ADDENDUM 1

Request for Bids
OJRSA Project #2027-02
General Water Reclamation Facility Installation Projects
August 26, 2026

<u>Clarification Item 1:</u> OJRSA will be paying the repair costs for the rebuild on the two (2) Lightnin aerators; however, the Contractor will need to provide the installation costs once they are repaired.

<u>Clarification Item 2:</u> OJRSA will be paying for the repair costs on the Lightnin Mixers from the Day Tank, Digester #1, and the Anoxic Mixer. No installation costs needs to be included for these items.

<u>Clarification Item 3:</u> The OJRSA wants to use Alternative #2 as identified in Section 5.4.2 in the attached *Sluice Gate Valve Replacement at OJRSA's Coneross WWTF* report as prepared by Goldie Associates in December 2025. See following pages for report.

Bypass Plan for Sluice Gate Valve Replacement at OJRSA's Coneross WWTF

Prepared by:

GOLDIE ASSOCIATES

210 West North Second Street
Seneca, SC 29678

Goldie Project #41.66.1

Prepared for:

OJRSA

Oconee Joint Regional Sewer Authority
623 Return Church Road
Seneca, SC 29678

DECEMBER 2025

RELEASE B

Release Notes

Release	Date	Comments
A	December 16, 2025	Release for Initial Review
B	December 29, 2025	Incorporate modifications from Kyle Lindsay. Submit as final version.

Table of Contents

Appendices

Definitions and Acronyms

Not all definitions or acronyms are necessarily used in this document.

AB	Aeration Basin
AF	Allocated Flow – how much of the capacity of the WWTF has been utilized or committed
AX	Anoxic
BOD	Biochemical Oxygen Demand – a measure of the amount of biodegradable organic waste in water.
CFS	Cubic feet per second
CWT	Centralized Wastewater Treatment
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
EPA	Environmental Protection Agency
FC	Fecal Coliform – the amount of fecal bacteria in wastewater
Force main	The discharge pipe from a sewage pump station.
G&A	Goldie Associates
GPCD	Gallons per capita day
GPD	Gallons per day
GPH	Gallons per hour
JACABB	JACABB Utilities
LAS	Land Application System
L.S.	Lift Station
MGD	Million gallons per day
MPN	Most Probable Number
NPDES	National Pollutant Discharge Elimination System. This is the EPA program that regulates discharges into surface waters of the US.
O&M	Operation and Maintenance
PAN	Plant Available Nitrogen
PER	Preliminary Engineering Report
POTW	Publicly Owned Treatment Works
P.S.	Pump Station
PVC	Polyvinyl Chloride Pipe
SCADA	Supervisory Control And Data Acquisition – a system for remote monitoring and control of equipment and facilities
SCDES	South Carolina Department of Environmental Services
SD	Subdivision
SGV	Sluice Gate Valve
SNC	Significant Non-Compliance
TKN	Total Kjeldahl Nitrogen – a measure of the ammonia and organic nitrogen in wastewater.
TSS	Total Suspended Solids – the amount of filterable solids in wastewater
USGS	US Geologic Survey
VFD	Variable Frequency Drive
WWTP	Wastewater Treatment Plant
WWTF	Wastewater Treatment Facility

1. Executive Summary

The Sluice Gate Valves in the Distribution Box prior to the four Aeration Basins are no longer operable. OJRSA desires to replace these valves and two of the aeration basins must be taken offline for the replacements to be made. The WWTF must remain in compliance with its NPDES discharge permit during this process, so the WWTF's flow must be bypassed around these two basins.

The plan proposes to use a rental pump to pump from the first existing Aeration Basin (AB) #1 to the last Aeration Basin (AB) #5 to accomplish this. We recommend conducting the replacement in the warmer weather months (May 1 to September 26) when the flows are lower and more consistent (only 3 flow days over 5.0 MGD in this date range). The proposed two pumps (primary and backup pumps) would pump 6.25 MGD to allow a 25% safety factor for equalized diurnal flows.

The new sluice gate valves are expected to take 16 weeks to ship, and the replacement work must be completed within 5 working days.

2. Introduction and Purpose

The Oconee Joint Regional Sewer Authority (OJRSA) owns and operates the Coneross WWTF, which treats the wastewater from municipal customers across Oconee County. The WWTF was constructed in the late 1970s, and expanded in the mid-1990s. The 36" sluice gate valves in the Distribution Box for the original aeration basins are now almost 50 years old, are no longer functional, and must be replaced.

The purpose of this plan is to propose a feasible way to bypass portions of the process train so that the valves can be replaced while maintaining WWTF compliance.

