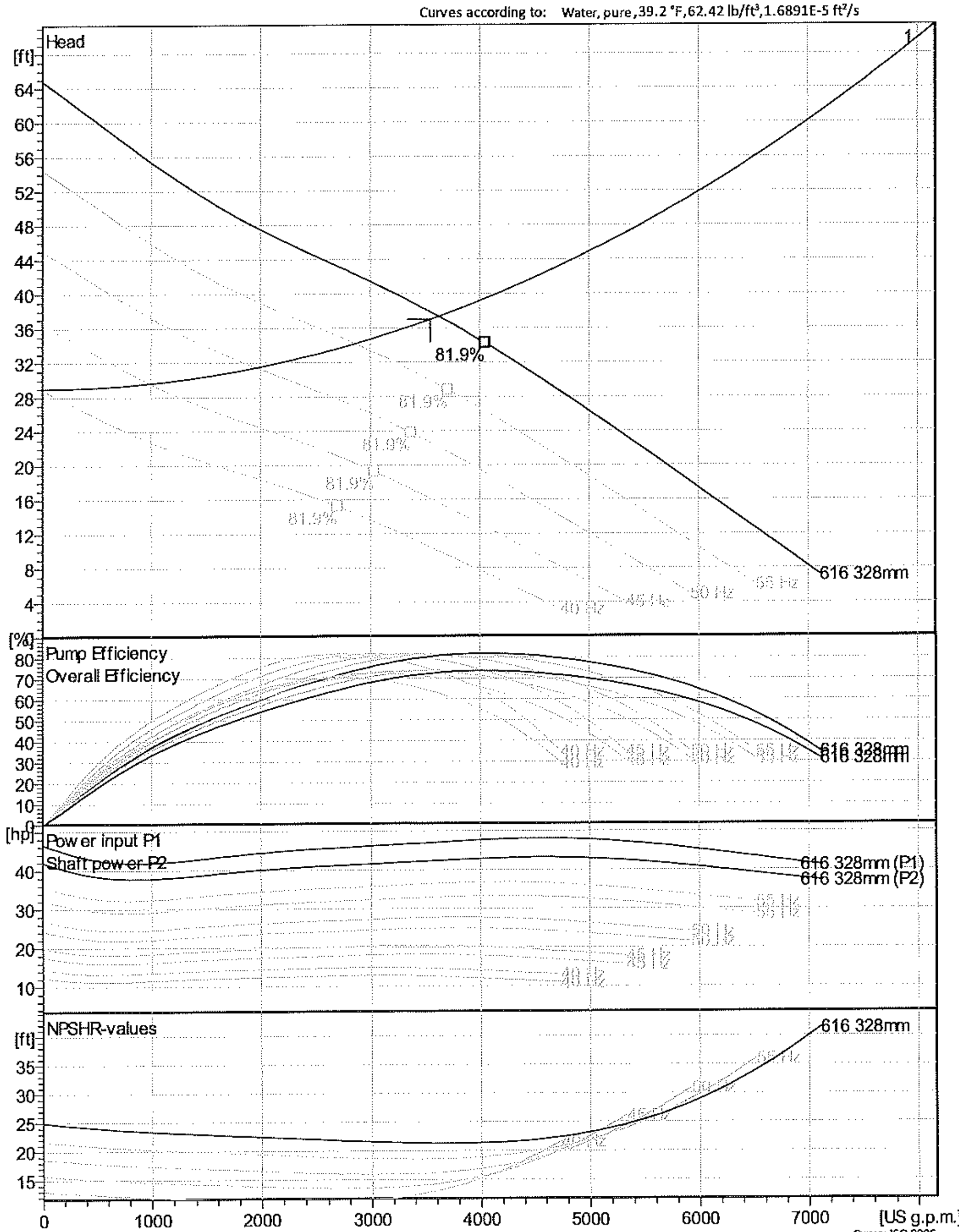
Project		Created by	George Peart		
Block		Created on	2/2/2022	Last update	2/2/2022

NP 3202 LT 3~ 616

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Project

Block 0

Created by George Peart

Created on 2/2/2022 **Last update** 2/2/2022

Program version 61.0 - 12/1/2021 (Build 144)

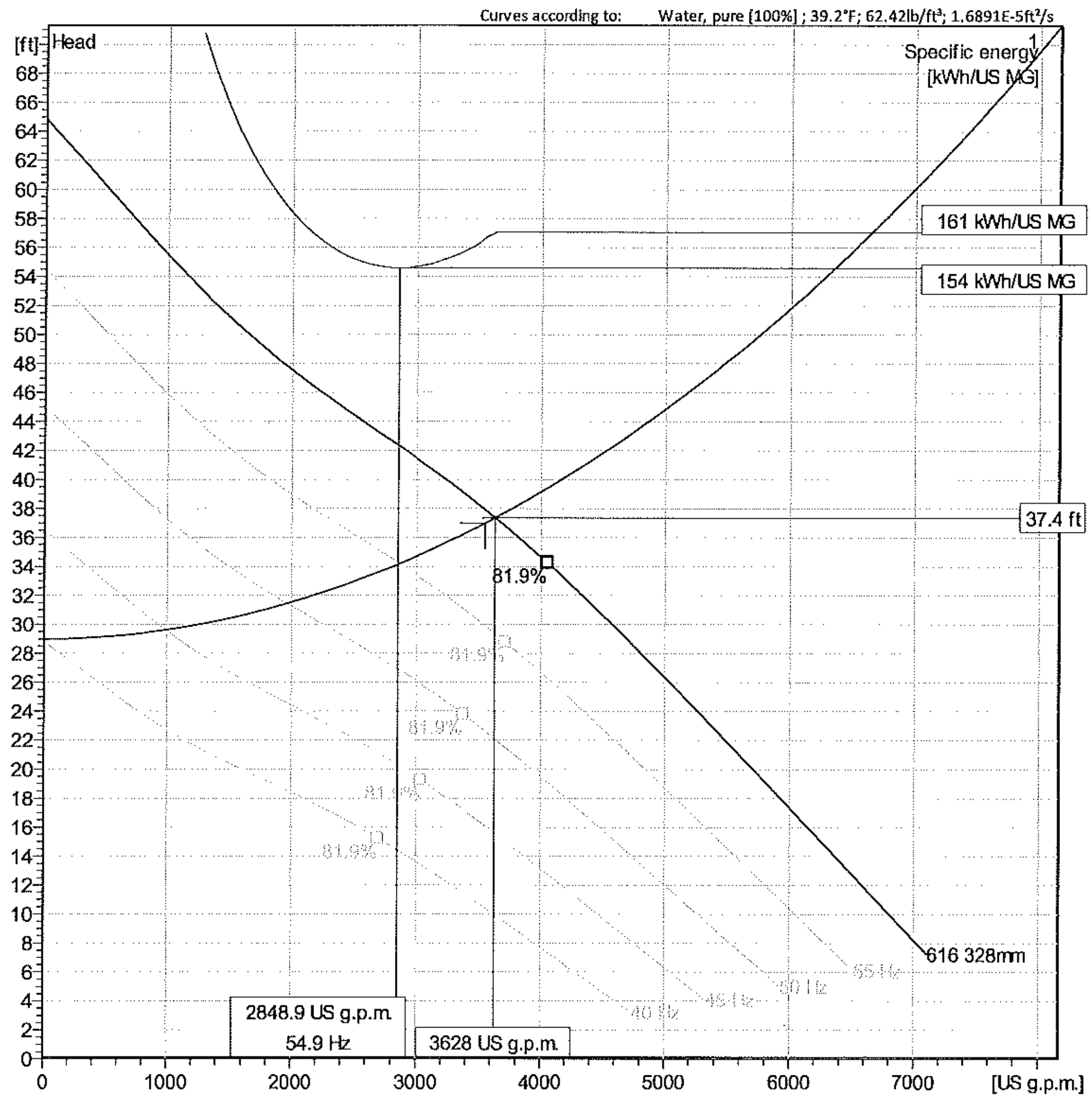
Data version 1/12/2022 15:59 A1P1

User group(s) Xylem: USA - EXT

NP 3202 LT 3~ 616

VFD Analysis

FLYGT a xylem brand



Operating Characteristics

Pumps / Systems	Frequency	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Specific energy kWh/US MG	NPSHre ft
1	60 Hz	3630	37.4	42.4	3630	37.4	42.4	80.9 %	161	21.3
1	55 Hz	2860	34.2	32.1	2860	34.2	32.1	77 %	154	18.7
1	50 Hz	1960	31.4	23.6	1960	31.4	23.6	66.4 %	166	16.5
1	45 Hz	987	29.6	16.2	987	29.6	16.2	45.6 %	231	14.6

Project

Block 0

Created by George Peart

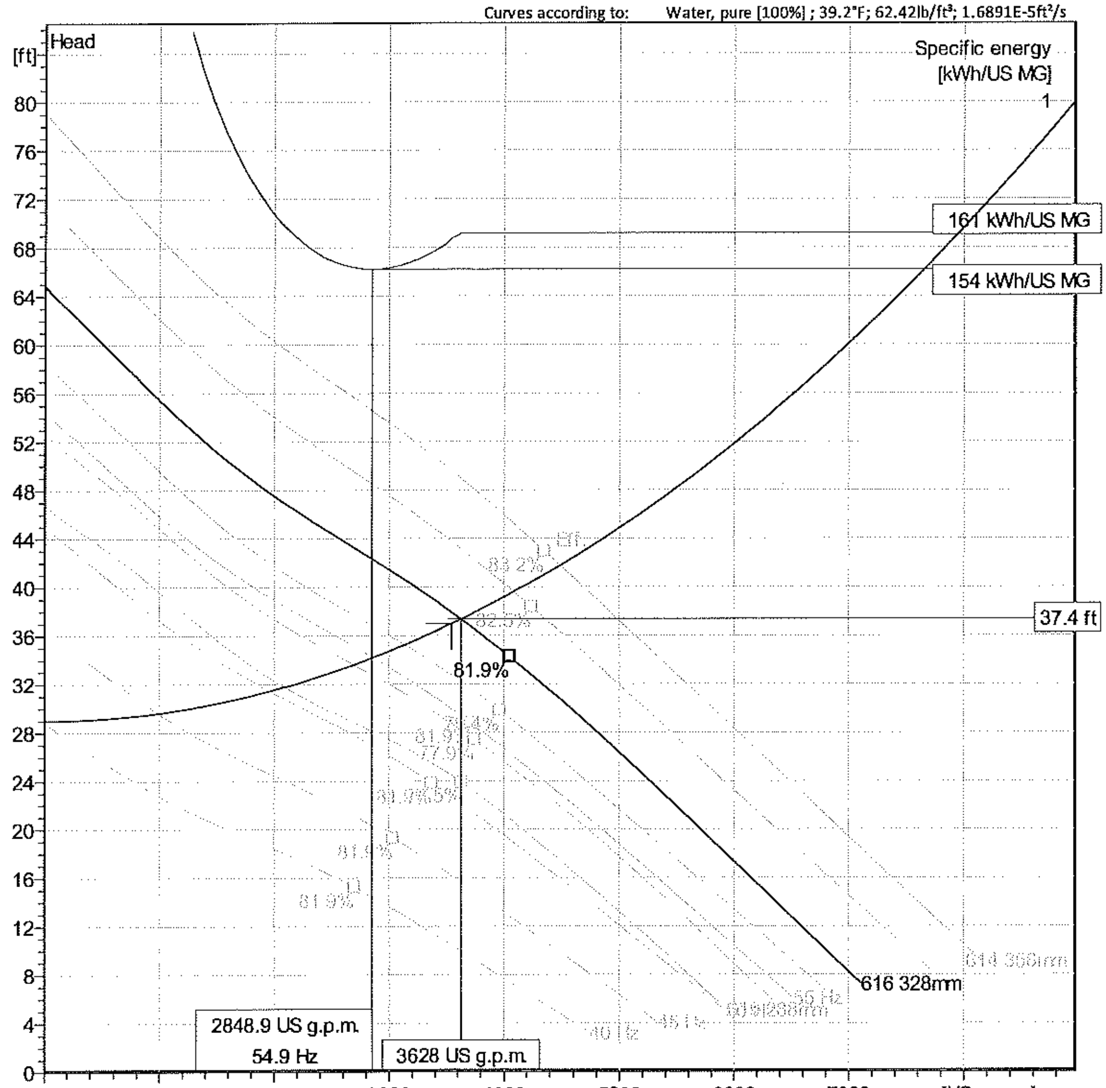
Created on 2/2/2022 Last update 2/2/2022

NP 3202 LT 3~ 616

VFD Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating Characteristics

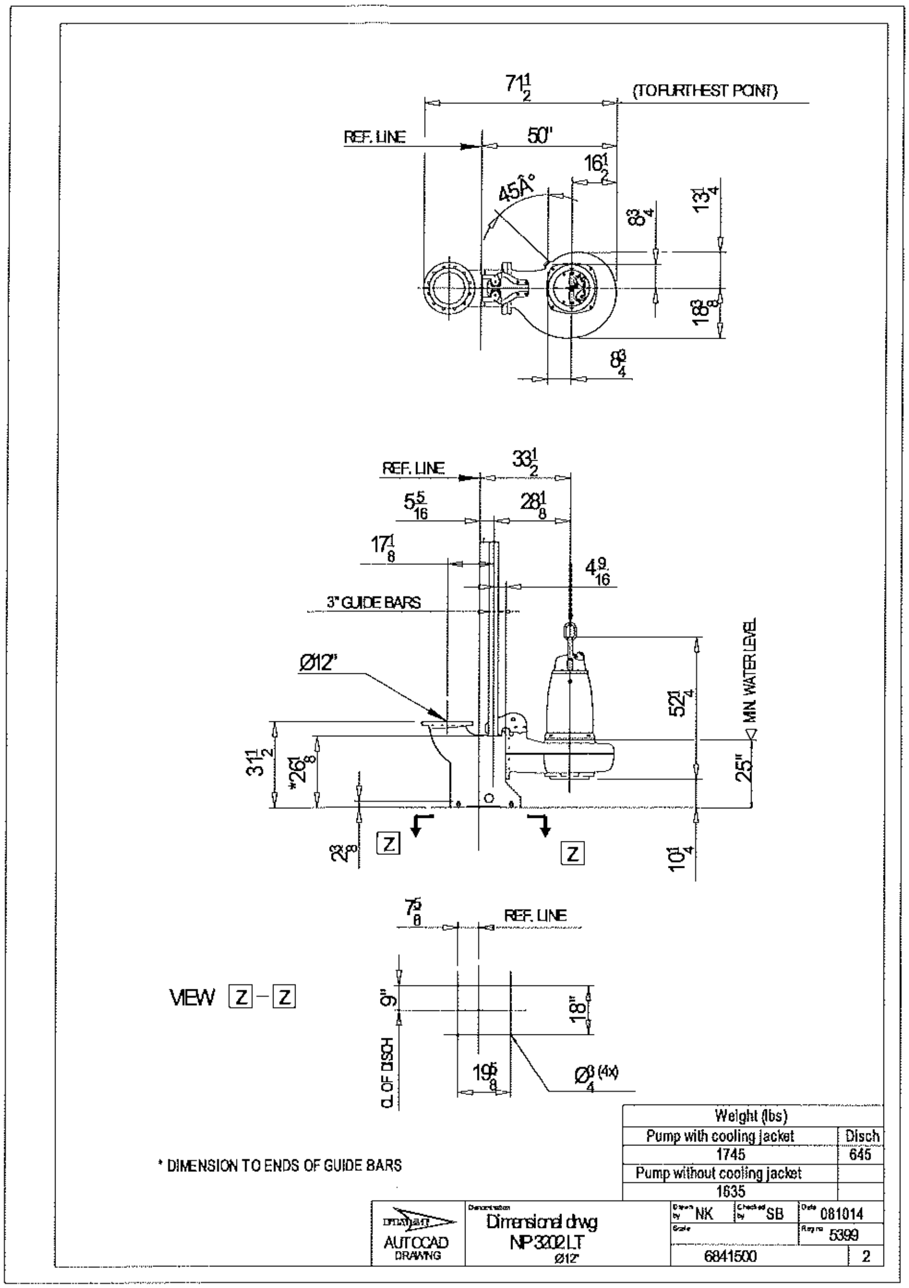
Pumps / Systems	Frequency	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Specific energy kWh/US MG	NPSHre ft
1	40 Hz									

Project		Created by	George Peart
Block	0	Created on	2/2/2022
		Last update	2/2/2022

NP 3202 LT 3~ 616

Dimensional drawing

FLYGT
a xylem brand



Weight (lbs)	
Pump with cooling jacket	Disch
1745	645
Pump without cooling jacket	
1635	

Project
Block 0

Created by George Peart
Created on 2/2/2022 **Last update** 2/2/2022

ONSITE SPS

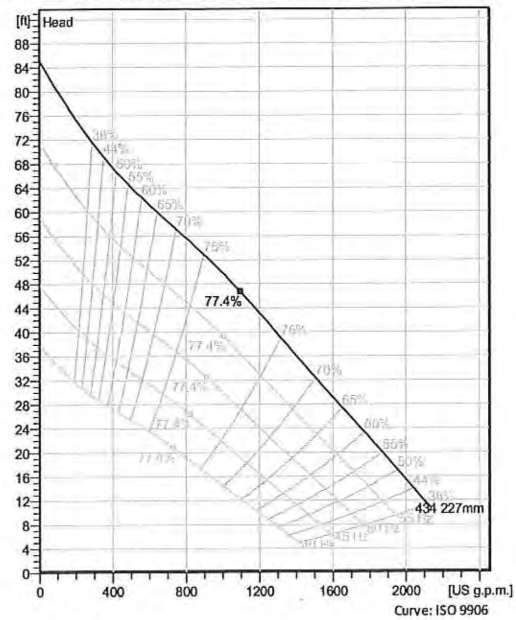
NP 3153 MT 3~ 434

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Modular based design with high adaptation grade.

