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July 17, 2023

Stephen Monteverde
NYSDEC – Region 3
21 South Putt Corners Road
New Paltz, New York 12561

Re: Chelsea Ridge WWTP
Town of Wappinger, Dutchess County, New York
SPDES Permit No. NY- 0031739
WWTP Upgrade Project
Comment Response

Dear Mr. Monteverde

Delaware Engineering is in receipt of your May 26, 2023 and June 29, 2023 comments regarding the engineering report, plans and specifications for the upgrades to the Chelsea Ridge WWTP. Please note the following responses / clarifications in regards to these comments.

May 26, 2023 Comments and Responses

For the new MBR basin:
Comment: Is there any other cleaning mechanism for the MBRs beyond scouring? – e.g., backwashing or chemical – I noticed reference to sodium hydroxide as it is not currently in use)

Response: The continuous membrane cleaning consists of air scouring and a relaxation period which permeating ceases, allowing the sludge blanket on the membrane to sluff off. The system is configured to permeate for 9 minutes followed by a 1 minute relax cycle. The system does require a periodic clean in place (CIP) process utilizing chlorine (sodium hypochlorite) or citric acid. The chlorine clean is utilized to address a biological/organic fouling whereas the citric acid clean is done to address inorganic fouling. The required frequency of the chemical cleans varies between facilities. The typical flat plate MBR requires a chlorine CIP once every six months or whenever the transmembrane pressure (TMP) increases by 1 PSIG over the baseline TMP. The Chelsea Ridge WWTP upgrade design includes provisions to streamline the CIP process and make the CIP process less operator intensive than the current CIP system. The CIP process is shown on Sheets M11 and M16.

Comment: There is also reference in the design docs to the reduced flow scenario due to viscosity and cold water effects. Will the membrane size impact the process and D.O. if temperatures drop below freezing or if temps get to high? – it looks like the membranes are sized appropriately an this probably has not been an issue yet.

Response: The capacity of the membrane decrease as the reactor temperature decreases. The system is designed to accommodate the maximum flows with a reactor temperature of 50ºF. In 2021-2022, the minimum temperature of the wastewater was 53ºF and the maximum was 77ºF. This corresponds with what we typically see in these type of systems. The membrane manufacturer (Toray) recommends that the membranes be operated with reactor temperatures ranging from 41ºF to 104ºF.

Blowers and Scour:
Comment: I suppose the only real comment that I have right now is in regards to the sizing and specs of the blowers and scour blowers. Is there a spec document and/or a detail showing the sizing of all process equipment in this upgrade?

Response: Sheet M1 lists the equipment, complete with the required sizing, HP requirements, etc. These capacities match what is defined in the engineering report. This is a private owner and we are negotiating the equipment procurement rather than going through a hard bid process. As a result, we did not generate specifications sections for each piece of equipment.

Comment: It was tough to find things to comment on, which I guess is a good sign. The only other thing that I can think to request would be a hydraulic profile of the process including the upgrades although some of the sheets show elevations in the profile.

Response: The existing and proposed hydraulic profiles are attached.

<u>June 29, 2023 Comments and Responses</u>

Comment: I was hoping to get more clarification on the recycle rate of the mixed liquor and the flow rate of the activated return, from the mbr tank to the splitter box, and the residual D.O. concentration after removal. The recycle flow rate should be between 3 to 6 times the design flow (according to our guidance documents) and consider the peak hourly flow rate. Peak hourly flow should also be considered when considering the residual D.O. concentration. Is there also a mass balance diagram that is potentially available for what is wasted and the "food' coming into the plant?

Response: The RAS rate for the MBR process is driven by the design/allowable MLSS concentrations that the membranes can operate with in conjunction in the aeration basin design MLSS. These are as follows:
Toray membrane maximum allowable MLSS: 18,000 mg/l
MBR system design FM at MMDF: 0.055
Design MBR MLSS: 10,000 mg/l
Design Aeration Basin MLSS: 8,000 mg/l
Influent and Permeate at MDF (post EQ PHF): 0.20 mgd
MBR Basins MLSS: 10,000 mg/l
Aeration Basin: 8,000 mg/l
RAS rate: 1.0 mgd (5.0 x post-EQ PHF)
Aeration Basin MLSS = (10,000 mg/lx1.0 mgd) / (1 mgd + 0.20 mgd) = 8,300 mg/l

The MBR process is designed for the peak hourly flow downstream of the flow equalization process of 0.200 mgd. Assuming at the design BOD/NH3 concentrations are maintained during these high flow events (the high flow events are typically I&I related and the BOD/NH3 concentrations are diluted), the oxygen demand is 1,196 lbs/day. The proposed aeration / MBR process is capable of providing 1,390 lbs / oxygen under the peak flow conditions. See page 26 of the engineering report

for aeration capacity information. Note that TR-16 requires that aeration capacity of 1.85 times the average loading be provided to accommodate the peak organic/NH3 loading. Following TR-16 standards, the aeration system is required to provide a maximum daily oxygen of 900 lbs/day. Also note that the effluent DO limit of 7.0 mg/l is achieved via the post-aeration system rather than residual DO from the biological process.