3. Background and Existing Conditions

3.1 *Responsible Persons and Contacts*

Owner: Oconee Joint Regional Authority

Address: 623 Return Church Road, Seneca, SC 29678

Contact: Mr. Kyle Lindsay

Phone: (864) 972-3900

Email: kyle.lindsay@ojrsa.org

Engineer: Goldie Associates

Address: 210 W. North Second Street, Seneca, SC 29678

Contact: Mr. Paul Lewis, P.E.

Phone: (864) 882-8194 ext. 106

Email: paul@goldieassociates.com

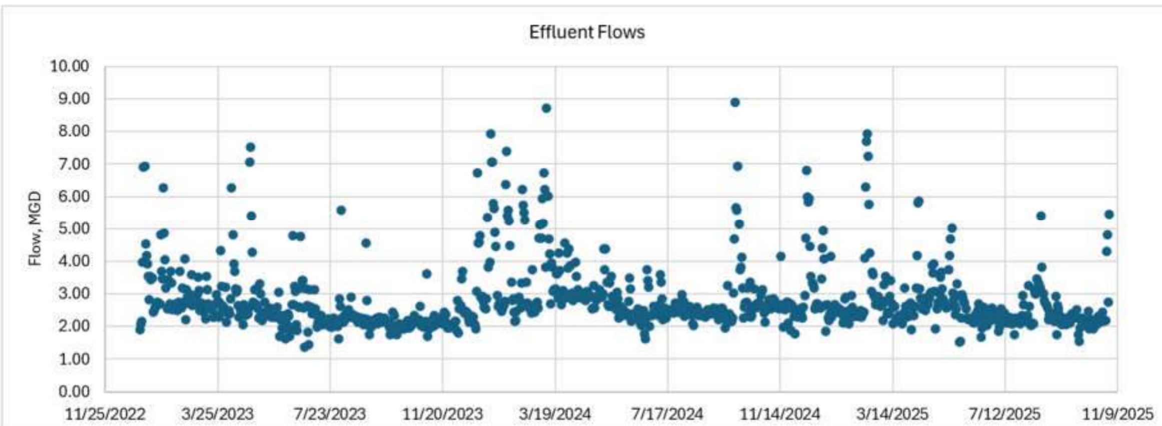
3.2 *WWTF Flows*

Flows from 1/1/2023 to 10/31/2025 were evaluated to determine the typical and maximum flows needed for bypass. The relevant flow information is presented below in tabular form, and graphically in the chart following.

Table 1. Flow Values

Flow Description	Flow (Mgd)
Permitted flow	7.8
Average	2.84
Minimum	1.36
Maximum	8.90

Figure 3-1 Coneross WWTF Effluent Flows



It is significant to note the impact of seasonal rainfall on the flows. The summertime flows are significantly less and more consistent. For example, there are only three daily flows above 5.0 mgd that occur between May 1 and September 26 (see table) for any of the three years of data (one of these days was only slightly above, at 5.03 mgd).

Table 2 Summer Flows over 5.0 mgd

Date	Flow (MGD)
8/4/2023	5.59
5/16/2025	5.03
8/19/2025	5.40

The figures below show the windows of reduced flow that occur in the summer months.