FLYGT a xylem brand

Technical specification

Curves according to: Water, pure Water, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Configuration

Motor number
N3153.185 21-18-4AA-W
20hp

Installation type
P - Semi permanent, Wet

Impeller diameter
227 mm

Discharge diameter
6 inch

Pump information

Impeller diameter
227 mm

Discharge diameter
6 inch

Inlet diameter
150 mm

Maximum operating speed
1755 rpm

Number of blades
2

Max. fluid temperature
40 °C

Materials

Impeller
Hard-Iron ™

Project	MRM Onsite PS	**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

NP 3153 MT 3~ 434

Technical specification

Motor - General

Motor number N3153.185 21-18-4AA-W 20hp	**Phases** 3~	**Rated speed** 1755 rpm	**Rated power** 20 hp
ATEX approved No	**Number of poles** 4	**Rated current** 26 A	**Stator variant** 5
Frequency 60 Hz	**Rated voltage** 460 V	**Insulation class** H	**Type of Duty** S1
Version code 185			

Motor - Technical

Power factor - 1/1 Load 0.83	**Motor efficiency - 1/1 Load** 87.5 %	**Total moment of inertia** 2.07 lb ft²	**Starts per hour max.** 30
Power factor - 3/4 Load 0.77	**Motor efficiency - 3/4 Load** 89.0 %	**Starting current, direct starting** 148 A	
Power factor - 1/2 Load 0.66	**Motor efficiency - 1/2 Load** 89.0 %	**Starting current, star-delta** 49.3 A	

Project	MRM Onsite PS	**Created by**	George Peart		
Block	0	**Created on**	2/2/2022	**Last update**	2/2/2022

NP 3153 MT 3~ 434

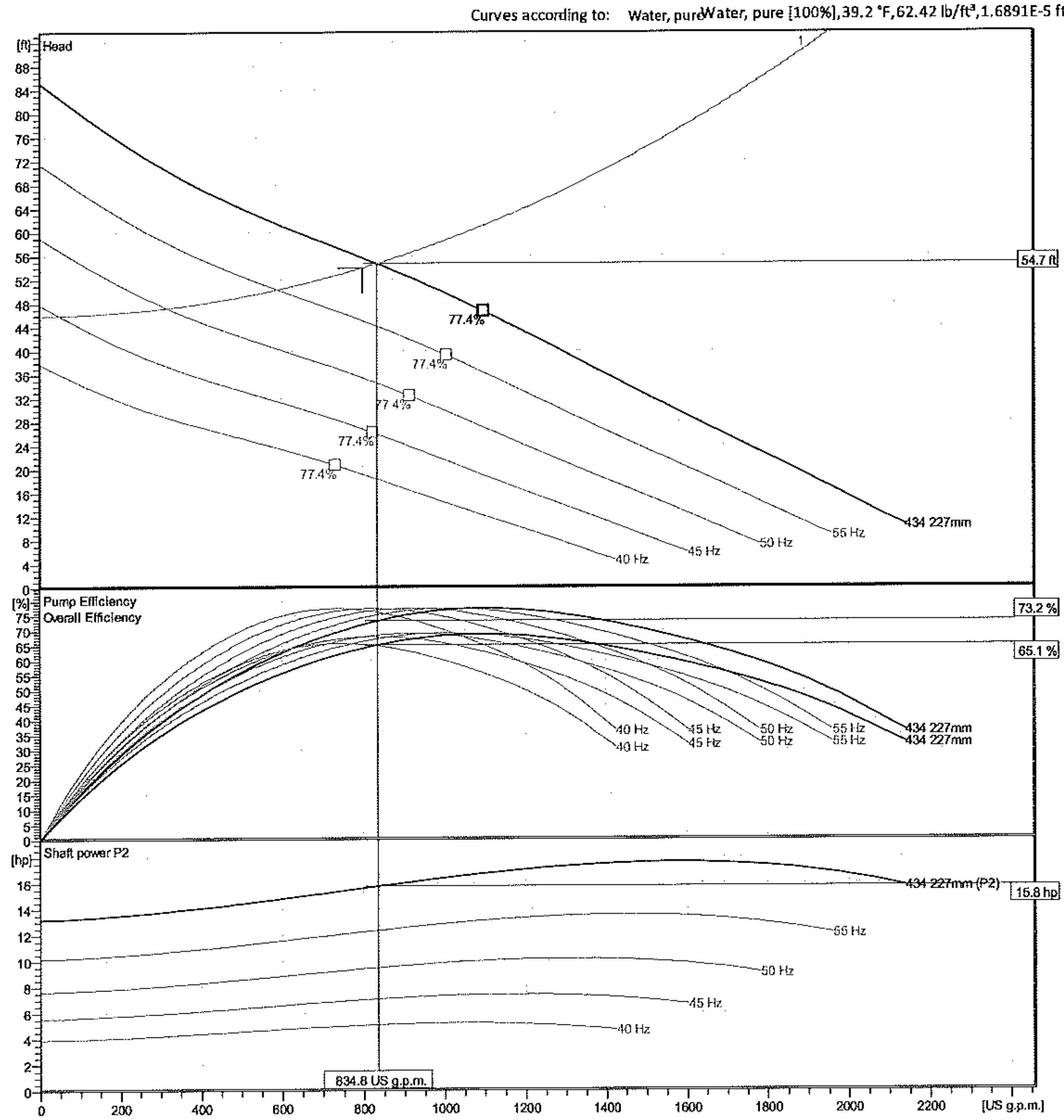
Performance curve

FLYGT
a xylem brand

Duty point

Flow	Head
835 US g.p.m.	54.7 ft

Curves according to: Water, pureWater, pure [100%],39.2 °F,62.42 lb/ft³,1.6891E-5 ft²/s



Curve: ISO 9906

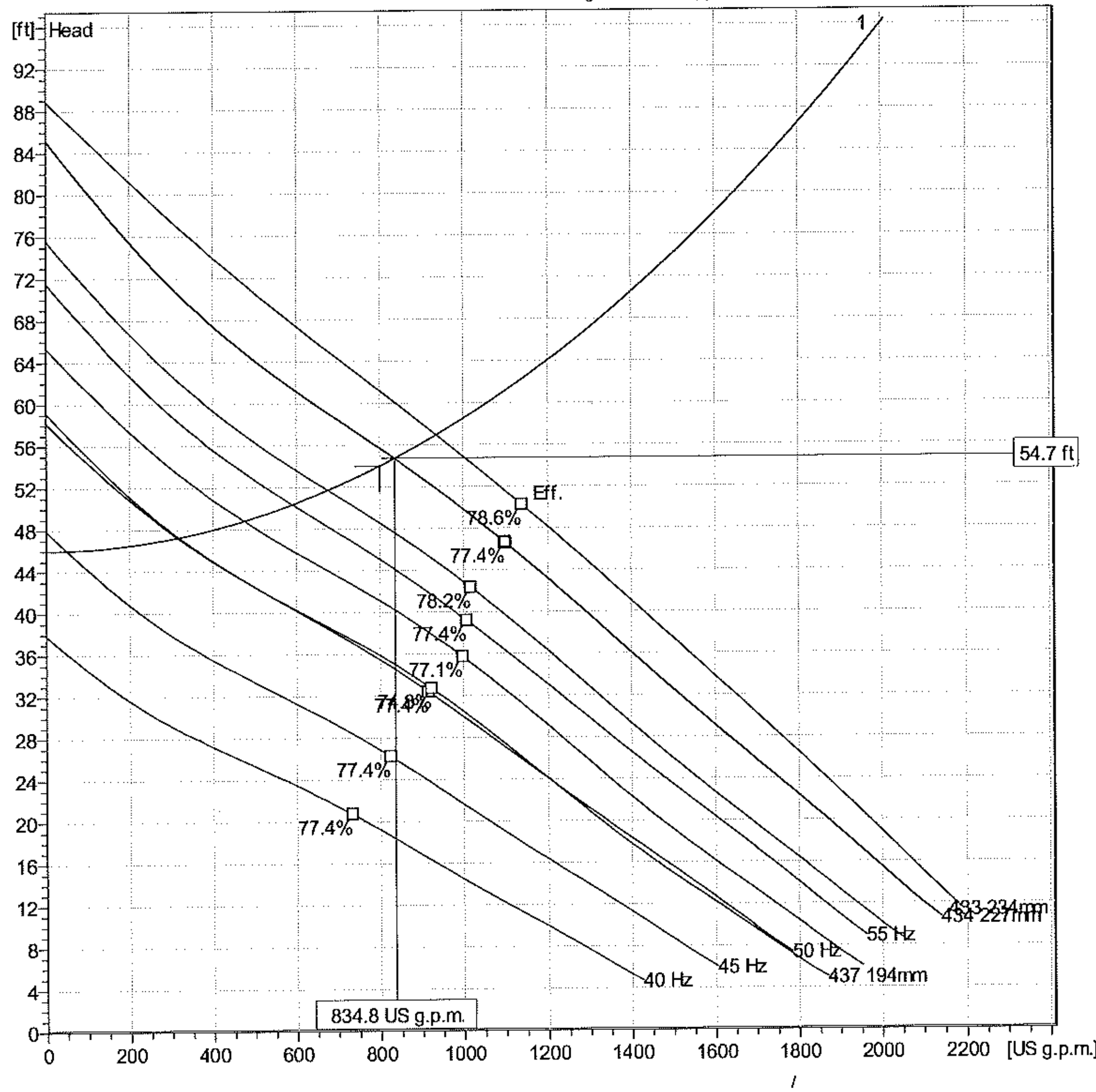
Project	MRM Onsite PS	Created by	George Peart
Block	0	Created on	2/2/2022 Last update 2/2/2022

NP 3153 MT 3~ 434

Duty Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



Operating characteristics

Pumps / Systems	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Spec. Energy kWh/US MG	NPSHre ft
1	835	54.7	15.8	835	54.7	15.8	73.2 %	264	22.8

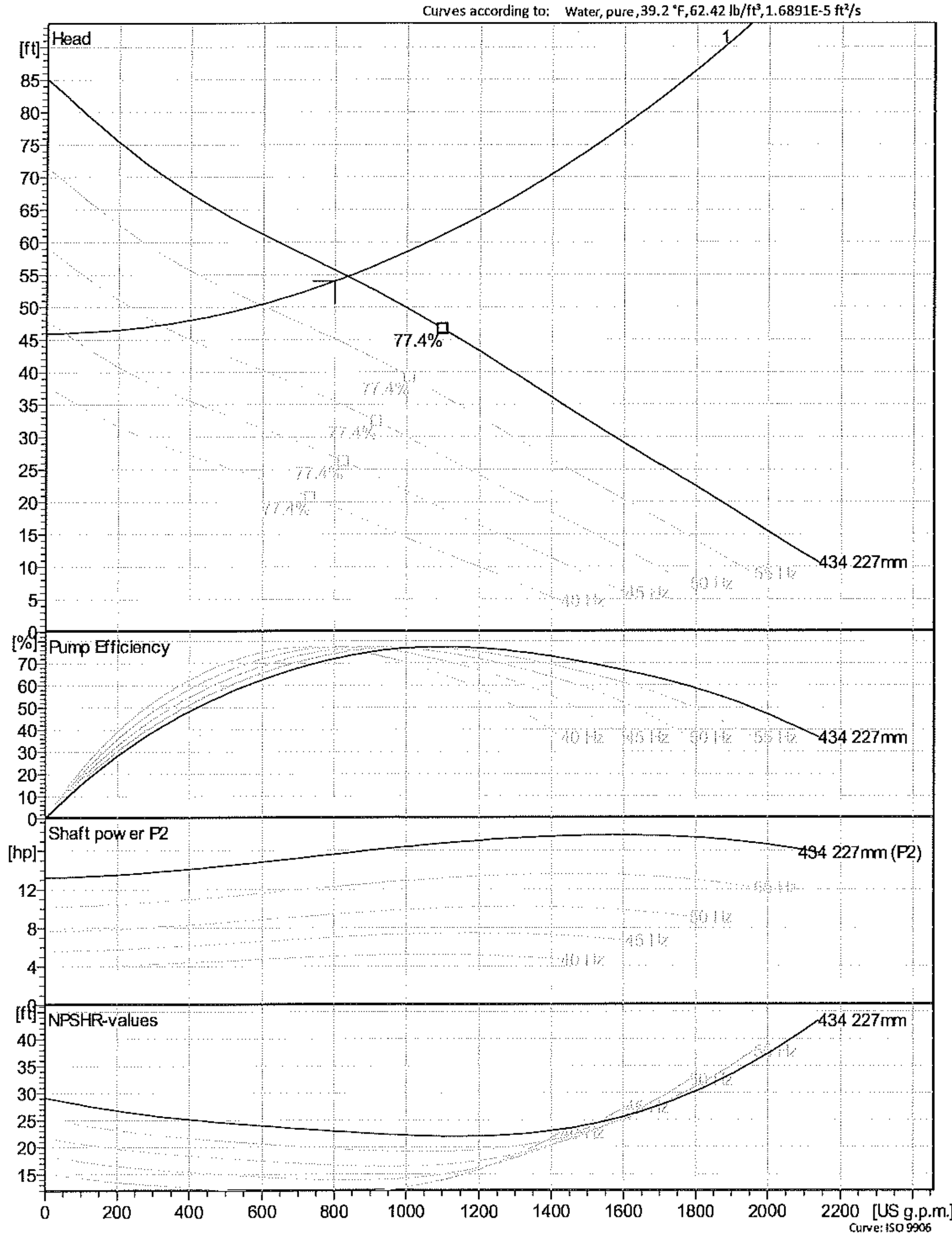
Project		Created by	George Peart		
Block	MRM Onsite PS	Created on	2/2/2022	Last update	2/2/2022

NP 3153 MT 3~ 434

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



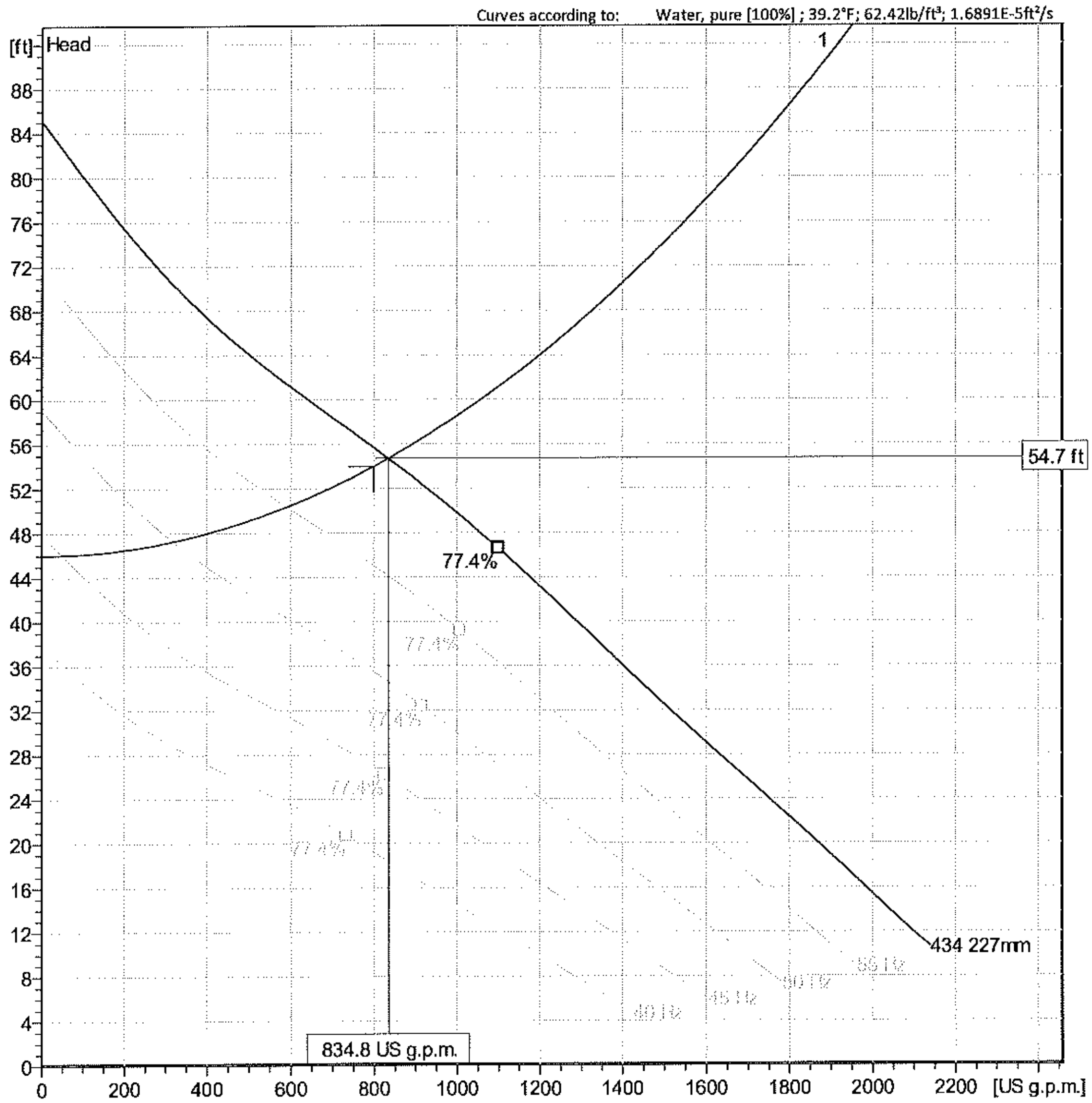
Project	MRM Onsite PS	**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

Program version 61.0 - 12/1/2021 (Build 144)
Data version 1/12/2022 15:59 A1P1
User group(s) XylemUSA-EXT

NP 3153 MT 3~ 434

VFD Analysis

FLYGT a xylem brand



Operating Characteristics

Pumps / Systems	Frequency	Flow US g.p.m.	Head ft	Shaft power hp	Flow US g.p.m.	Head ft	Shaft power hp	Hydr.eff.	Specific energy kWh/US MG	NPSHre ft
1	60 Hz	835	54.7	15.8	835	54.7	15.8	73.2 %	264	22.8
1	55 Hz	591	50.4	11.6	591	50.4	11.6	65.1 %	272	20.6
1	50 Hz	318	47.3	8.12	318	47.3	8.12	46.8 %	358	18.9
1	45 Hz	49.5	46	5.6	49.5	46	5.6	10.3 %	1630	17.9