The mass balance for BOD at an ADF flow of 0.095 mgd is as follows:
MBR Influent BOD: 0.095 mgd x 248 mg/l x 8.34 = 196 lbs/day
MBR Effluent BOD: 0 lbs/day
Total sludge produced: 76 lbs/day (0.8 dry lbs / 1,000 gallons for extended aeration process - *Table 13-7, Wastewater Engineering Treatment and Resource Recovery, Fifth Addition (Metcalf & Eddy),*
WAS concentration: 10,000 mg/l
Wasting rate: 911 gpd

- **Comment:** I did note that the maximum permeating rate of 0.200 MGD would require a RAS rate of 0.600 MGD and the RAS pumps can achieve a pump rate that is 5 to 6 times that of the permeate pumps. I am also trying to follow the D.O. concentrations throughout the process and if there is a concentration calculated and maintained in the 2.0 and 6.0 mg/L range in the mbr.
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- **Response:** The oxygen demand and associated aeration / blower calculations are provided on pages 23-26 of the engineering report. As detailed in the response to comment #3, the air scour volumes in the MBR is a function of the associated flow rate through the membrane. The variations in oxygen demand will be accounted for by pacing the aeration blowers to maintain the DO levels in the aeration basins that achieve the required BOD/ammonia removal. The design DO concentration is 2.0 mg/l.

Comment: Also, in case the aeration tank is taken offline, can the retrofitted aeration tank/EQ still provide aeration if all units remain in place? Page 26 and 11 of the ER mention that a spare aeration tank is available so it sounds like the EQ tank will be able to serve as both.

Response: The aeration tank / EQ will be configured to operate as either an aeration tank or an EQ tank. This tank will have fine bubble diffuser and the same capacity as the duty aeration tank when it is serving as an aeration tank.

Comment: Lastly, can you confirm if there will be a DO probe within the mbr basin itself? Or what the D.O. set point is/ target D.O. concentration is for the mbr tanks? Is there also currently a desired set point for the aeration tank (current or for the proposed upgrade)?

Response: The MBR basins will not be equipped with DO probes. The primary purpose of the air scour system in each MBR basin is to provide continuously scour the membranes to ensure that the membranes do not foul. Each Toray membranes require air scour between 40 scfm / membrane with membrane operating at low flows and 71 scfm with the membrane operating at high flows. The plant control system will automatically adjust / control the blower output via VFDs to ensure the correct air scour is occurring at all times. To little air scour can result in premature fouling of the membranes and too much air scour can reduce the life of the membrane. The D.O. is being monitored in the aeration basin and the plant controls will pace the aeration blowers to maintain an operator adjustable preset D.O. level in the aeration basin. The setpoint for nitrification is typically 2.0 mg/l but this can be increased should operating data show that additional oxygen is required for nitrification.

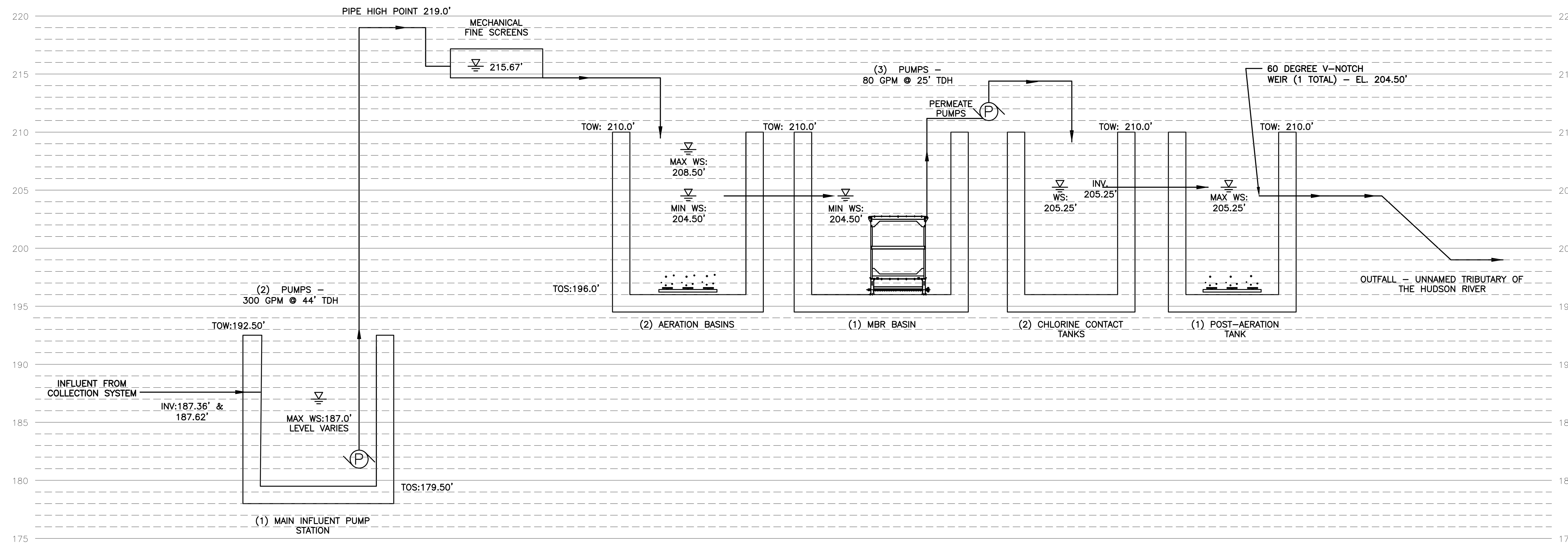
If there are any questions or you need further information you can contact me at (518) 452-1290 ext 234 or via email at bjuusola@delawareengineering.com.