Figure 3-2 2023 Effluent flows

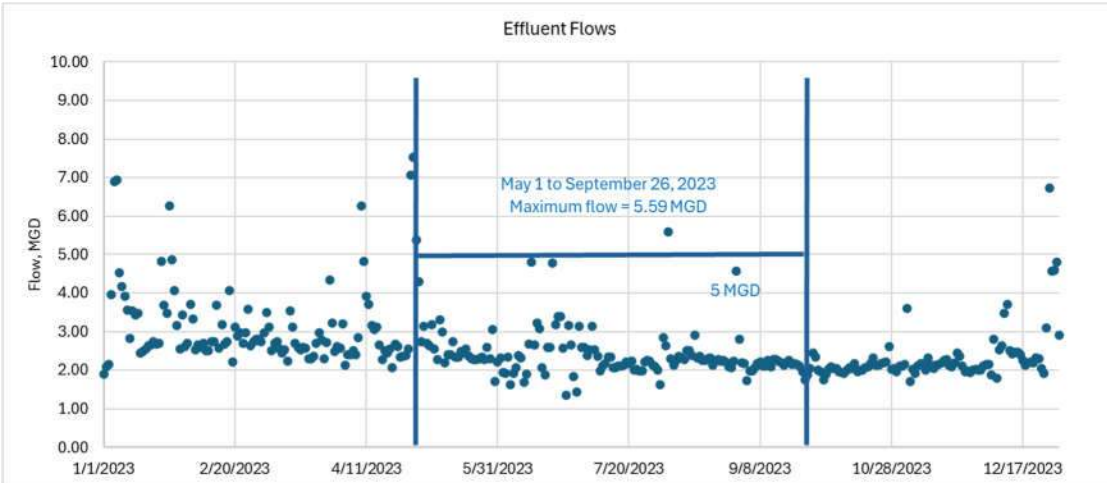


Figure 3-3 2024 Effluent flows

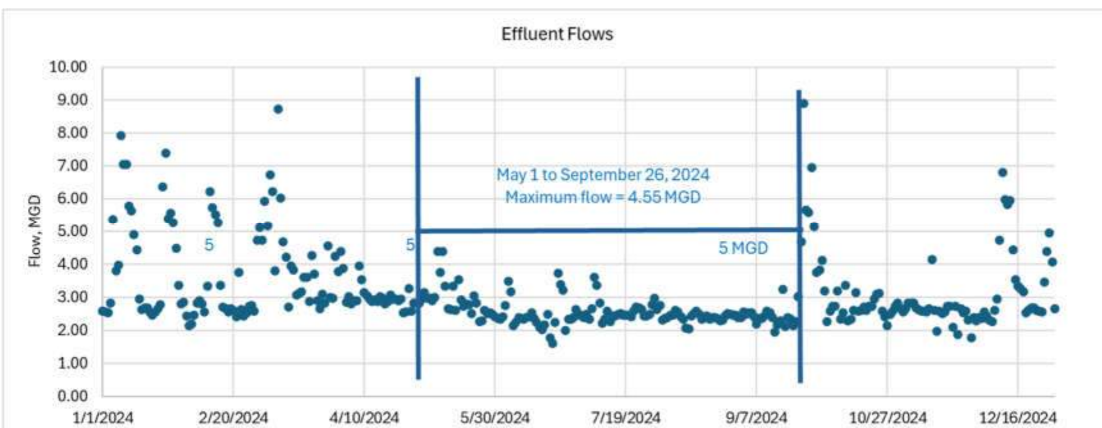
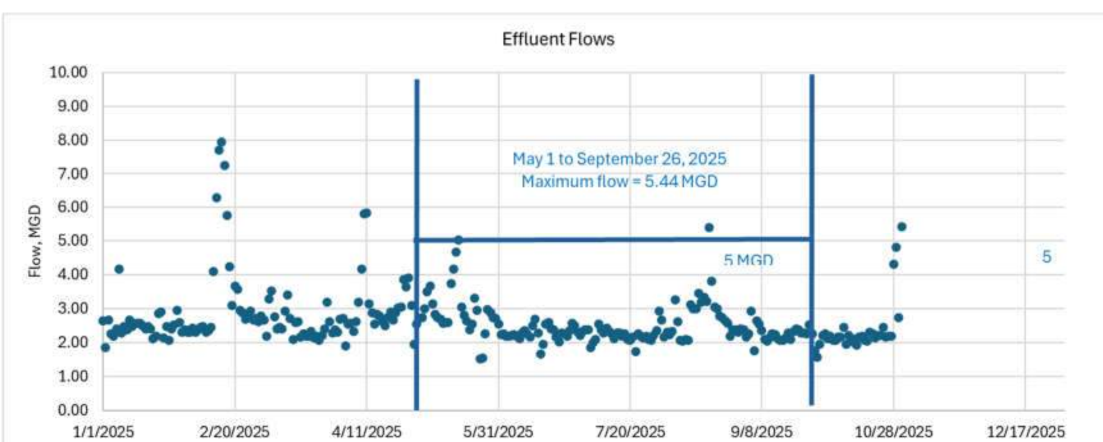