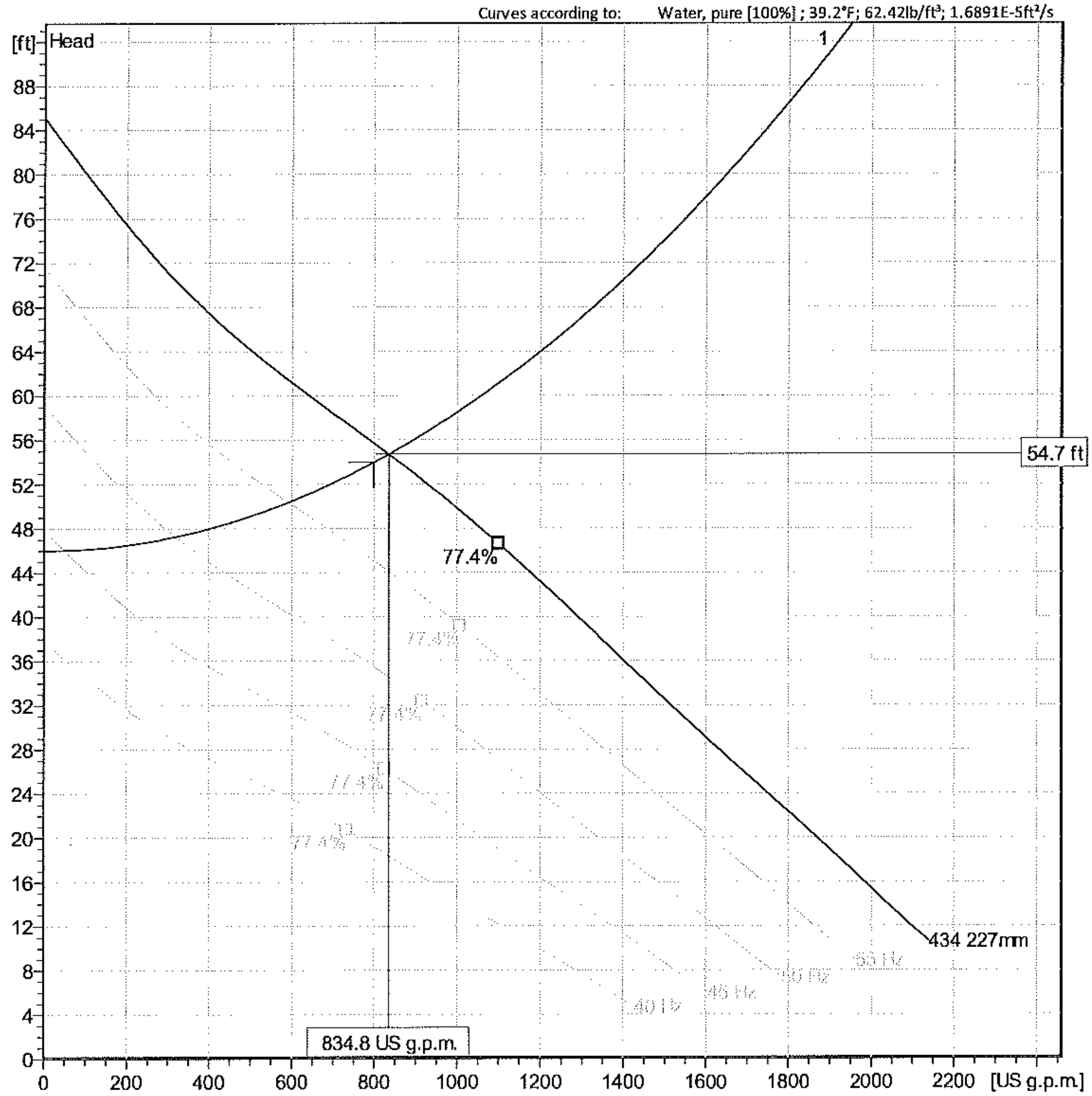
Project	MRM Onsite PS	Created by	George Peart		
Block	0	Created on	2/2/2022	Last update	2/2/2022

NP 3153 MT 3~ 434

VFD Analysis

FLYGT
a xylem brand

Curves according to: Water, pure [100%] ; 39.2°F; 62.42lb/ft³; 1.6891E-5ft²/s



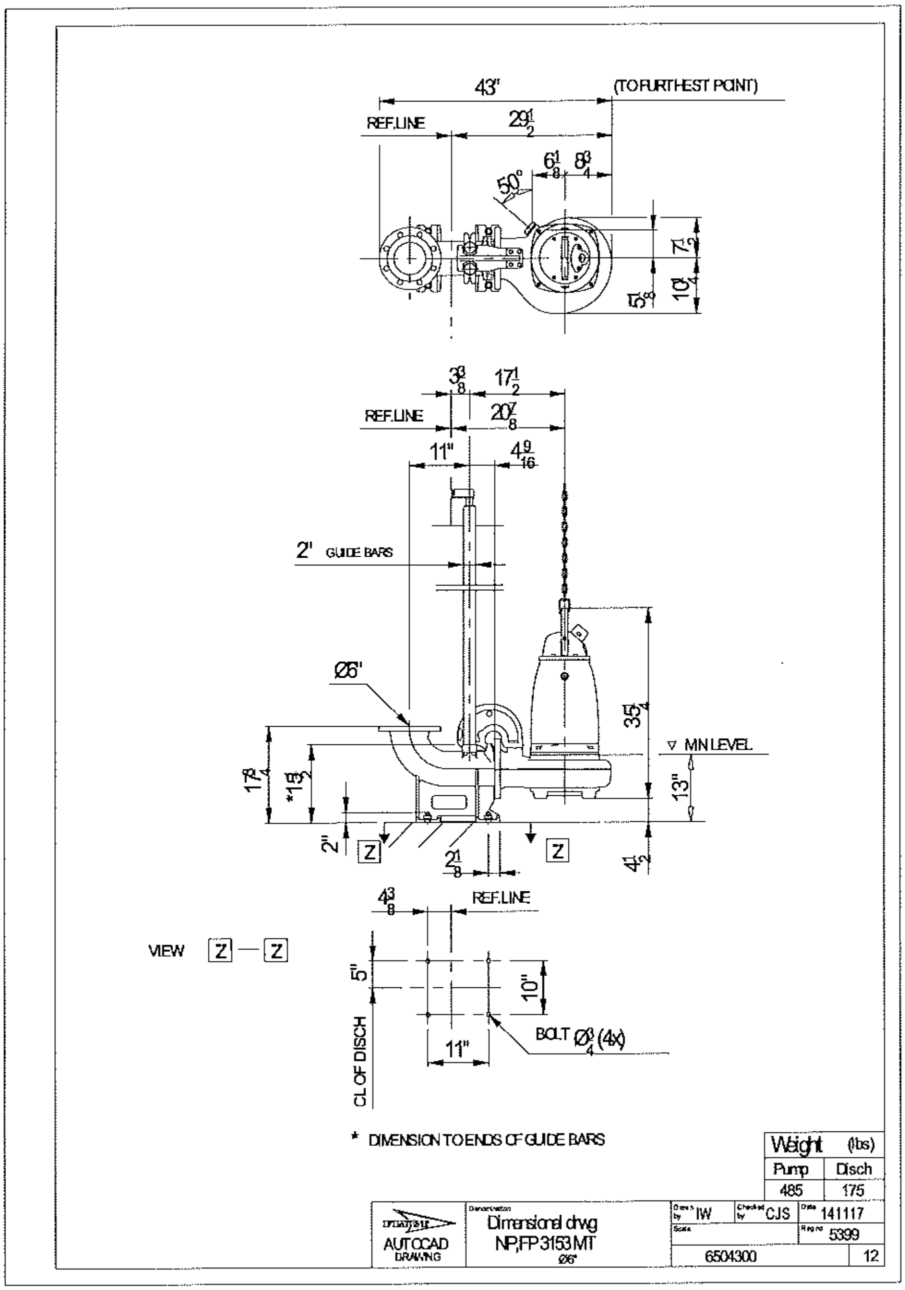
Operating Characteristics

Pumps / Systems	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hydr.eff.	Specific energy	NPSHre
		US g.p.m.	ft	hp	US g.p.m.	ft	hp		kWh/US MG	ft
1	40 Hz									

Project	MRM Onsite PS	**Created by**	George Peart		
Block	0	**Created on**	2/2/2022	**Last update**	2/2/2022

NP 3153 MT 3~ 434

Dimensional drawing



Project	MRM Onsite PS	Created by	George Peart
Block	0	Created on	2/2/2022 Last update 2/2/2022

Hydraulic Calculations

Memphis Regional Megasite Wastewater Treatment Plant

Wauford Project No. 3679

JAMES G. DAVENPORT
PROFESSIONAL ENGINEER
XVI
AGRICULTURE
COMMERCE
No. 104881
STATE OF TENNESSEE
04/05/22

MAIN PLANT

HYDRAULICS

Effluent P.S. → Headworks

Given: • Design Q → MS River = 5.1 MGD = 3540 GPM
• Design Q → Lagoon = 10.2 MGD = 7080 GPM
• Design Max Decant Q = 8900 GPM
• C=120 DIP

Req'd: Hydraulics

Sol'n:

① Calculate H_L from EPS to Cl_2 Chamber (Q=3540 gpm)

	Pipe Unit	EL 30"
1.0	30" $V^2/2g$ out	
	30" 90° (2)	150
	110'-30"	110
0.5	30" $V^2/2g$ in	
		260

$H_L = 0.260(0.35) + 1.5(0.04)$
$= 0.15'$

EPS HWA = 349.83
0.15'
349.98

WSE Transfer P.S. wetwell = 348.15' (348.00 + 0.15') Pump ON = 350.50 ok

② Calculate H_L CL_2 → Eff. Filters (Q = 8900 GPM) (Assume one CL2 out of operation)

		Pipe Unit	EL 30"	EL 24"
Q = 8900 gpm	1.0	$V^2/2g$ 30" out		
		70'-30"	70	
		30" 90	75	
		30" Tee	146	
		30" BV	65	
		3-30" Tee →	150	
			506'	
Q = 4450 gpm		30" 90	75	
		24x30 90		60
		24" BV		60

$H_L = 1.0(0.26) + 1.99(0.506)$
$H_L = 1.39'$

$24/30^2 \quad \frac{3.63}{1.23} = 2.95$

$EL = 120(2.95) + 75$
$= 430'-30"$

$H_L = 0.430(0.55)$
$H_L = 0.24'$

H_L CL_2 → Eff filter = 1.39 + 0.24 = 1.63'
Inlet weir L = 16'-3" / Q = 8900 gpm / Q/ft = $\frac{8900}{16.25}$ = 548 gal/LF
(351.75)
H = 6.25" = 0.52'   WSE Downstream Farthest Filter = 351.75
0.52
1.63
353.90

Cl Filter = 354.08 ok

Check CL2 chamber volume for disinfection/storage

(1) Check Disinfection V @ min CL2 levels

Req'd depth @ 10.2 MGD

$A = 2[120(60) - 43.75(1)(6)] = 13,875\ SF$
$= 103,785\ gal/VF$

Q = 5.1 MGD out

$V_{15 min} = (7,080\ gpm)(15) = 106,200\ gal$

$D = \frac{106,200}{103,785} = 1.02'$ Min WSE = 342.33
+ 1.02
343.35

Pump off Level = 343.50 ok

(2) Check ability to store entire decant

Assume EPS pumping 5.1 MGD WSE = 348.00
H_L CL2 → EPS = 0.15
WSE CL2 = 348.15

Decant V = 50(200)(370.93 - 368.18)
= 27,500 CF = 205,700 gallons

$CL2\ depth = \frac{205,700\ gal}{103,785\ gal/VF} = 1.98'$

WSE = 348.15 + 1.98' = 350.13

Transfer pump on = EL 350.50 ok

Check EPS Run Times

Assume two MS River Pumps start @ min speed w/ zero inflow

Combined Flow = 2,500 gpm +/-

Pump Run V = (28.33) 35 (3.5) (7.48) = 25,960 gal

$T = \frac{25,960}{2500} = 10.4\ min$ ok

(3) Calculate H_L Effluent Filters → SBR's

According to Westech, Distance from Concrete Slab to overflow weir = 1816 mm = 71.5"

Slab EL = 352.58
5.96'

Upstream WSE = 358.54

(3A) H_L Filters to inlet/bypass box

	Pipe Unit	EL 24"	EL 30"
	$V^2/2g$ 24" out		
1/2 Q	8'-24"	8	
4450 gpm	24" B.V.	60	
	24x30	56	
	30" 90°		75
	6'-30"		6
	30" Tee ⊥		146
1.0 Q	$V^2/2g$ 30" in		
8900 gpm			

H_L = 1.0(0.16) + 0.124(1.64) + (0.081)(0.55) = 0.41'

H_L = 0.5(0.26) + 0.146(1.98) = 0.42'

H_{LT} = 0.41 + 0.42 = 0.83'

WSE Bypass box = 358.54
0.83
359.57

Top structure = 361.93 ok

(3B) Calculate H_L Bypass Box → SBRS (8,900 GPM)

Pipe Unit	EL 24"	EL 30"
$V^2/2g$ 30" out		
10'-30"		10
30" Tee →		50
30x24 (2)		120
15'-24	15	
20'-30"		20
30" Tee ⊥		146
30" Tee → (2)		100
30" Tee ⊥		146
30x24		60
6'-24"	6	
24" 90		

24" BV 60
24x16 60

141 652'

$\frac{24}{30} = 2.95$

$EL = 141(2.95) + 652$
$= 1068' - 30'$

$H_L = 1.0(0.26) + 1.068(1.98)$
8900 gpm
$= 2.37'$ (TWL)

$H_L = 1.0(0.08) + 1.068(0.64)$
4900 gpm
$= 0.76'$ (BWL)

WSE Downstream Decanter = 359.57 (TWL) + 2.37 = 361.94 (TWL)
359.57 + 0.76 = 360.33 (BWL)

(TWL)
HGL in decanter @ 8900 gpm = 361.94 + 6.00 (Decanter H_L @ 8900 gpm) = 367.94

TWL = 370.93 ok > 367.94

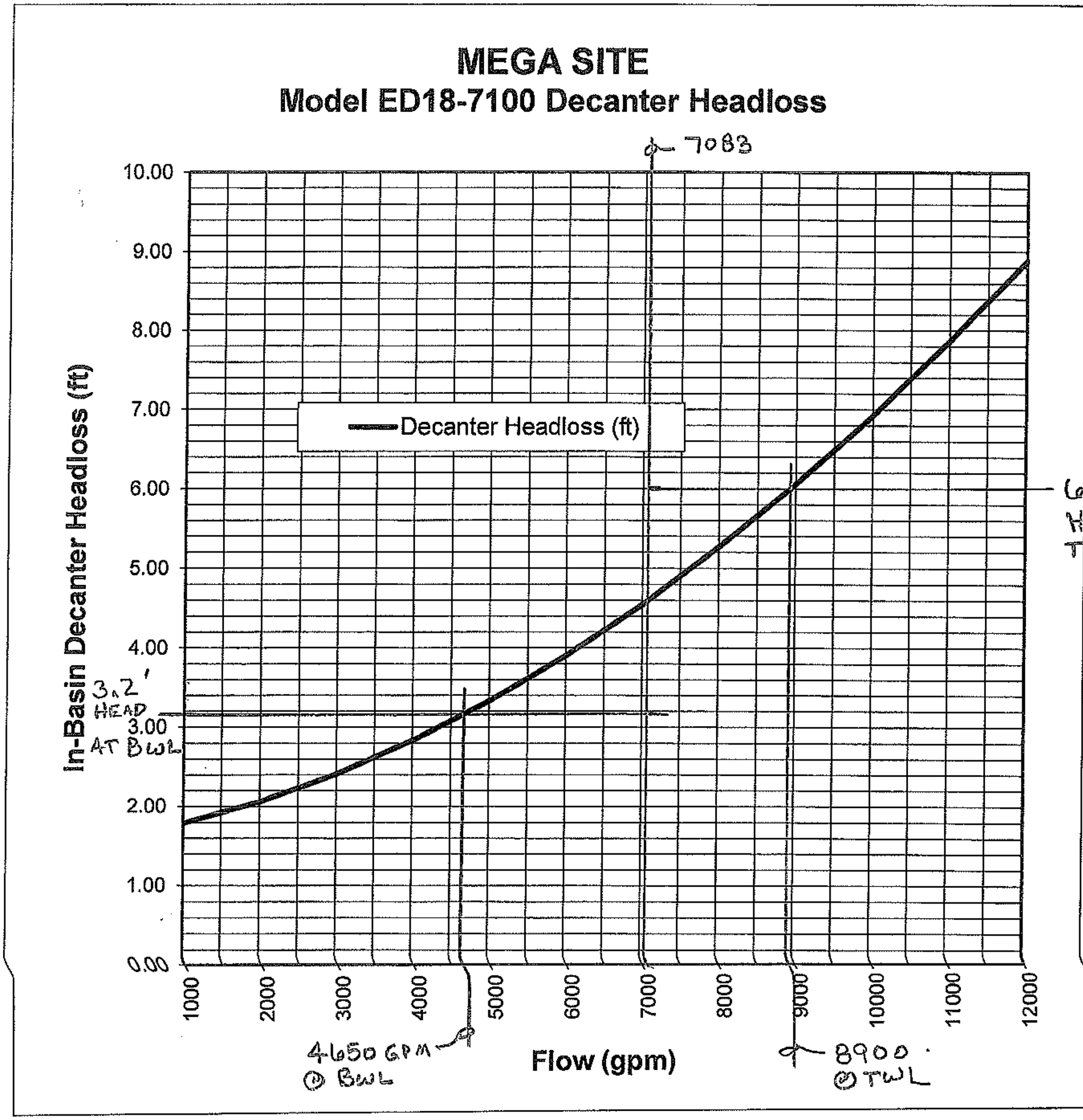
HGL in decanter @ 4900 gpm (BWL) = 360.33 + 3.20 (decanter H_L @ 4900 gpm) = 363.53

BWL = 368.18 ok > 363.53

ONE DECANTER PER REACTOR

2-HOUR CYCLE : 7083 GPM

Δh = 2.8 FT



(6) Calculate H_L SBR → Headworks

Q_{in} Max = 10.2 MGD = 7,080 GPM

Pipe Unit	EL 30"
30" $V^2/2g$ out	
4'-30"	4
30" 90°	75
30" P.V.	100
4'-30"	4
Future Basin No. 6 — 30" Tee	146
340'-30"	340
2-30" 45	80
30" 90	75
11'-30"	11
36" $V^2/2g$ in	
	835'

H_L = 1.0(0.16) + 0.5(0.07) + 0.835(1.80) = 1.70'

TWL = 370.93
H_L = 1.70'
372.63

WSE Downstream Parshall Flume

Flume IE = 374.50 ok

(7) Calculate H_L through Headworks

H upstream Flume @ 7,080 gpm = 2.44'

WSE upstream Flume = 375 + 2.44 = 377.44

Grit unit H_L = 0.04'

WSE upstream Grit = 377.48

Channel V = 10.2(1.55)/(2.5)(377.48 - 375.00)

= 2.55 fps ok

WSE downstream Screens = ? 377.5 +/-

Depth = 2'-6"

TOC = 380.00 ok

Screen Loss = 1'-0" Max.