Sincerely,

Brock Juusola, P.E.
Project Engineer / Partner

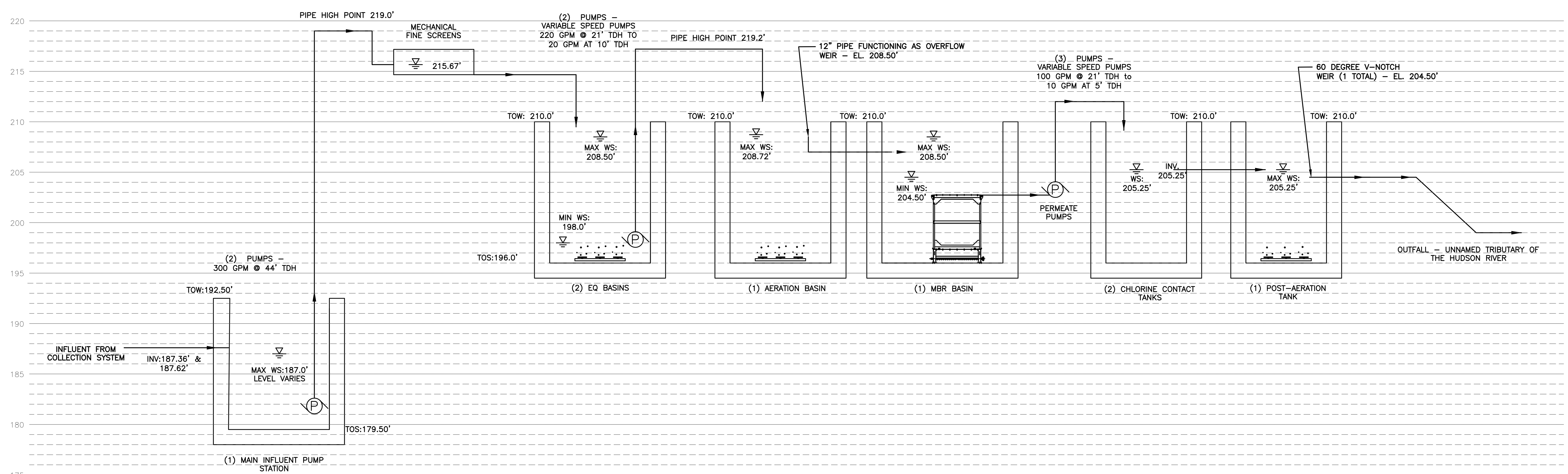
Encl. Sheet PR2 – Hydraulic Profiles

Cc. J. Albert, Dawn Homes Management
M. Parrottino, Dawn Homes Management
T. Johnston, Delaware Engineering



EXISTING HYDRAULIC PROFILE

SCALE: NTS



PROPOSED HYDRAULIC PROFILE

SCALE: NTS

DATE: 3/2023
DRAWN BY: JMF
SCALE: AS SHOWN
REVIEWED BY: BDJ
PROJECT NO.: 21-2151
FILE: FILE NAME

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REVISIONS

NO.	DATE	DESCRIPTION

CHELSEA RIDGE WWTP
UPGRADE PROJECT
TOWN OF WAPPINGER
DUTCHESS COUNTY, NY

HYDRAULIC PROFILES

SHEET: PR2