Figure 3-4 2025 Effluent flows

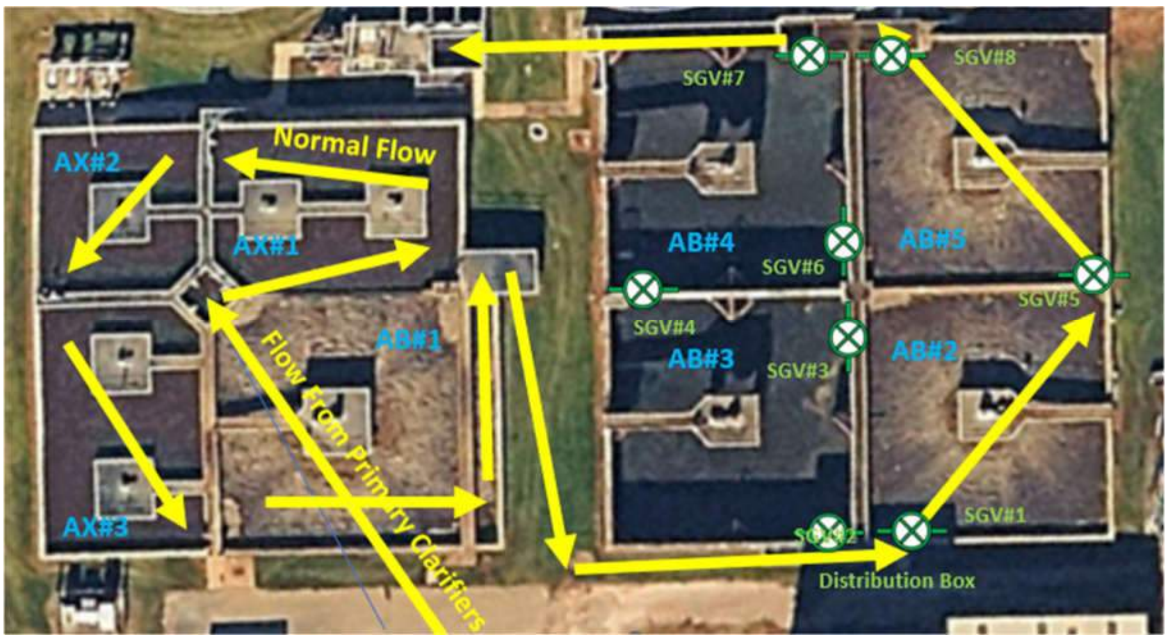


3.3 *Existing WW Treatment Process*

The normal wastewater treatment process flow is as follows:

Wastewater into the WWTP is pumped to the Headworks (the Influent Screen and Grit Chamber), then flows by gravity to the Primary Clarifiers and through the WWTP. (In high flows, wastewater can be diverted from the Headworks to the 6.0 mgal Lower Pond and pumped into the treatment train at another time.) The clarified influent flows from the Primary Clarifiers to the Anoxic Tanks and Aeration Basin #1 tank structure (added 1995). (See Figure 3.5 for existing flow path through biological treatment.)

Figure 3-5 Existing Flow Path Through Biological Treatment



From Aeration Basin #1 flow proceeds to the distribution box in the Aeration Basins #2-#3.

Aeration Basins #2-#4 are connected by sluice gate valves, labeled in the figure below as SGV-1, etc. The original mid-1970s valves are still in place, and all but SGV-1, 2, 3 and 6 are functional (SGV-1 is open, and SGV-2, 3, and 6 are closed). The goal of this project is replace SGV-1 and SGV-2.

From Aeration Basins #4 and #5 the wastewater flows to the AB's effluent box to the Secondary Clarifiers' distribution box.

Presently, Aerations Basins #2 and #5 are functional, with working slow speed aerators.

Aeration Basins #3 and #4 are not in use. SGV-2 to Aeration Basins #3 and #4 is closed and non-functional, but SGV-4 connecting Aeration Basins #3 and #4 is functional. Also, the slow speed aerators for these basins are either missing or non-functional.

The basins sizes are presented in the table below.

Table 3 Biological Treatment Basin Sizes

Name	Description	Quantity	Vol.
Tanks			
Anoxic Tanks #1 & #3 Anoxic Tank #2	75 ft x 50 ft x 15 ft deep = 0.42 mgal 50 ft x 50 ft x 15 ft deep = 0.28 mgal	2 1	0.84 mgal 0.28 mgal
Aeration Basin #1 Aeration Basins #2-#5	75 ft x 75 ft x 15 ft deep = 0.63 mgal 75 ft x 75 ft x 12 ft deep = 0.50 mgal	1 4	0.63 mgal 2.0 mgal
Total Volume			3.75 mgal

4. Needed Repairs

The repairs to be done at the plant are the replacement of SGV-1 and SGV-2.

These valves must be replaced within 5 days. The replacement of these valves is necessary so that the replacement of the surface aerators can proceed.

5. Proposed Bypass Plan

5.1 *Process Flow*

In order to make the needed repairs, the flow from Aeration Basin must bypass the normally used Distribution Box that flows to Aeration Basins #2 and #3. This means that the flow must bypass Aeration Basins #2 and #3.

5.2 *Recommended Repair Time of Year*

We recommend that the repairs be conducted between May 1 and September 1. The flows during this period or lower and more consistent.

5.3 *Bypass Pump Selection*

Based on a base flow of 5.0 mgd, a peaking factor must be included to address the diurnal flows that occur in the plant. Considering that the combined equalization capacity of the two EQ basins is 7.5 million gallons, the basins should be able to hold and equalize a day's flow. Even with this equalization, the transfer pumps should include some margin of safety (25%) so that there is some flexibility in the system.

A 5.0 MGD pump with a 25% peaking factor would transfer 4,340 gpm

There is a suitable Godwin Diesel Pump that is available.