WSE upstream Screens = 377.5 + 1.0 378.50 ok

HWA EPS = 349.83

WSE CCC = 348.15 Normal

WSE Downstream Effluent Filters = 353.90

WSE Upstream Effluent Filters = 358.54

WSE Downstream SBR	361.94	8900 GPM Decant (TWL)
	360.33	4900 gpm Decant (BWL)
SBR TWL	370.93	367.94 (HGL downstream)
BWL	368.18	363.53 (HGL downstream)
WSE Downstream Headworks	372.63	
WSE Upstream Headworks	379.00	

TRACOM INC.

770.664.6513 (V) 770.664.6565 (F)

Discharge Table For 12" Parshall Flume

8/9

LEVEL		FLOW		
FEET	INCHES	CFS	GPM	MGD
2.01	24.12	11.66	5231	7.533
2.02	24.24	11.75	5272	7.591
2.03	24.36	11.84	5312	7.650
2.04	24.48	11.93	5353	7.708
2.05	24.60	12.02	5393	7.767
2.06	24.72	12.11	5434	7.826
2.07	24.84	12.20	5475	7.885
2.08	24.96	12.29	5516	7.944
2.09	25.08	12.38	5557	8.003
2.10	25.20	12.47	5599	8.063
2.11	25.32	12.57	5640	8.122
2.12	25.44	12.66	5682	8.182
2.13	25.56	12.75	5723	8.242
2.14	25.68	12.85	5765	8.302
2.15	25.80	12.94	5807	8.362
2.16	25.92	13.03	5849	8.422
2.17	26.04	13.13	5891	8.483
2.18	26.16	13.22	5933	8.544
2.19	26.28	13.31	5975	8.604
2.20	26.40	13.41	6017	8.665
2.21	26.52	13.50	6060	8.726
2.22	26.64	13.60	6102	8.788
2.23	26.76	13.69	6145	8.849
2.24	26.88	13.79	6188	8.911
2.25	27.00	13.88	6231	8.973
2.26	27.12	13.98	6274	9.034
2.27	27.24	14.07	6317	9.096
2.28	27.36	14.17	6360	9.159
2.29	27.48	14.27	6403	9.221
2.30	27.60	14.36	6447	9.283
2.31	27.72	14.46	6490	9.346
2.32	27.84	14.56	6534	9.409
2.33	27.96	14.66	6577	9.472
2.34	28.08	14.75	6621	9.535
2.35	28.20	14.85	6665	9.598
2.36	28.32	14.95	6709	9.662
2.37	28.44	15.05	6753	9.725
2.38	28.56	15.15	6797	9.789
2.39	28.68	15.24	6842	9.853
2.40	28.80	15.34	6886	9.917
2.41	28.92	15.44	6931	9.981
2.42	29.04	15.54	6975	10.045
2.43	29.16	15.64	7020	10.109
2.44	29.28	15.74	7065	10.174
2.45	29.40	15.84	7110	10.239
2.46	29.52	15.94	7155	10.303
2.47	29.64	16.04	7200	10.368
2.48	29.76	16.14	7245	10.434
2.49	29.88	16.24	7291	10.499
2.50	30.00	16.35	7336	10.564

Source: United States Departmenbt of the Interior, Bureau of Reclamation, Water Measurement Manual, Third Edition, pp. A-17 - A-22.

9/9

Greg Davenport

From: Scott Daniel
Sent: Monday, March 14, 2022 12:29 PM
To: Greg Davenport
Cc: 3679
Subject: FW: Mega Site Memphis, TN delivery times

See below on the headloss for the Vulcan grit removal system.

Thanks,

W. Scott Daniel, P.E.
Vice President
60 Volunteer Boulevard
Jackson, Tennessee 38305
(731) 668-1953 (o)
(731) 571-7873 (c)
www.jrwauford.com

WAUFORD

From: George Peart <gpeart@gsengr.com>
Sent: Monday, March 14, 2022 11:52 AM
To: Scott Daniel <scottd@JRWAUFORD.COM>
Subject: Re: Mega Site Memphis, TN delivery times

Scott – per Vulcan:

For the Vistex grit removal chamber, we typically figure for 1/4" max headloss from the inlet to the outlet trough.

Does this help?

Thanks,

George Peart
Director of Sales

Gulf States Engineering Co., Inc.
8381 Industrial Drive
Olive Branch, MS 38654
662-890-4768 (phone)
662-890-4769 (fax)

901-490-4842 CELL

www.gsengr.com

Gulf States Engineering Co., Inc.
Engineered Products for Process and Power

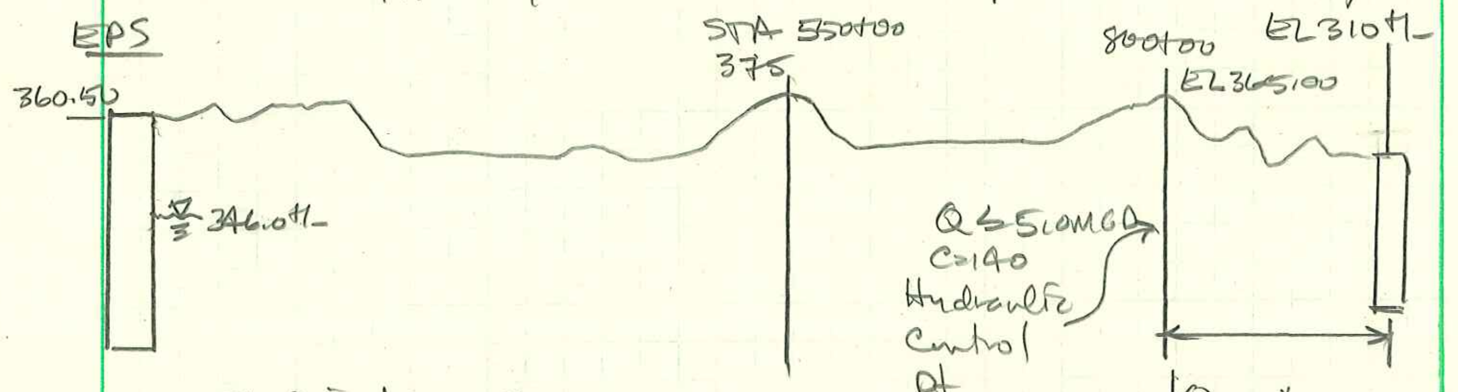
Effluent Pumping Station

Hydraulics

Given: Design Q = 5.1 MGD = 3,540 GPM
Use two pumps to achieve duty point
provide two redundant pumps
Attached pipeline hydraulics

Req'd: Hydraulics

Sol'n: Hydraulic Profile Summary



Station Losses

	Unit	EL 12	EL 18"	EL 20"
Q = 1/2 Q	12' Suction	20'		
	12" 90	30		
	12" C.V.	70		
	12" G.V.	8		
	12x18		45	
	18" 90		45	
	18" Tee		86	
1.0 Q	18" 90		45	
	50'–18"		50'	
	18x20			45

$EL_{20} = 1599 + 149 = 1698'$

$EL_{20}' = 300 + 45 = 345'$

EL 365±0
@ STA 800+00

12/20 = 11.5/0.95 = 12.1
18/20 = 1.58/0.95 = 1.66

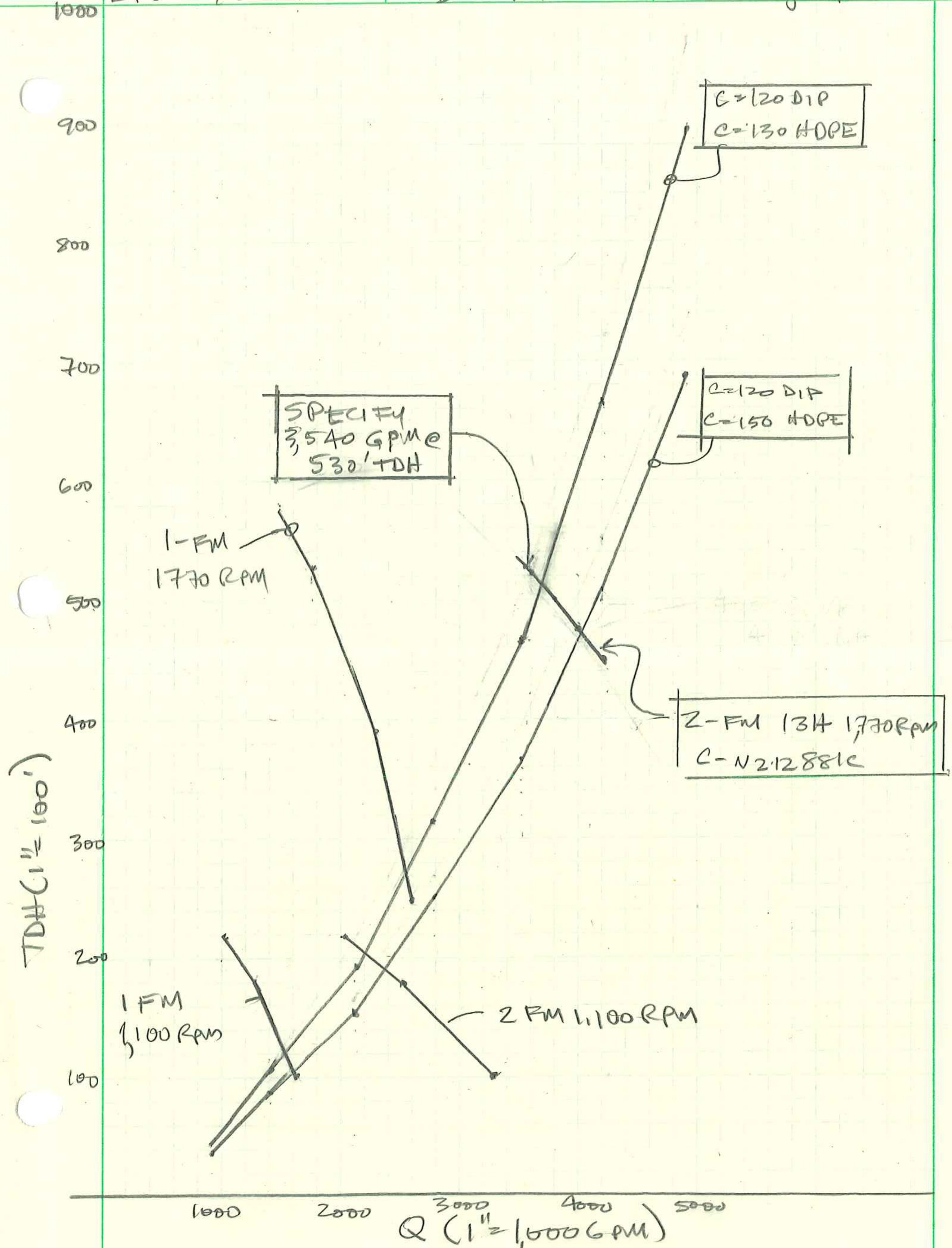
Q gravity
$H_L/1k' = \frac{55}{10} = 5.5'/1k$
Q = 5.0 MGD
C = 140

STA 800+00 STATIC = 365 – 345 = 20'

COVINGTON SPS STATIC 310 – 345 = –35'

Q	EL = 345'			1/2 Q	C=120 DIP EL = 1,698'			Hf Spreadsheet & C(HDPE)		TDH	
MGD	GPM	Hf/1k'	Hf	MGD	GPM	Hf/1k'	Hf	C=130	C=150	C=130	C=150
1.0	700	0.12	0	0.5	350	0.03	0	23	17	43	37
2.0	1400	0.45	0.2	1.0	700	0.12	0.2	81	63	101	83
3.0	2100	0.95	0.3	1.5	1050	0.26	0.4	172	133	193	154
4.0	2800	1.62	0.6	2.0	1400	0.45	0.8	293	227	315	249
5.0	3500	2.45	0.9	2.5	1750	0.68	1.2	443	342	466	365
6.0	4200	3.44	1.2	3.0	2100	0.95	1.6	699	540	667	509
7.0	4900	4.58	1.6	3.5	2450	1.27	2.2	927	716	896	685

* EL = Equivalent Length



C=120 DIP
C=130 HDPE
C=120 DIP
C=150 HDPE
SPECIFY
3,540 GPM @
530' TDH
1-FM
1770 RPM
2-FM 1314 1,770 RPM
C-N212881C
1 FM
1,100 RPM
2 FM 1,100 RPM
1000
900
800
700
600
500
400
300
200
100
TDH (1" = 100')
1000
2000
3000
4000
5000
Q (1" = 1,000 GPM)

Station	Distance between Stations (LF)	Pipe	
69+78.47	2,772	20" FM - DIP CLASS 52	✓
97+50.00	730	20" FM - HDPE DR7.3	✓
104+80.00	1,737	20" FM - DIP CLASS 52	✓
122+17.49	16,015	20" FM - HDPE DR9	✓
282+32.06	12,445	18" FM - HDPE DR11	✓
406+77.48	2,507	18" FM - HDPE DR9	✓
431+84.82	915	18" FM - HDPE DR11	✓
441+00.00	222	18" FM - HDPE DR13.5	✓
443+22.19	984	18" FM - HDPE DR9	✓
453+05.82	9,206	18" FM - HDPE DR13.5	✓
545+11.47	1,620	18" FM - HDPE DR9	✓
561+31.16	3,453	18" FM - HDPE DR13.5	✓
595+83.85	1,439	18" FM - HDPE DR9	✓
610+22.42	695	18" FM - HDPE DR13.5	✓
617+17.29	1,378	18" FM - HDPE DR11	✓
630+95.12	4,443	18" FM - HDPE DR13.5	✓
675+37.78	177	18" FM - HDPE DR11	✓
677+14.34	4,100	18" FM - HDPE DR13.5	✓
718+14.31	528	18" FM - HDPE DR11	✓
723+41.96	1,163	18" FM - HDPE DR13.5	✓
735+05.06	1,008	18" FM - HDPE DR11	✓
745+12.73	2,618	18" FM - HDPE DR13.5	✓
771+30.89	399	18" FM - HDPE DR11	✓
775+29.83	7,777	18" FM - HDPE DR13.5	✓
853+06.83	819	18" FM - HDPE DR11	✓
861+25.60	1,808	18" FM - HDPE DR13.5	✓
879+33.14	464	18" FM - HDPE DR11	✓
883+97.23	1,633	18" FM - HDPE DR13.5	✓
900+30		Covington SPS EL 310.00	

FM MRM WWTP — COVINGTON

Pipe	Total Length (LF)	TOTAL Length (LF)	ID (in)	ID FT
20" FM - DIP CLASS 52	~~7,278~~	4509	20.76	1.73
20" FM - HDPE DR7.3	~~730~~	730	15.06	1.26
~~20" FM - HDPE DR7.4~~	~~898~~			
18" FM - HDPE DR9	~~11,080~~	6550	14.91	1.24
20" FM - HDPE DR9	~~35,245~~	16,015	16.51	1.38
18" FM - HDPE DR11	~~27,627~~	18133	15.74	1.31
~~20" FM - HDPE DR11~~	~~37,073~~			
18" FM - HDPE DR13.5	~~69,019~~	37118	16.44	1.37
TOTAL		83,055		

weighted ID = 16.90"

NOTE: This data was obtained from SSOE COP revised plans Feb 2022

JGO
03/13/22

3/6

Memphis Regional Megasite - Effluent Pumping Station Hydraulics

Last Updated March 13, 2022

Static Q<3500 GPM	
station 800+00	365
MRM WSE	345
	20

Nominal D	Pipe	ID (ft)	Length	C
20	DIP CL 52	1.73	5009	120
20	HDPE DR 7	1.26	730	130
20	HDPE DR 9	1.38	16015	130
18	HDPE DR9	1.24	6550	130
18	HDPE DR11	1.31	18133	130
18	HDPE DR13.5	1.37	34063	130
			80500	

Static Q>3500 GPM	
Covington SPS	310
MRM WSE	345
	-35

Nominal D	Pipe	ID (ft)	Length	C
20	DIP CL 52	1.73	5009	120
20	HDPE DR 7	1.26	730	130
20	HDPE DR 9	1.38	16015	130
18	HDPE DR9	1.24	6550	130
18	HDPE DR11	1.31	18133	130
18	HDPE DR13.5	1.37	44063	130
			90500	

			20-inch	20-inch	20-inch	18-inch	18-inch	18-inch	HLF	
GPM	MGD	CFS	DIP CL 52	HDPE DR 7	HDPE DR 9	HDPE DR9	HDPE DR11	HDPE DR13.5	Total	TDH
700	1.01	1.56	1	0	4	3	6	10	25	45
1400	2.02	3.13	2	1	16	11	23	35	88	108
2100	3.03	4.69	4	2	34	23	49	74	187	207
2800	4.03	6.25	7	4	58	40	84	127	319	339
3500	5.04	7.82	10	6	87	60	127	192	482	502
4200	6.05	9.38	15	9	122	84	178	347	754	719
4900	7.06	10.94	20	9	162	112	236	462	1000	965

4/6

Memphis Regional Megasite - Effluent Pumping Station Hydraulics

Last Updated March 13, 2022

Static Q<3500 GPM	
station 800+00	365
MRM WSE	345
	20

Nominal D	Pipe	ID (ft)	Length	C
20	DIP CL 52	1.73	5009	120
20	HDPE DR 7	1.26	730	150
20	HDPE DR 9	1.38	16015	150
18	HDPE DR9	1.24	6550	150
18	HDPE DR11	1.31	18133	150
18	HDPE DR13.5	1.37	34063	150
			80500	