Figure 5-1 Rental Pump (Diesel)

Specifications

Suction connection	12" 125# ANSI B16.1
Delivery connection	12" 150# ANSI B16.5
Max capacity	5990 USGPM †
Max solids handling	3.7"
Max impeller diameter	14.3"
Max operating temp	176°F*
Max pressure	88 psi
Max suction pressure	58 psi
Max casing pressure	132 psi
Max operating speed	1800 rpm

* Please contact our office for applications in excess of 176°F.

† Larger diameter pipes may be required for maximum flows.

5.4 *Bypass Alternatives Considered*

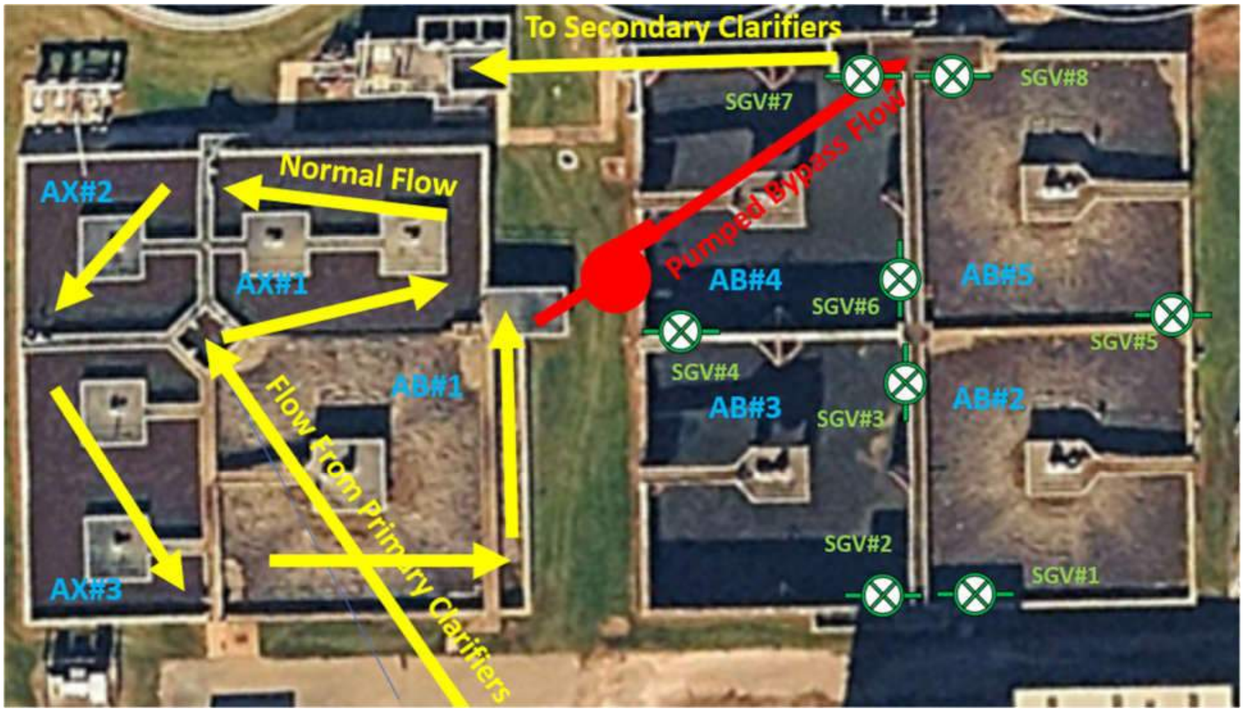
The alternatives considered are:

1. Pump from Aeration Basin #1 directly to the Effluent Box after Aeration Basins #4 and #5,
2. Close Sluice Gate Valve #5, and pump the flow from Aeration Basin #1 to Aeration Basin #5, and
3. Close Sluice Gate Valves #4 and #5, open Sluice Gate Valve #6, and pump from Aeration Basin #1 to Aeration Basin #4, flowing to Aeration Basin #5 and then out through the Effluent Box. This alterative would require the replacement of the slow speed mixer in Aeration Basin #4.

5.4.1 Alternative #1 – Pump from AB#1 to the Effluent Box

In this alternative, the AB#4 and #5 effluent sluice gates (SGV#7 and SGV#8) would be closed and the wastewater would be pumped (by a rental pump) from the effluent box at AB#1 directly to the effluent box after AB#5.

Figure 5-2 Alternative #1 Pump from AB#1 to Exit Flow Box



Using the volume of Aeration Basin #1 (0.63 mgd) along with the existing anoxic basins, the average influent data from Coneross WWTP, a typical influent TKN (40 mg/L), and a winter water temperature of 8°C, the basin calculates a treatment capacity of only 2.25 MGD. Higher temperatures increase the capacity of the basin, as shown the table below.

The bypass pump will be controlled by using a level sensor in AB#1 and modulating the pump to maintain a level set point in AB#1.

Table 4 AB#1 Treatment Capacity at various temperatures

Temp (°C)	Flow (MGD)
8	2.25
10	2.6
15	3.78
20	5.72
25	8.89

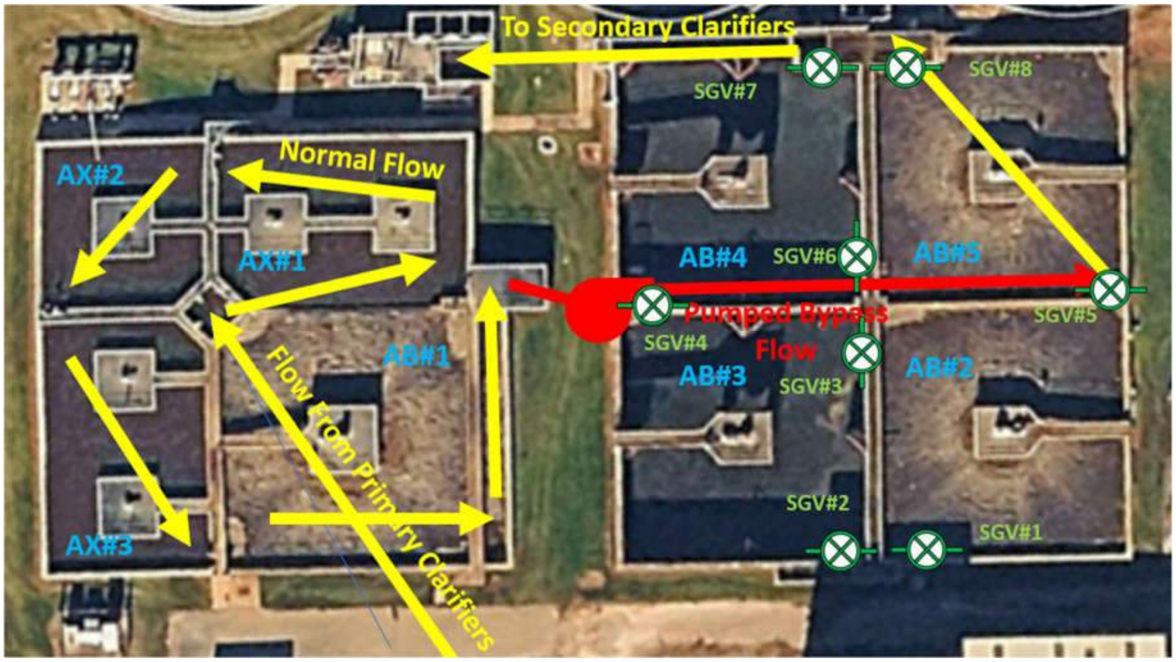
In this scenario, the biological cultures (bugs) from AB#2 and AB#5 would have to be kept in AB#5 and fed until the repairs are completed.

5.4.2 Alternative #2 – Pump from AB#1 to AB#5

In this scenario the influent sluice gate to AB#5 (SGV-5) would be closed and the wastewater pumped from AB#1 into AB#5 at SGV-5. Because AB#2 will be shut down and unaerated, its contents must be pumped into AB#5 as part of the bypass.

As in Alternative #1, the bypass pump will be controlled by using a level sensor in AB#1 and modulating the pump to maintain a level set point in AB#1.

Figure 5-3 Alternative #2 Pump from AB#1 to AB#5



Using the combined volumes of AB#1 and AB#5 (1.13 MGD), the treatment capacity of the two basins is as shown in the table below. The treatment capacity of this scenario is considerably greater than Alternative #1. Also, in this scenario, AB#2 would be shut down and unaerated, so the bugs from AB#2 would need to be pumped into AB #5 during the shutdown.