Static Q>3500 GPM	
Covington SPS	310
MRM WSE	345
	-35

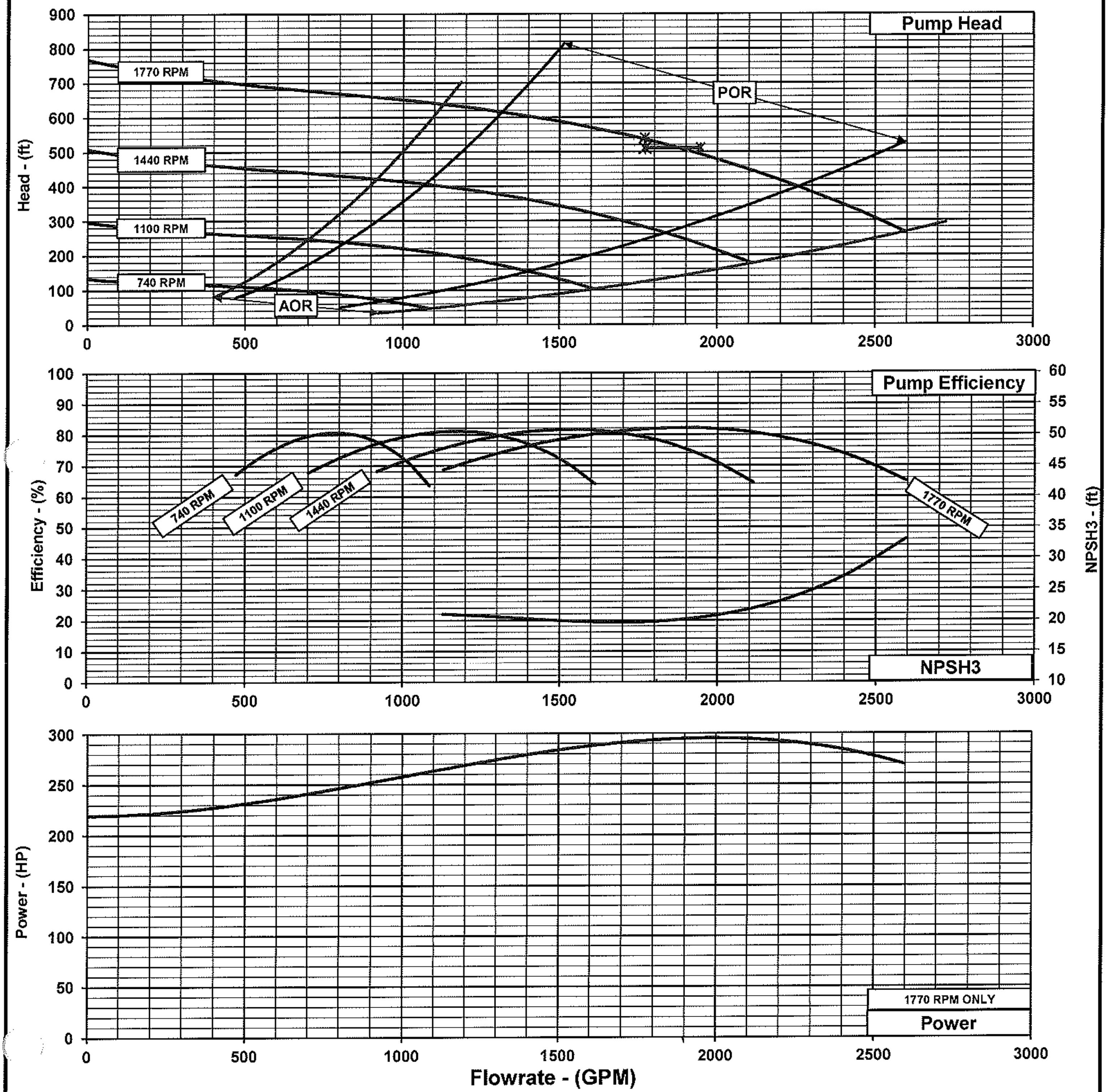
Nominal D	Pipe	ID (ft)	Length	C
20	DIP CL 52	1.73	5009	120
20	HDPE DR 7	1.26	730	150
20	HDPE DR 9	1.38	16015	150
18	HDPE DR9	1.24	6550	150
18	HDPE DR11	1.31	18133	150
18	HDPE DR13.5	1.37	44063	150
			90500	

			20-inch	20-inch	20-inch	18-inch	18-inch	18-inch	HLF	
GPM	MGD	CFS	DIP CL 52	HDPE DR 7	HDPE DR 9	HDPE DR9	HDPE DR11	HDPE DR13.5	Total	TDH
700	1.01	1.56	1	0	3	2	5	7	19	39
1400	2.02	3.13	2	1	12	8	18	27	68	88
2100	3.03	4.69	4	2	26	18	38	57	145	165
2800	4.03	6.25	7	3	44	30	64	97	246	266
3500	5.04	7.82	10	5	67	46	97	147	372	392
4200	6.05	9.38	15	7	93	64	136	266	582	547
4900	7.06	10.94	20	7	124	86	181	354	772	737

5/6

Ms EWBR PUMPS 6/6

13H Quotation Curve		PENTAIR FAIRBANKS NIJHUIS™							
(CUR)VE NUMBER:	C-N212881C	SPEED	DRIVER	DIAMETER	SPHERE	GUARANTEED VALUES			
REV.	1	1770 RPM	300 HP	AS REQ'D	1.00"	FLOW	HEAD	PUMP EFF	HP
THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.		STAGES	IMPELLER	DATE	BY	1770	510	-----	-----
		9	AS REQ'D	3/21/2022	DAR	-----	-----	-----	-----
		Impeller diameter selected to maximize head while non-overloading driver				-----	-----	-----	-----
						-----	-----	-----	-----



EFFLUENT TRANSFER P.S.

&

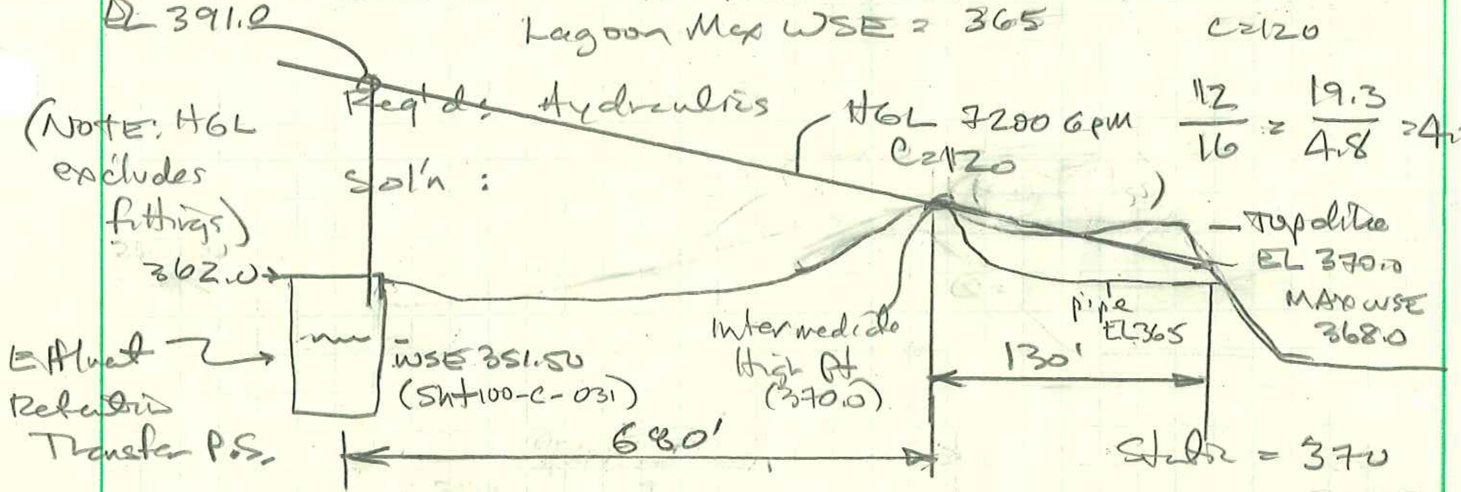
EFFLUENT RETURN P.S.

HYDRAULICS

Given: Transfer Rate = 10.2 MGD = 7,080 GPM
Lagoon Max WSE = 365   C=120

Req'd: Hydraulics

Sol'n:



$\frac{12}{16} = \frac{19.3}{4.8} = 4.0$

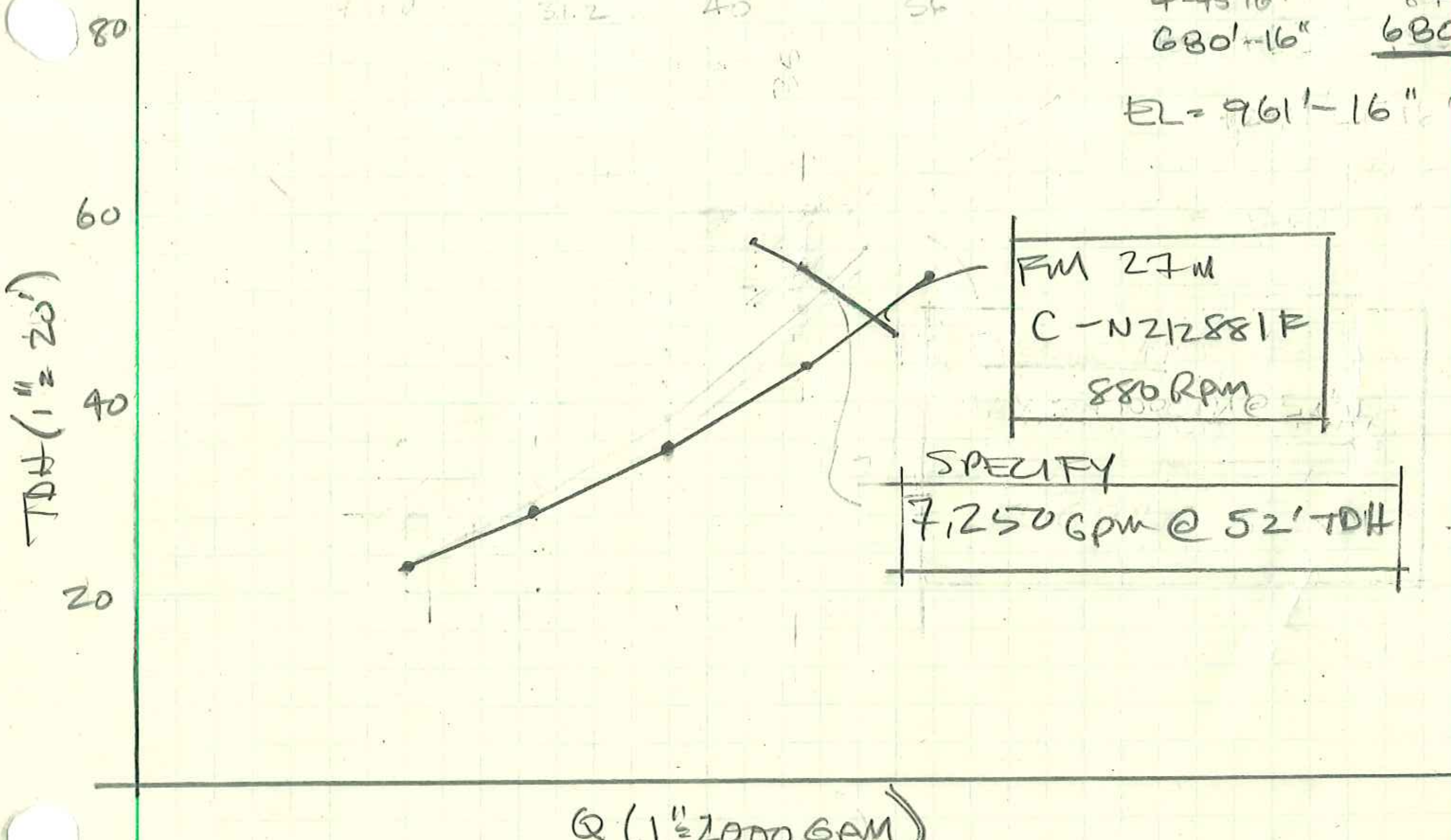
Static = 370
− 351.50
= 18.50'

Updated 06/07/22 to incl. HGL

Q	Hf/1k'	Hf	TDH
2800	4.80	4.6	23
4200	10.2	9.8	28.5
5600	17.4	16.7	35
7000	26.2	25.1	43.6
8400	36.9	35.5	54.0

unit	16
20"-16"	20
16" C.V.	100
16" G.V.	10
16" Tee →	27
16" 90	40
4-45 16"	84
680'-16"	680

EL = 961' − 16"



LAGOON TRANSFER PUMPS

27M Quotation Curve

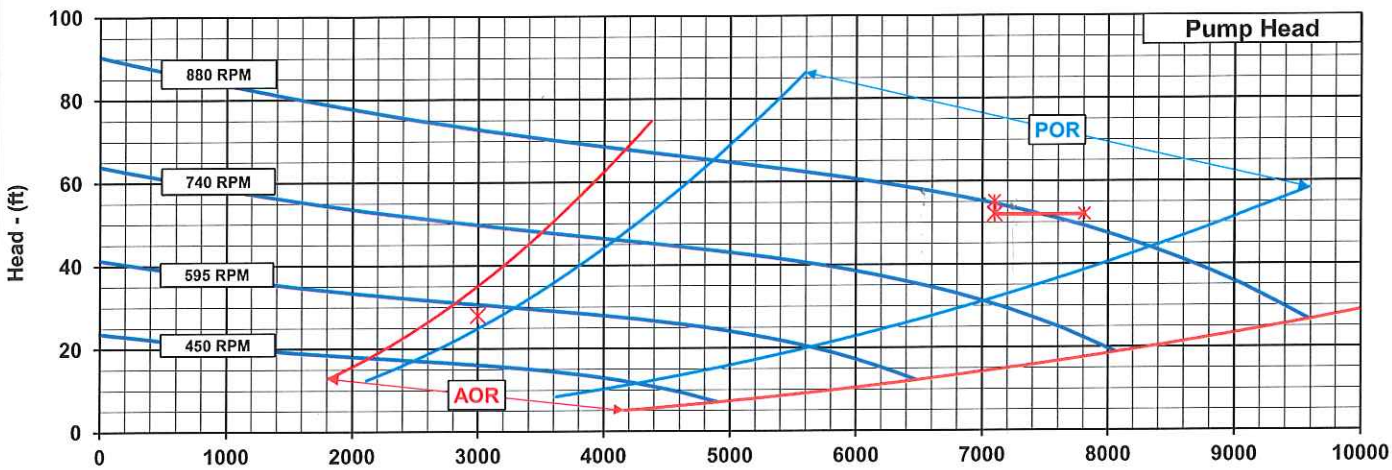
PENTAIR FAIRBANKS NIJHUIS™

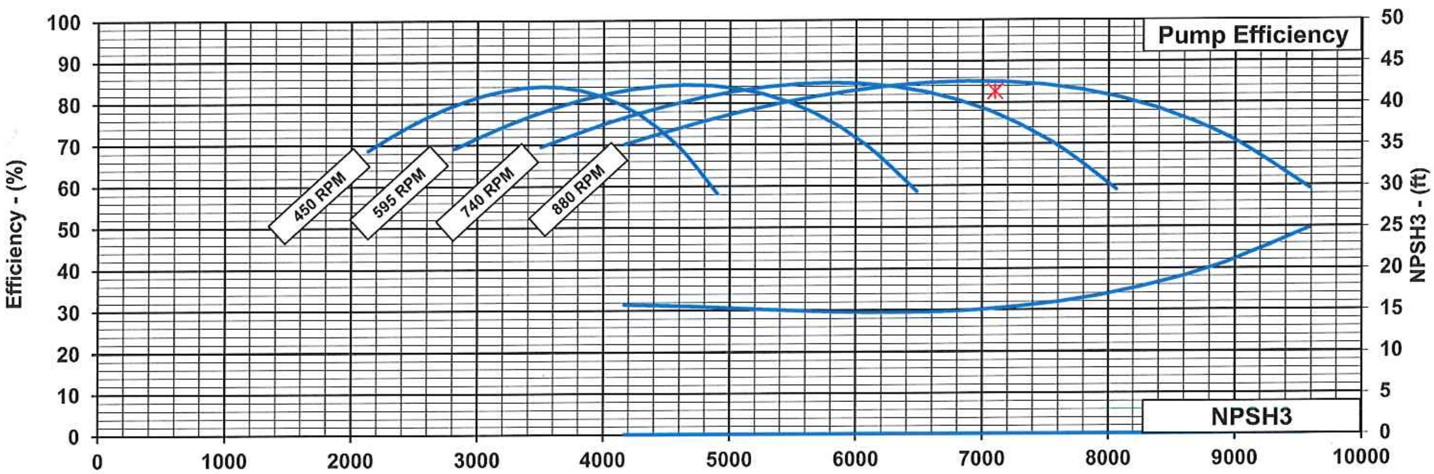
CURVE NUMBER:	C-N212881F	SPEED	DRIVER	DIAMETER	SPHERE
REV.	0	880 RPM	125 HP	AS REQ'D	2.75"
		STAGES	IMPELLER	DATE	BY
		1	AS REQ'D	2/22/2022	DAR

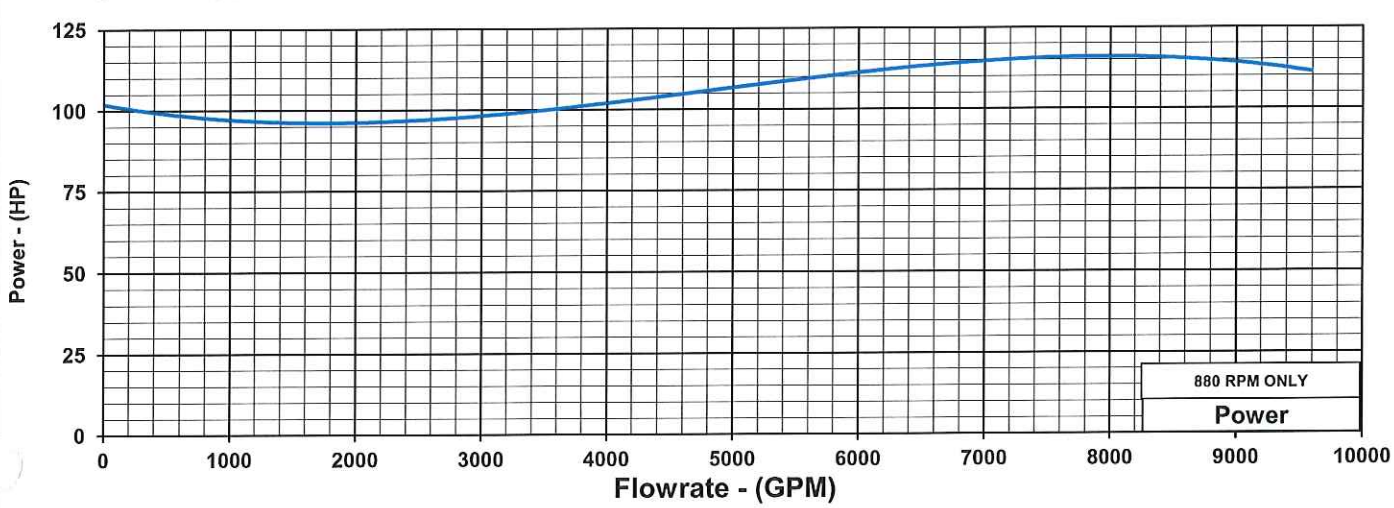
THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.

GUARANTEED VALUES

FLOW	HEAD	PUMP EFF	HP
7100	52	82.5	-----
3000	28	-----	-----
-----	-----	-----	-----
-----	-----	-----	-----





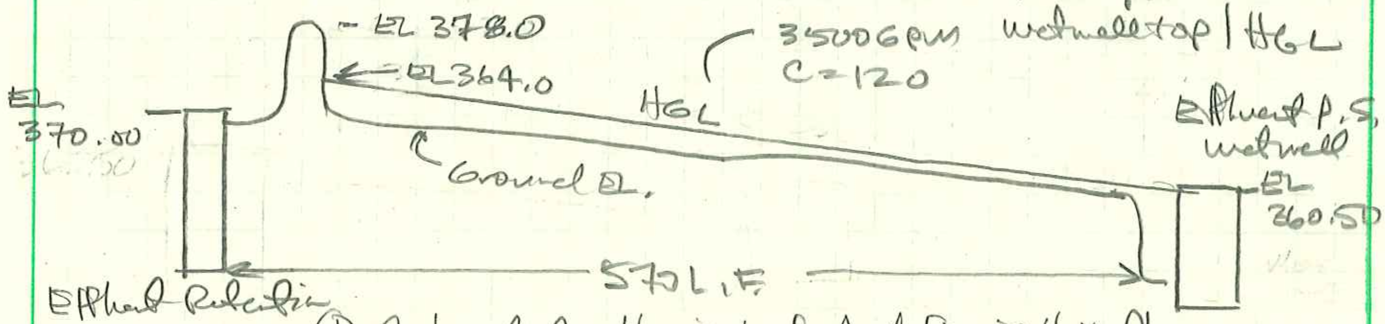


Given: Transfer Rate Max = 5.1 MGD
Lagoon Max WSE = 363
" Min WSE = 345
EPS WSE = 348.0

Req'd: Hydraulics

Soln:

Revised 05/16/22 to depict Revised wetwell top | HGL



① Calculate Height of Artificial High Pt

Distance P.S. → EPS = 700 +/−

(45°) (90)

$H_{L\,16"}$ 5.1 MGD / 700' = 700 + 3(21) + 40 = 803'

H_L = 0.803(7.5) = 6.0'

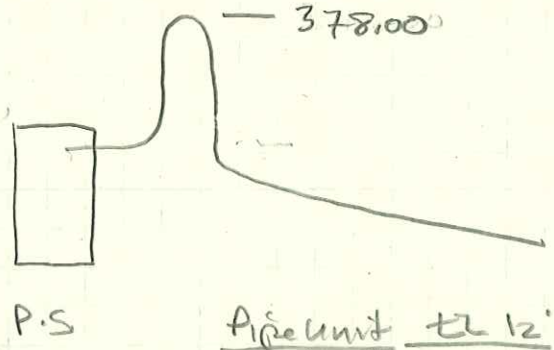
Max WSE EPS = 351
+ 6
Candy Cane Top = 357

FM Elev = 362.0 +/− ok except for siphon condition

Actual MIN STATIC = FM ELEV − LAGOON WSE
= 362 − 363 = −1'

(Pump will run out when lagoon is full)

Set Candy Cane @ 378.0 to induce 10' static when lagoon full



	MAX	MIN
STATIC	378	378
	350	368
	28	10'

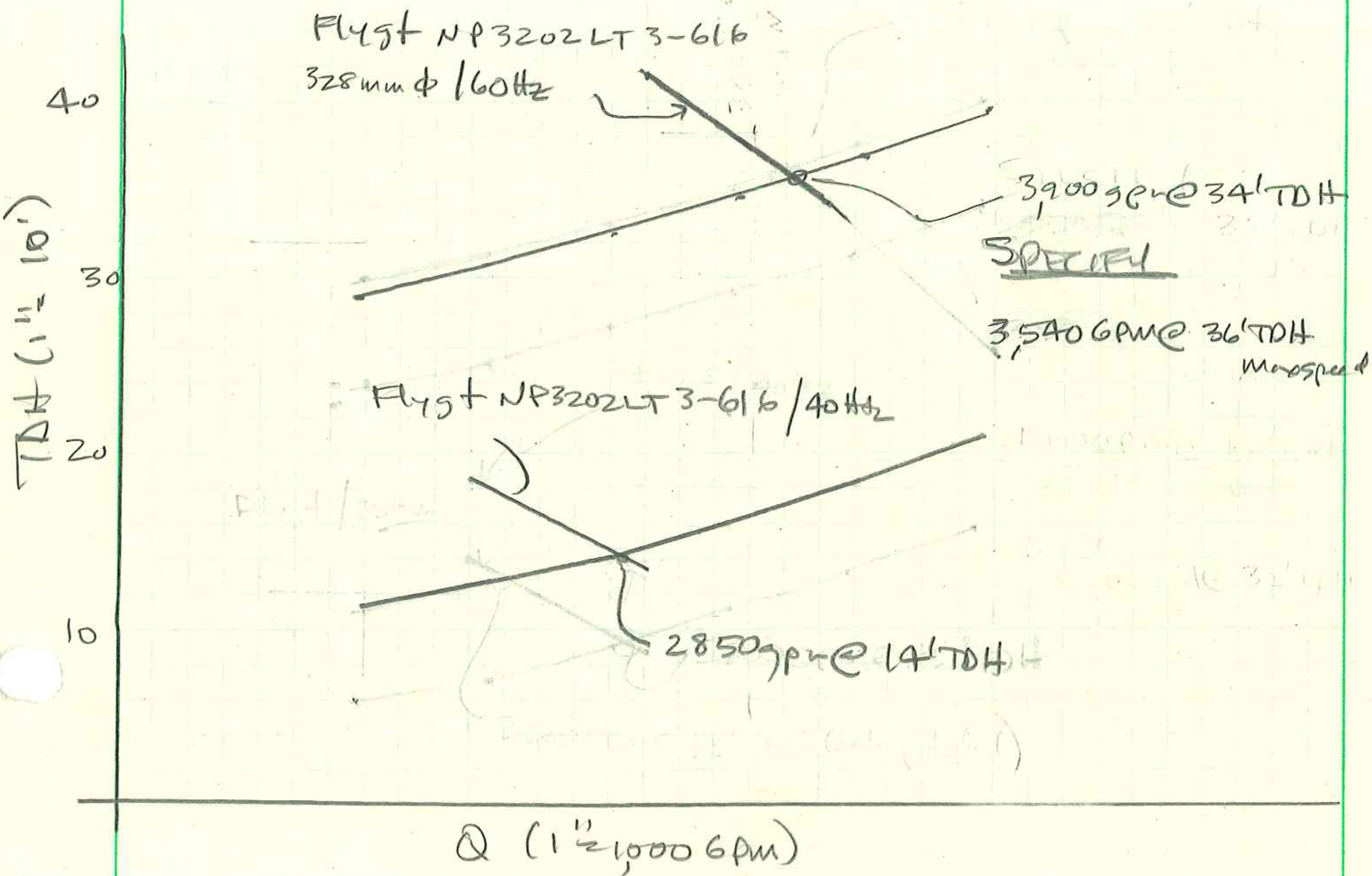
$\frac{12}{16} = \frac{19.3}{4.8} = 4.0$

EL = 4(153)+95

= 807'-16"

Pipe Unit	EL 12"	16"
20'-12"	20	
12" 90	30	
12" CV	70	
12" GV	8	
12x16	25	
16" 90(2)		80
15'-16"		15
	153	95

Q	HL/1K'	HLf	MIN TDH	MAX TDH
1400	1.33	1	29	11
2100	2.83	2.3	30	12
2800	4.80	3.9	31	14
3500	7.30	5.9	34	16
4200	10.2	8.2	36	18
4900	13.6	11	39	21



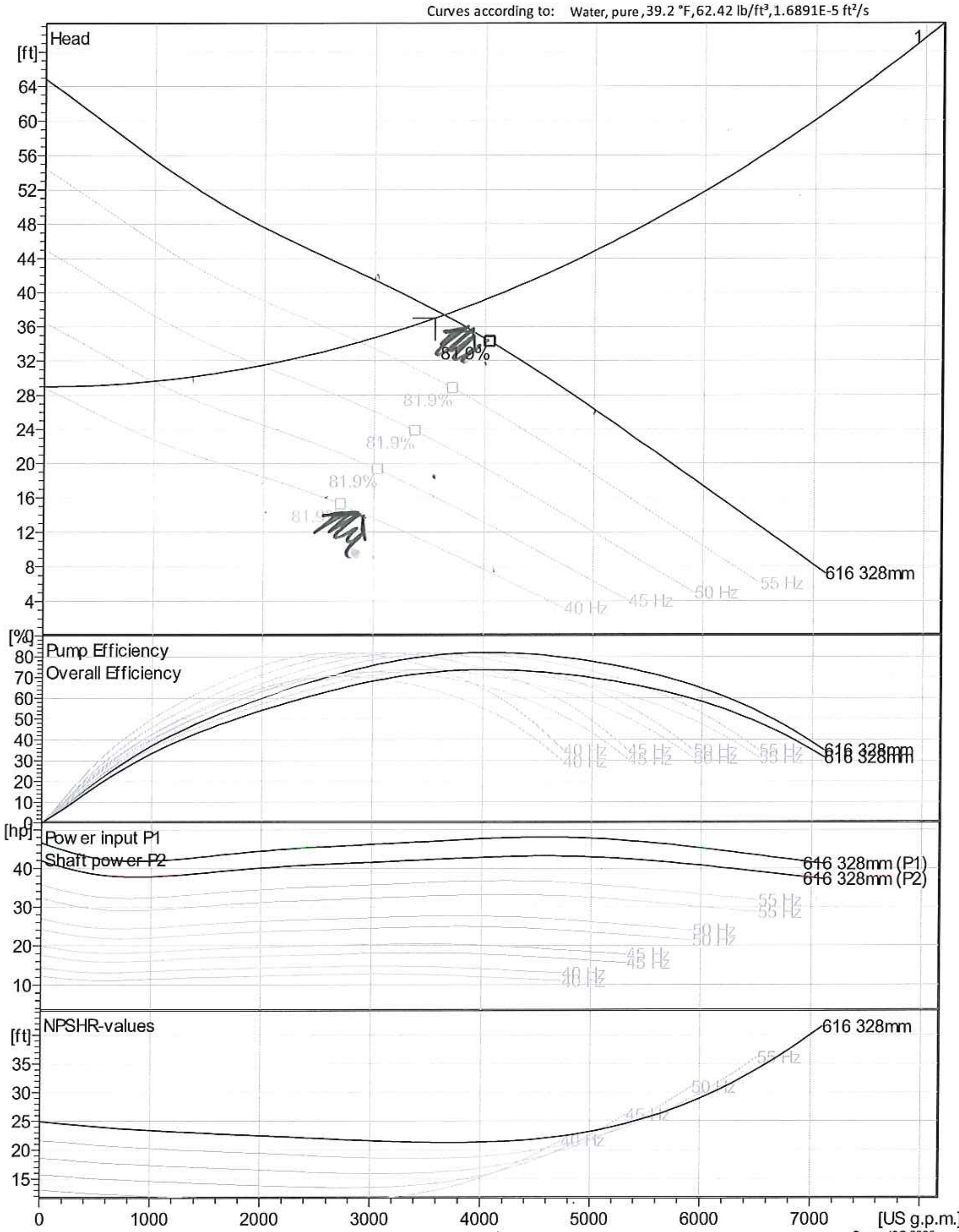
Return SPS

NP 3202 LT 3~ 616

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Project		**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

LOCAL P.S. HYDRAULICS

Given : Use wet pit submersible technology
- Must drain SBR BWL → Slab in 24 hrs
- Drain CL2 chambers
- Accept Screw Press Filtrate
- Accept Digester Supernate

Req'd : Hydraulics

Sol'n : Calculate Req'd Capacity

$V_{SBR\ BWL-SLAB} = 50(200)(365.88-350.18)$

$= 155{,}000\ C.F. = 1{,}159{,}400\ Gal$

Static: 378 − 332 = 46'

To Drain in 24 hrs $Q = \frac{1{,}159{,}400}{1440} = 805\ gpm$

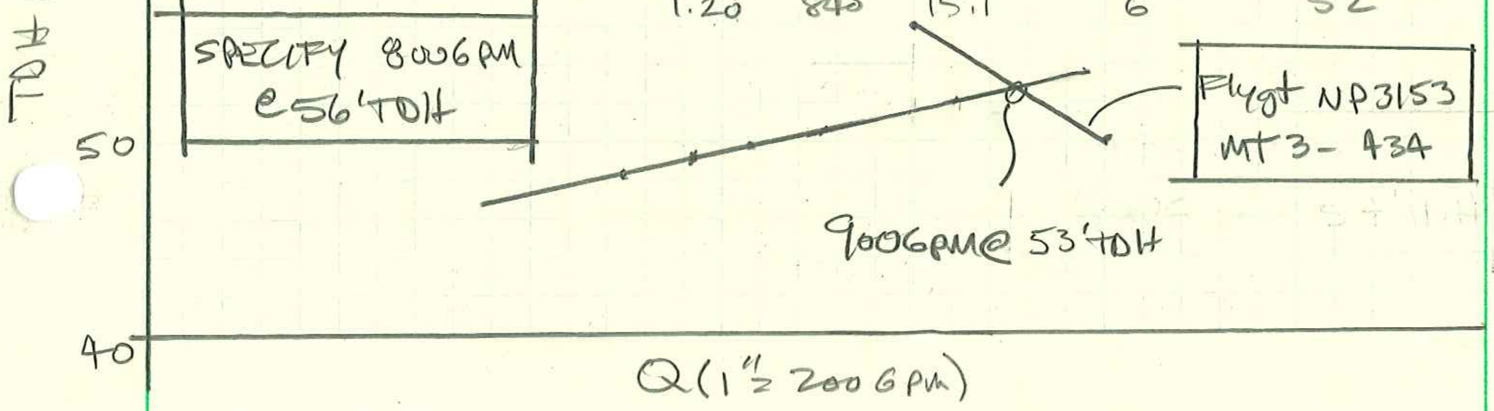
This flow should be sufficient to accept the following (not simultaneously)

- One SBR Drain + grit + operations Bldg
- One CL2 chamber + grit + operations Bldg
- Two Screw Presses + one digester supernate + operations Bldg + grit

Pipe Unit	EL 8"
30'-8"	30
8'-8"	8
8" CV	110
8" GV	5
8" Tee ↗	40
205' 8"	205
	398'

EL = 398'-8"   C=120

MGD Q	GPM Q	HL/1k'	HLf	TDH
0.6	420	4.19	1.7	47.7
0.7	490	5.6	2.2	48.2
0.8	560	7.1	2.8	48.8
0.9	630	8.9	3.6	49.6
1.00	700	10.8	4.3	50.3
1.10	770	12.8	5.1	51.1
1.20	840	15.1	6	52

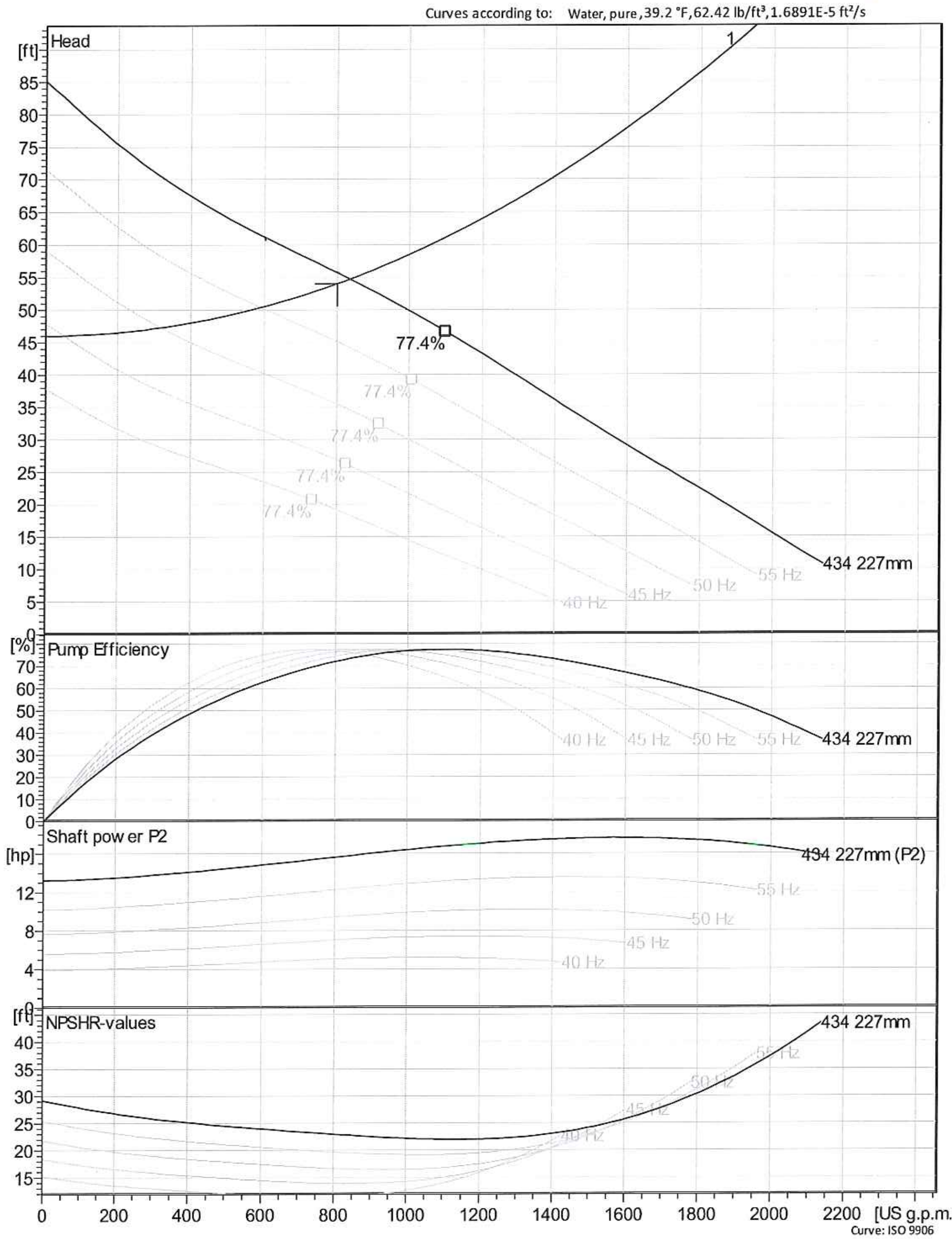


Local SPS

2/2

NP 3153 MT 3~ 434

VFD Curve



Project	MRM Onsite PS	**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

WAS PUMP HYDRAULICS

Given: • Max Waste Sludge Q = 50,000 gal/MGD

C = 120 = 250,000 gal/day (5 MGD)