Table 5 AB#1 + AB#5 Treatment Capacity at various temperatures

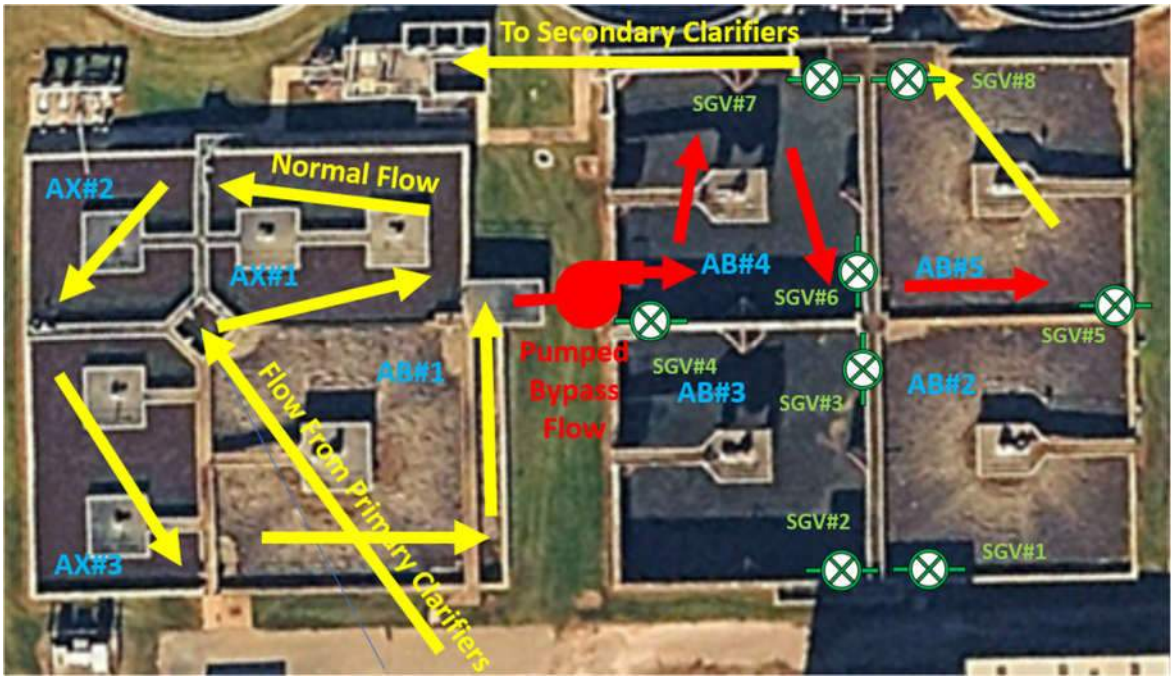
Temp (°C)	Flow (MGD)
8	4.04
10	4.64
15	6.78
20	10.26
25	15.95

5.4.3 Alternative #3 – Pump from AB#1 to AB#4

In this scenario, sluice gates SGV#4, #5, and #7 would be closed and SGV-6 and 8 would be open. An aerator would need to be installed for AB#4. Water would be pumped from AB#1 to AB#4, and would then flow to AB#5.

As in Alternatives #1 and #2, the bypass pump will be controlled by using a level sensor in AB#1 and modulating the pump to maintain a level set point in AB#1.

Figure 5-4 Alternative #3 Pump from AB#1 to AB#4 then AB#5



This configuration would provide the same treatment capacity that the existing plant has on the train that is in use.

5.4.4 Discussion of Alternatives

Alternative #1 (AB#1 alone) (Figure 5.3) appears to meet the flow requirements, but the calculations used for these estimates were performed with “textbook” factors; sampling and analysis would be needed before confidence could be given to this alternative.   Also, the need to feed and care for the offline AB#5 is also a negative in this scenario.

Alternative #2 (AB#1 + AB#5) (Figure 5.4) appears to provide more than ample treatment capacity, especially in warmer temperatures. Also, this scenario eliminates the need to aerate and feed the bugs from AB#2 and #5.

Alternative #3 (AB#1 + AB#4 + AB#5) (Figure 5.5) would provide the same capacity as the present day normal operating conditions of the WWTP. The downside to this alternative is the added cost of replacing the existing surface aerator, especially if the ultimate plan is to replace the aerators with blowers and diffusers.

5.4.5 Conclusion

Alternative #2 (AB#1 + AB#5) (Figure 5.4) appears to be the best, most advantageous alternative.

6. Path Forward

In order to stay in the optimal season to make the repairs, the sluice gate valves should be ordered in April, as shown in the conceptual schedule below. Actual construction schedule and activity durations may vary.

Table 6. Project Schedule

Task #	Milestone	Task Duration (Weeks)	Accumulated Project Time (Weeks)
1	Order Sluice Gates	0	15-Apr
2	Receive Sluice Gates	16	5-Aug
3	Complete repairs	1	12-Aug

7. Conclusion

The most feasible path forward to enable the replacement of Sluice Gate Valves #1 and #2 is to obtain two 4,340 gpm rental bypass pumps (one primary and one spare) and pump from AB#1 to AB#5. The sluice gate valves should be ordered by April to meet the best window of time for the replacement.

Appendix A

CALCULATIONS

GOLDIE
— ASSOCIATES —
ENVIRONMENTAL & ENGINEERING SERVICES

OJRSA Coneross WWTF
Sluice Gate Valve Replacement
G&A Project No. 41.66.1

Aeration Basin Calculations

From Metcalf and Eddy example 11-1 (pages 701-705 in third ed.)