• Waste from one SBR basin at a time

• Digester TOP = EL 381.0 SBR BWL = 365.68

Reqd: Hydraulics

Soln:

Static: 381 − 365 = 16'

Desired Pump Capacity

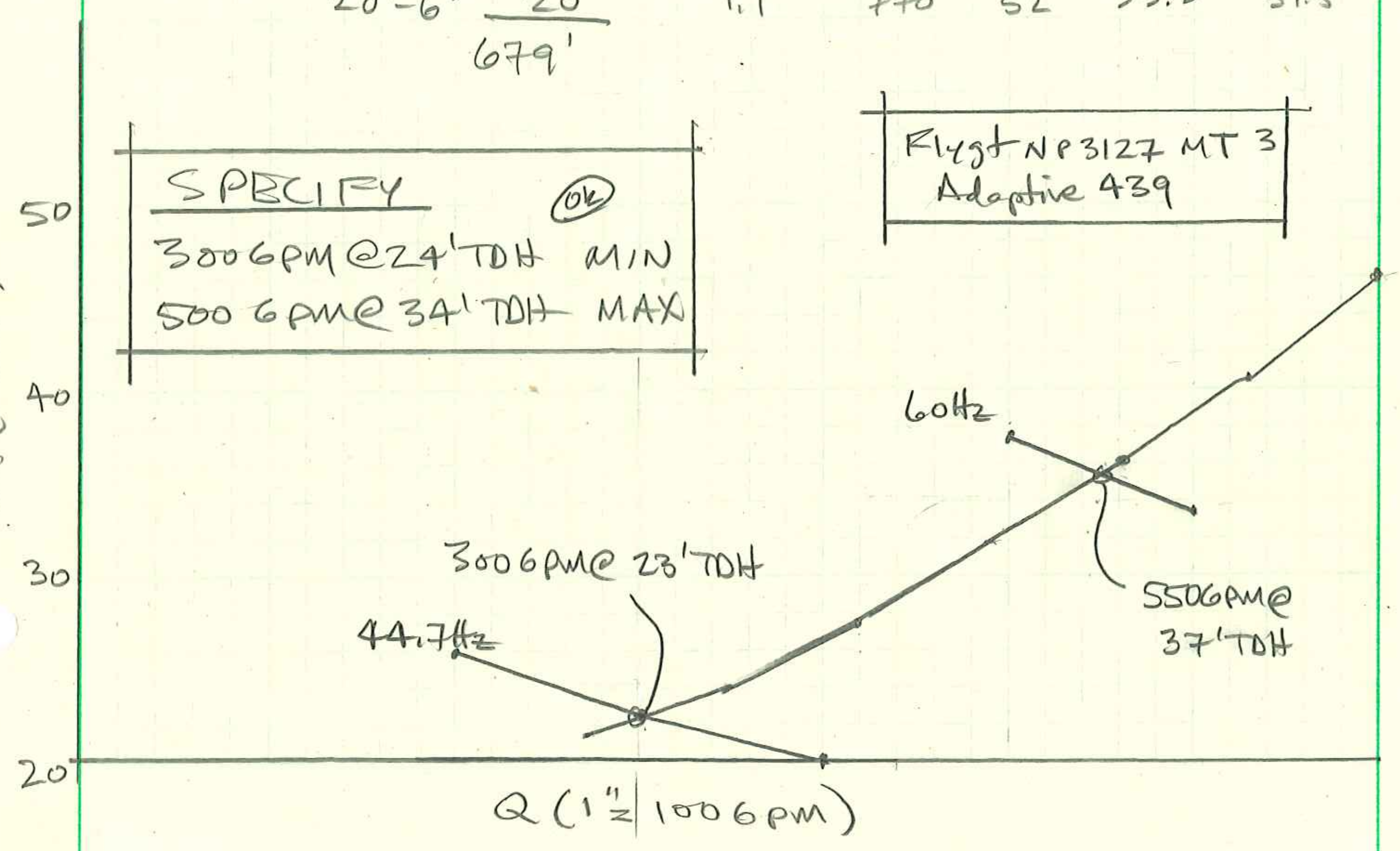
Waste all Sludge in 8 hr day

$$Q = \frac{250{,}000\ Gal}{d}\left(\frac{1\ day}{8\ hrs}\right)\frac{1\ hr}{60\ min} = 521\ gpm$$

use 500 GPM on VFD

Pipe unit	EL 6"
10'-6"	10
6" CV	36
6" GV	4
6" 90	16
(7) 6" Tee →	63
6" PV	15
500'-6"	500
6" PV	15
20'-6"	20
	679'

MGD Q	GPM Q	Hf/1K	Hf	TDH
0.3	210	4.7	3	19
0.4	280	8.0	5.5	21.5
0.5	350	12.1	8	24
0.6	420	17.0	11.5	27.5
0.7	490	22.6	15.5	31.5
0.8	560	28.9	20	36
0.9	630	35.8	24.5	40.5
1.0	700	43.8	30	46
1.1	770	52	35.5	51.5



2/2

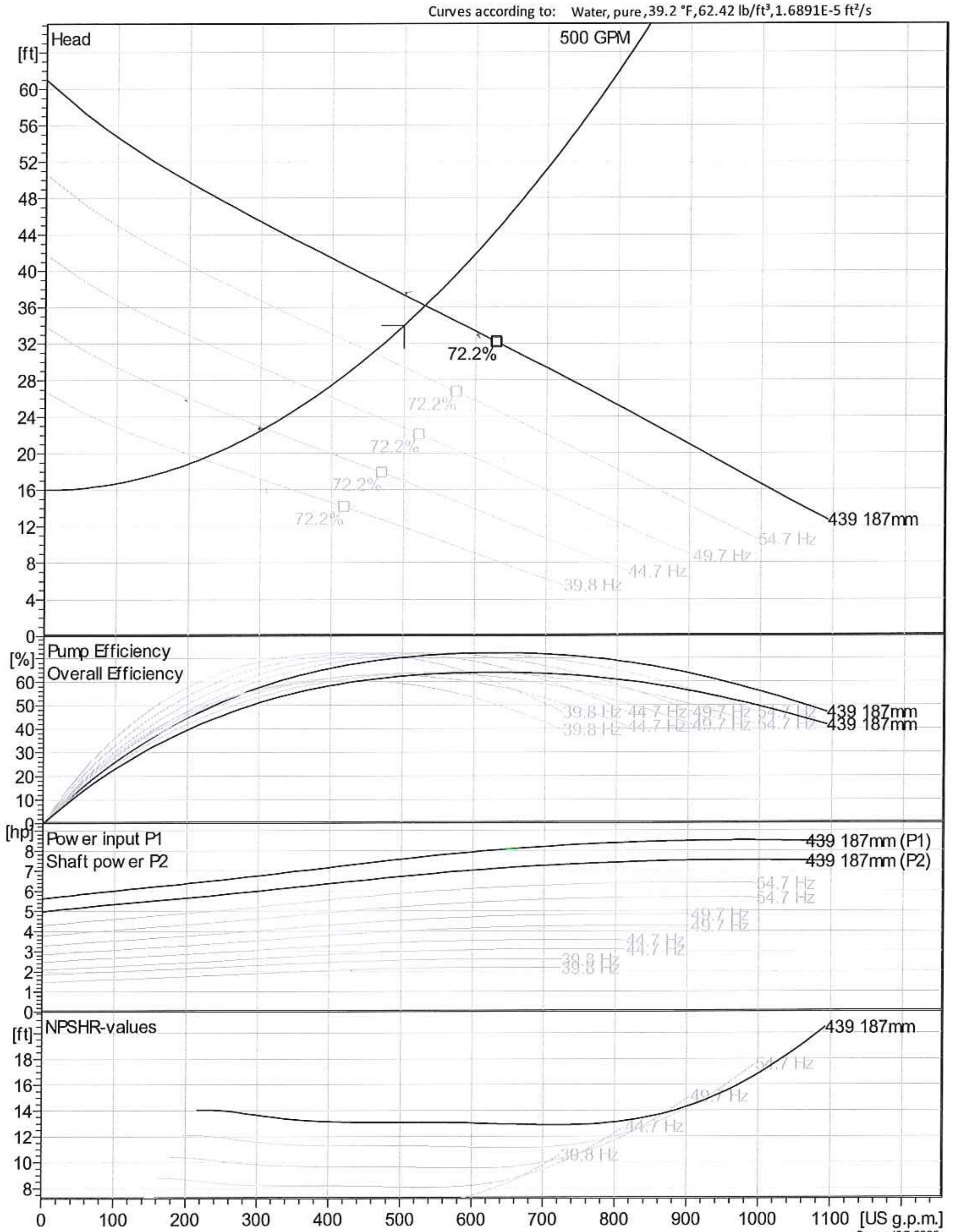
WAS Pumps

NP 3127 MT 3~ Adaptive 439

VFD Curve

FLYGT
a xylem brand

Curves according to: Water, pure, 39.2 °F, 62.42 lb/ft³, 1.6891E-5 ft²/s



Project		**Created by**	George Peart
Block	0	**Created on**	2/2/2022 **Last update** 2/2/2022

Program version 61.0 - 12/1/2021 (Build 144)

Data version 1/12/2022 15:59 A1P1

User group(s) Xylem.USA - EXT

FLUSHING WATER

PUMPS

Given: Flushing Water Pump Q = 300gpm max.
Two – 500gpm pumps – P=130psi
Req'd: Hydraulics
Sol'n:

Tank Flr EL = 365.50
P = 130 psi = 300'
HGL = 665.50

Static = 665.50
345 –
Static = 320.50'

EPS wetwell WSE = 345

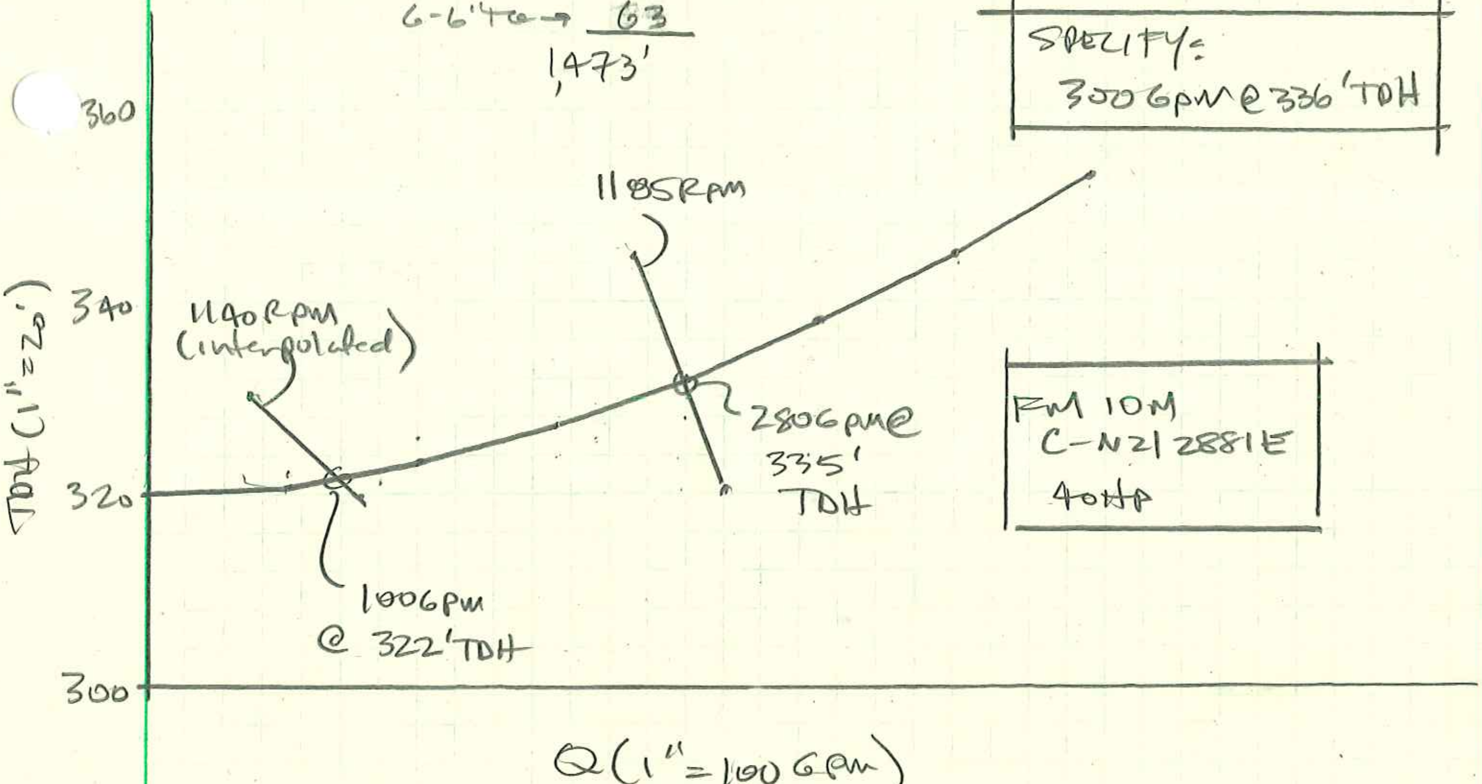
Assume zero usage

C=120

Pipe unit	EL 6"
20' – 6"	20
6" C.V.	36
6" G.V.	4
6" tee ⊥	30
6" 90 (2)	32
1120' – 6"	1120
8 – 6" 90	108
2 – 6" Tee ⊥	60
6 – 6" Tee →	63
	1,473'

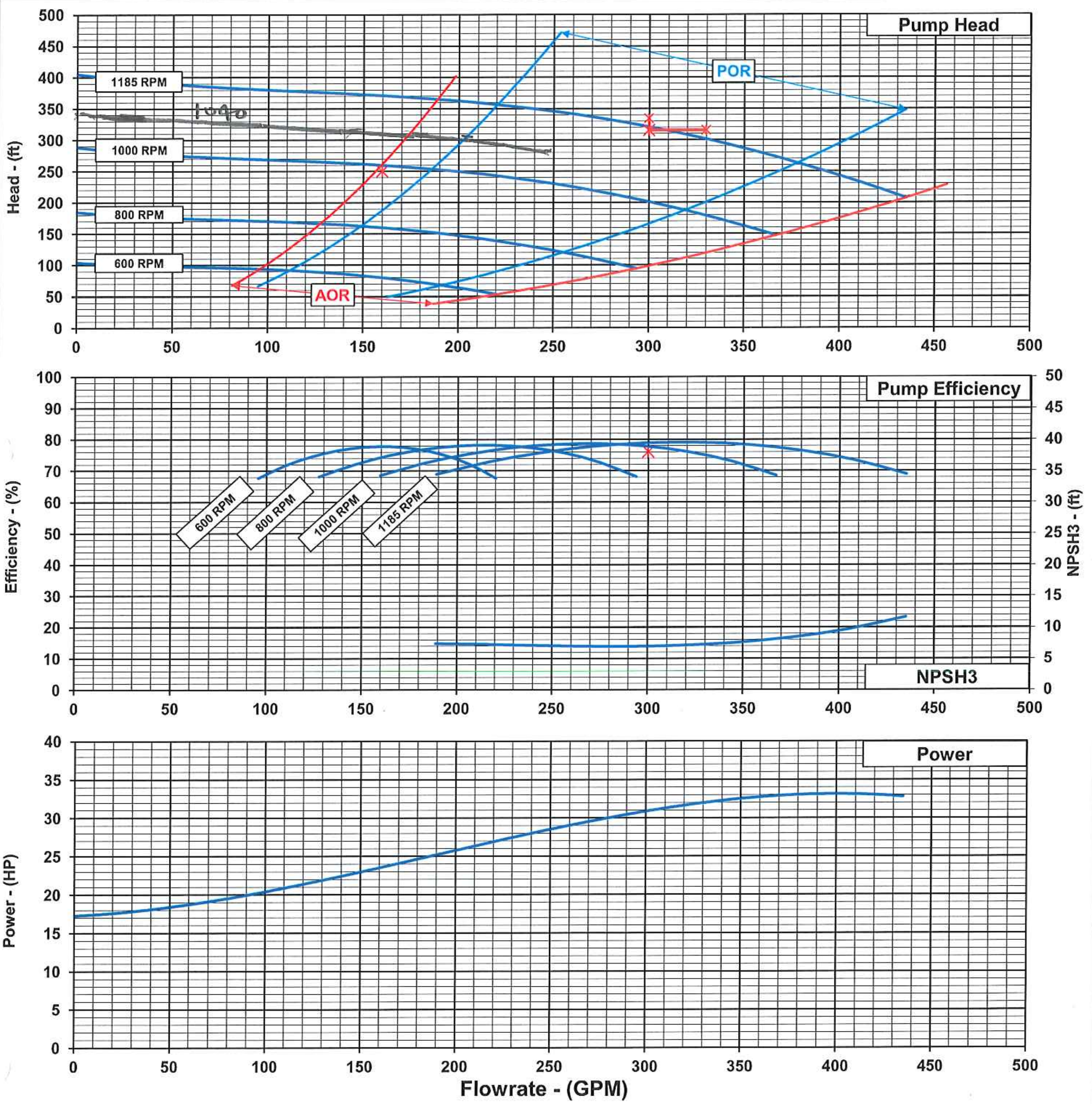
MGD	Q GPM	Hzf/1k'	Hzf	TDH
0.1	70	0.61	1	321
0.2	140	2.22	3	323
0.3	210	4.70	7	327
0.4	280	8.0	12	332
0.5	350	12.1	18	338
0.6	420	17.0	25	345
0.7	490	22.6	33	353

SPECIFY:
300 GPM @ 336' TDH



ONSITE FLUSHING WATER PUMPS

10M Quotation Curve		PENTAIR FAIRBANKS NIJHUIS							
CURVE NUMBER:	C-N212881E	SPEED	DRIVER	DIAMETER	SPHERE	GUARANTEED VALUES			
REV.	0	1185 RPM	40 HP	AS REQ'D	0.68"	FLOW	HEAD	PUMP EFF	HP
THIS CURVE IS BASED ON THE ACTUAL TEST PERFORMANCE OF A SIMILAR PUMP. ONLY THE INDICATED POINT(S) IS GUARANTEED.		STAGES	IMPELLER	DATE	BY	300	315	76	-----
		16	AS REQ'D	2/22/2022	DAR	160	250	-----	-----
						-----	-----	-----	-----
						-----	-----	-----	-----



PROCESS NOTES

DESIGN CRITERIA (4 REACTOR SYSTEM)

1. THE OPERATING PROTOCOL WILL BE AS DEPICTED ON FIGURE NO 1. THIS PROTOCOL REPRESENTS A CONVENTIONAL SBR OPERATION WITH SEPERATE FILL-ONLY AND DECANT-ONLY CYCLE COMPONENTS. THE DECANT RATE WILL BE BASED ON THE DECANTER "HEADLOSS - DISCHARGE RATE" CURVE AND THE TWL REACHED DURING A FILL COMPONENT

2. REACTOR DIMENSIONS ARE 50' WIDTH, 200' LENGTH AND 18.00' BWL

3. NORMAL FLOW CONDITIONS ARE FLOWS UP TO 5.1 MGD

4. PEAK INFLUENT WASTEWATER FLOW RATE = 10.2 MGD

5. A 4-HOUR CYCLE WILL BE USED UNDER NORMAL FLOW CONDITIONS. THE COMPONENTS OF THE 4-HOUR CYCLE WILL BE:

FILL/REACT	: 60 MINUTES
REACT	: 60 MINUTES
SETTLE	: 60 MINUTES
DECANT	: 60 MINUTES

6. THE MINIMUM CYCLE TIME WILL BE 2-HOURS AT THE 10.2 MGD PEAK INFLUENT FLOW RATE. THE COMPONENTS OF THE 2-HOUR CYCLE WILL BE:

FILL/REACT	: 30 MINUTES
REACT	: 30 MINUTES
SETTLE	: 30 MINUTES
DECANT	: 30 MINUTES

THE FILL VOLUME UNDER THE 2-HOUR CYCLE WILL ESTABLISH THE TOP WATER LEVEL (TWL) HEIGHT ABOVE THE BOTTOM WATER LEVEL (BWL).

7. WHEN THE INFLUENT VOLUMETRIC FLOW RATE REACHES THE MAGNITUDE THAT CAUSES THE TWL ESTABLISHED AS STATED AT DESIGN CRITERIA "6" TO BE REACHED WITHIN THE 60-MINUTES FILL COMPONENT OF A 4-HOUR CYCLE, THE CONTROL SYSTEM WILL CHANGE THE CYCLE TIME FROM A 4-HOUR CYCLE TO A 3-HOUR CYCLE.

THE COMPONENTS OF THE 3-HOUR CYCLE WILL BE:

FILL/REACT : 45 MINUTES
REACT : 45 MINUTES
SETTLE : 45 MINUTES
DECANT : 45 MINUTES

8. WHEN THE INFLUENT VOLUMETRIC FLOW RATE REACHES THE MAGNITUDE THAT CAUSES THE TWL ESTABLISHED AS STATED AT DESIGN CRITERIA "6" TO BE REACHED WITHIN THE 45-MINUTE FILL COMPONENT OF A 3-HOUR CYCLE, THE CONTROL SYSTEM WILL CHANGE THE CYCLE TIME FROM A 3-HOUR CYCLE TO A 2-HOUR CYCLE.

DETERMINE TWL AT PEAK FLOW RATE

4-HOUR CYCLE (60-MINUTE [1 HOUR] FILL COMPONENT)

$$\left(\frac{10{,}200{,}000 \text{ GAL}}{\text{DAY}}\right)\left(\frac{\text{FT}^3}{7.48 \text{ GAL}}\right)\left(\frac{\text{DAY}}{24\text{-HR}}\right)\left(\frac{1 \text{ HR}}{\text{FILL VOL.}}\right) = \frac{56{,}818 \text{ FT}^3}{\text{FILL VOLUME}}$$

$$\text{TWL} = \frac{56{,}818 \text{ FT}^3}{(50 \text{ FT})(200 \text{ FT})} = 5.68 \text{ FT}$$

3-HOUR CYCLE (45-MINUTE [0.75 HOUR] FILL COMPONENT)

$$\left(\frac{10{,}200{,}000 \text{ GAL}}{\text{DAY}}\right)\left(\frac{\text{FT}^3}{7.48 \text{ GAL}}\right)\left(\frac{\text{DAY}}{24\text{-HR}}\right)\left(\frac{0.75 \text{ HR}}{\text{FILL VOL.}}\right) = \frac{42{,}614 \text{ FT}^3}{\text{FILL VOLUME}}$$

$$\text{TWL} = \frac{42{,}614 \text{ FT}^3}{(50 \text{ FT})(200 \text{ FT})} = 4.26 \text{ FT}$$

2-HOUR CYCLE (30-MINUTE [0.5 HOUR] FILL COMPONENT)

$$\left(\frac{10{,}200{,}000 \text{ GAL}}{\text{DAY}}\right)\left(\frac{\text{FT}^3}{7.48 \text{ GAL}}\right)\left(\frac{\text{DAY}}{24 \text{ HR}}\right)\left(\frac{0.5 \text{ HR}}{\text{FILL VOL}}\right) = \frac{28{,}409 \text{ FT}^3}{\text{FILL VOLUME}}$$

$$\text{TWL} = \frac{28{,}409 \text{ FT}^3}{(50 \text{ FT})(200 \text{ FT})} = 2.8 \text{ FT}$$

DESIGN VALUE TWL - BWL

DETERMINE MAXIMUM ALLOWABLE INFLUENT FLOW RATE FOR EACH OPERATING CYCLE

$$\text{TWL} - \text{BWL VOLUME} = 28{,}409 \text{ FT}^3$$

$$28{,}409 \text{ FT}^3 \times \frac{7.48 \text{ GAL}}{\text{FT}^3} = 212{,}500 \text{ GAL.}$$

4-HOUR CYCLE MAXIMUM INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{60 \text{ MINUTE FILL TIME}} = \frac{3542 \text{ GAL}}{\text{MINUTE}} \times \frac{1440 \text{ MIN}}{\text{DAY}} = 5.1 \text{ MGD}$$

3-HOUR CYCLE MAXIMUM INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{45 \text{ MINUTE FILL TIME}} = \frac{4722 \text{ GAL}}{\text{MINUTE}} \times \frac{1440 \text{ MIN}}{\text{DAY}} = 6.8 \text{ MGD}$$

2-HOUR CYCLE MAXIMUM INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{30 \text{ MINUTE FILL TIME}} = \frac{7083 \text{ GAL}}{\text{MINUTE}} \times \frac{1440 \text{ MIN}}{\text{DAY}} = 10.2 \text{ MGD}$$

DETERMINE AVERAGE DECANT RATES FOR EACH OPERATING CYCLE

4-HOUR CYCLE AVERAGE DECANT RATE AT 5.1 MGD INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{60 \text{ MINUTE DECANT TIME}} = 3542 \text{ GPM}$$

3-HOUR CYCLE AVERAGE DECANT RATE AT 6.8 MGD INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{45 \text{ MINUTE DECANT TIME}} = 4722 \text{ GPM}$$

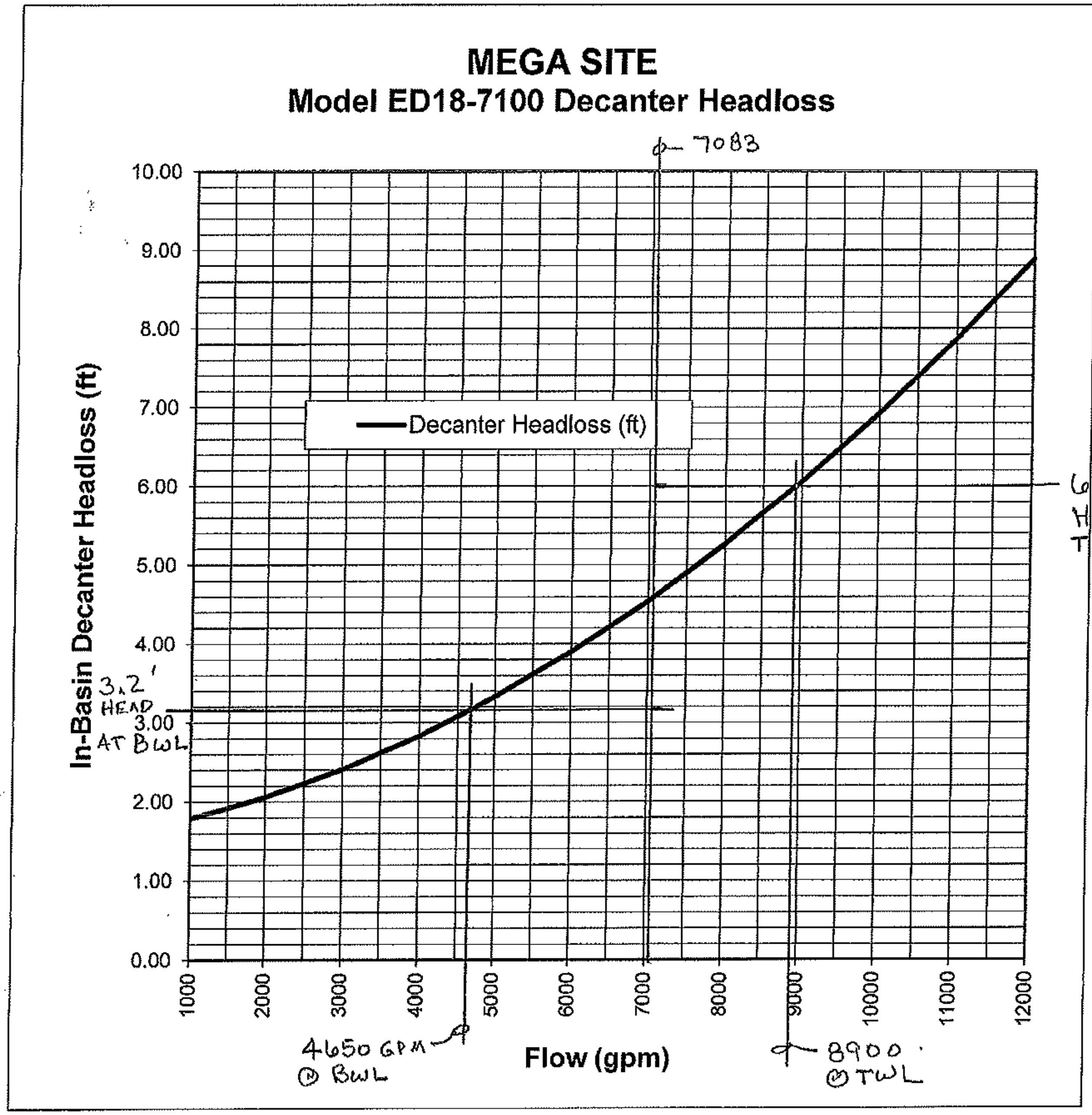
2-HOUR CYCLE AVERAGE DECANT RATE AT 10.2 MGD INFLUENT FLOW RATE

$$\frac{212{,}500 \text{ GAL}}{30 \text{ MINUTE DECANT TIME}} = 7083 \text{ GPM}$$

ONE DECANTER PER REACTOR

2-HOUR CYCLE : 7083 GPM

Δh = 2.8 FT



Given : Peak Q = 10.2 MGD
Need D_T = 30 MIN
Need to store one complete Decant Flow

Req'd : Volume

Sol'n : Min V = 10.2(694 gpm/MGD) (30 min)
= 212,364 gallons

A_{tank} = 120(60) - 6(43.75) = 6,937.50 S.F.
= (51,892.50 gal/VF)

A_{TOTAL} = 2(6937.50) = 13,875.0 SF
(103,785 gal/VF)

ONE TANK		TWO TANKS	
Q (MGD)	D	Q (MGD)	D
5.1	2.05'	5.1	1.02'
10.2	4.10'	10.2	2.05'

With one tank out of operation we need
2.05' @ 5.1 MGD for 30 MIN &
2.05' @ 10.2 MGD for 15 min

Set min depth @ 2.1'

TREATED EFFLUENT TRANSFER
PUMPS TO FORD

W. SCOTT DANIEL
REGISTERED ENGINEER
NO. 104,[illegible]
TENNESSEE

4/15/22

GIVEN: FLOW RATE = 3.0 MGD = 2,080 GPM   C=120

12-INCH F/M TO FORD'S STORAGE TANK

TANK = 400,000 GALLON

TANK GROUND ELEV = 335'   TANK TOP = 368'

PUMPING STATION W.S. = 342'

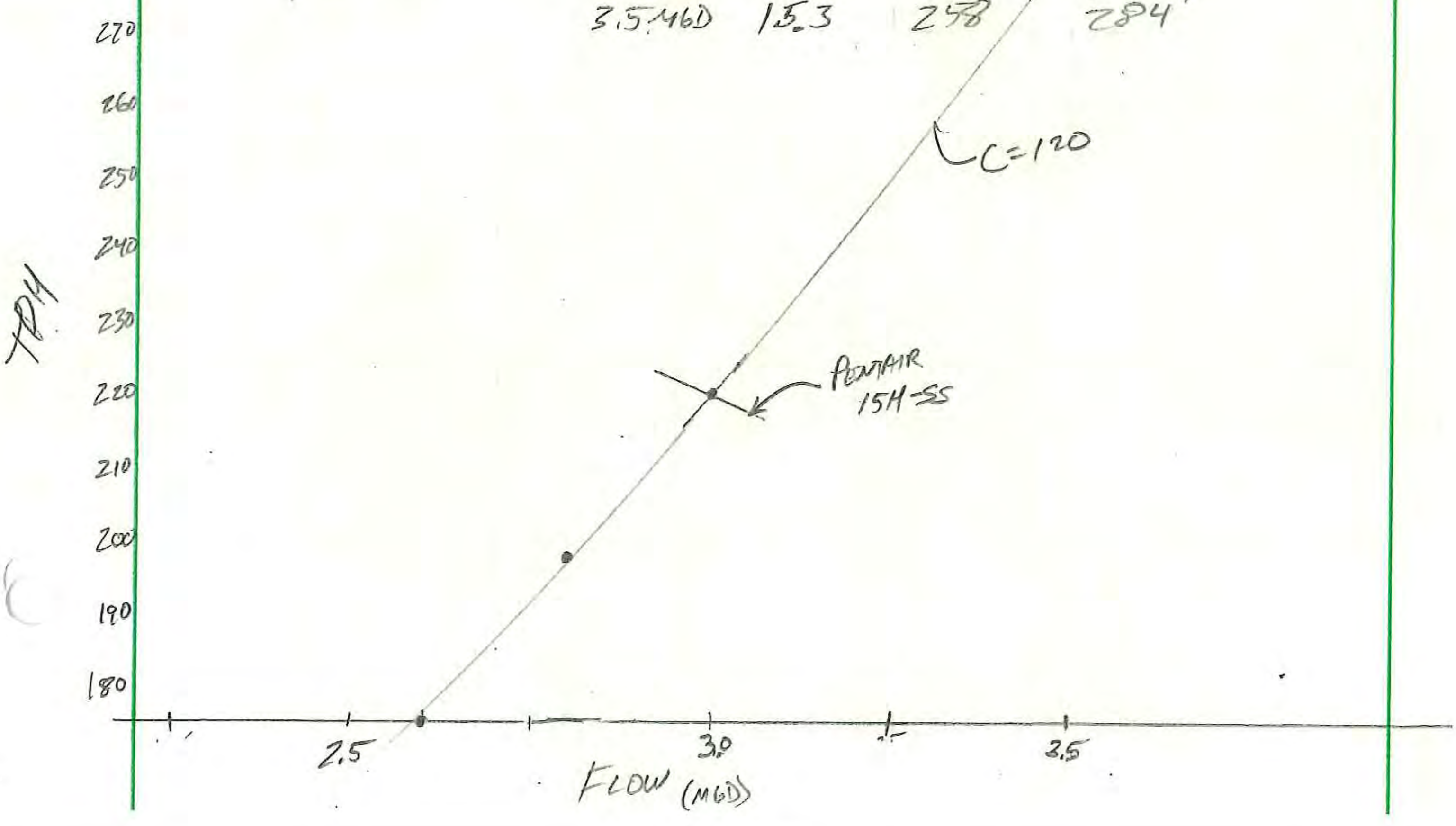
15,120' - 12" PIPE

EQU. LENGTH

12" PIPE	=	15,120
12" CV	=	78
12" GV	=	7
12" TEE	=	66
3x 12" 90°	=	99
4x 12" 45°	=	64
		16,891

STATIC = 368 − 342 = 26'

Q	h_L/1K'	H.f	TDH
2.6 MGD	8.8	149	175'
2.8 MGD	10.1	171	197'
3.0 MGD	11.5	194	220'
3.5 MGD	13.3	258	284'



TREATED EFFLUENT PUMP TO FORD'S STORAGE TANK 2/2

PENTAIR

Customer : Guthrie Sales & Service Co Inc

Project name : Default

Pump Performance Datasheet

Encompass 2.0 - 22.1.0

Item number	: 001	Size	: 15H-SS
Service	:	Stages	: 6
Quantity	: 1	Based on curve number	: 15_TURB_3010_1800_SS Rev 190418
Quote number	: 243486	Date last saved	: 14 Apr 2022 3:45 PM

Operating Conditions

Flow, rated	: 2,100.0 USgpm
Differential head / pressure, rated (requested)	: 221.0 ft
Differential head / pressure, rated (actual)	: 219.7 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1180 rpm
Impeller diameter, rated	: 9.90 in
Impeller diameter, maximum	: 9.90 in
Impeller diameter, minimum	: 8.00 in
Efficiency (bowl / pump)	: 81.97 / - %
NPSH required / margin required	: 10.76 / 0.00 ft
nq (imp. eye flow) / S (imp. eye flow)	: 63 / 172 Metric units
Minimum Continuous Stable Flow	: 1,200.0 USgpm
Head, maximum, rated diameter	: 320.0 ft
Head rise to shutoff (bowl / pump)	: 45.61 / - %
Flow, best eff. point (bowl / pump)	: 1,901.7 / - USgpm
Flow ratio, rated / BEP (bowl / pump)	: 110.43 / - %
Diameter ratio (rated / max)	: 100.00 %
Head ratio (rated dia / max dia)	: 100.00 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Near miss

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 1.31 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

Material selected	: Cast Iron bowl Std impeller

Pressure Data

Maximum working pressure	: See the Additional Data page
Maximum allowable working pressure	: See the Additional Data page
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: See the Additional Data page

Driver & Power Data (@Max density)

Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.00
Power, hydraulic	: 117 hp
Power (bowl / pump)	: 142 / - hp
Power, maximum, rated diameter	: 145 hp
Minimum recommended motor rating	: 150 hp / 112 kW

Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.