Variable	Explanation	Value	Units	Excel Variable	Reference
DO	Dissolved O2 to be maintained	2	mg/l	DO	Typical DO
k	maximum rate of substrate utilization, time -1			k	
kd	endogenous decay coefficient, time -1			kd	
Kn	nitrogen half velocity constant adjusted for temperature, mass/unit volume			Kn	
Ko2	DO half-velocity constant	1.3		Ko2	M&E Problem 11-1
Ks	substrate half velocity constant, mass/unit volume			Ks	
MLVSS		4,000	mg/l	X	very conservative estimate
Ni	influent TKN, mg/L	40	mg/l	Ni	historical, average
Ne	calculated effluent NH3-N	1.48	mg/l	Ne	
	effluent NH3-N Limit	2.00			Permit
Buffer capacity of the wastewater is adequate to maintain the pH at or above 7.2					M&E Problem 11-1
pH		7.2		pH	
Q	Influent Flow rate	15.952927	MGD	InflFlowRate	Permit
Si	influent BOD5 mg/l	340.00	mg/l	Si	historical, average
Se	effluent BOD5 mg/l	5	mg/l	Se	historical, average
Safety Factor		2		SF	M&E Problem 11-1. We reduced the safety factor because we are looking at a worst case situation already in regard to temperature.
T	Min sustained temp	25	C	T	regional
X_N	Fraction of nitrifiers	0.08		NitrifFraction	M&E Table 11-13
Y	maximum yield coefficient, mass of cell formed / mass of substrate consumed			Y	
µm	maximum specific growth rate, time -1	0.5	d-1	Um	M&E Table 11-16
V	Volume of actual or proposed aeration tank volume, gallons		gallons	Vol	

1,130,000

8.34 = conversion factor lb/Mgal • mg/l
1.42 = conversion factor for cell tissue to BODl
4.57 = conversion factor for amount of oxygen required for complete oxidation of TKN

Kinetic coefficients for ammonia takeup (M&E Table 11-16)

Coefficents	Basis	Range	Typical Value	
Nitrosomonas				
µm	d-1	0.3-2.0	0.7	
Ks	NH4+ -N, mg/l	0.2-2.0	0.6	
Nitrobacter				
µm	d-1	0.3-3.0	1	
Ks	NO2- -N, mg/l	0.2-5.0	1.4	
Overall				
µm	d-1	0.3-3.0	0.5	these values are the ones actually
Ks	NH4+ -N, mg/l	0.2-5.0	1.4	used in the calculations

Y	NH4+ -N, mg/l VSS/mg	0.1-0.3	0.2
kd	d-1	0.03-0.06	0.05

Kinetic coefficients for BOD removal (M&E Table 8-7)

k	d-1	2-10	5
Ks	mg/L BOD5	25-100	60
	mg/L COD	15-17	40
Y_{BOD}	mg VSS/mg BOD	0.4-0.8	0.5
	lb VSS/lb BOD5		0.5
kd_{BOD}	d-1	0.025-0.075	0.06

1 **Safety Factor** 2

2 **Maximum growth rate for nitrifying organisms, μ'm**

μ'm = μm * temperature correction factor * DO factor * pH factor

μ'm=μm*e^0.098(T-15)*DO/(Ko2+DO)*(1-0.833(7.2-pH))

μ'm=0.5*(e^0.098(25.0-15))*2.0/(1.3+2.0)*(1-0.833(7.2-7.2))

μ'm = 0.807 d-1

3 **determine max rate of substrate utilization k**

k = μ'm/Y

k = 0.81/0.2

k = 4.04 d-1

4 **Determine minimum and design mean cell residences times; Θmc, Θc**

Minimum Θmc

1/Θmc ~ Y k - kd

1/Θmc ~ (0.2* 4.04) - 0.05

1/Θmc ~ 0.76 days

Θmc = 1.32 days

Find Θc w/ safety factor

Θc = SF * Θmc

Θc = 2.0 * 1.32

Θc = 2.64 days

5 **Determine design subtrate utilization rate for oxidation of ammonia; U**

1 / Θc = Y U - kd

U = (1/Θc + Kd) * 1/Y

U = (1/2.6 + 0.05) * 1/0.2

U = 2.14 d-1

6 **Determine effluent ammonia concentration; N**

N = NH3-N

U_{NH3} = kN / (Kn + N) = 2.14 d-1

Therefore

N= U_{NH3}*Kn/(k-U_{NH3})

Kn = 10^(0.051*T-1.158) (from M&E Table 11-15)

Kn = 10^(0.051*25.0-1.158)= 1.31 mg/L

N= 2.1*1.31/(4.04-2.14)

N = NH3-N = 1.48 mg/l

NH3-N limit = 2.00 mg/l

Plant should meet NH3-N limit.

7 **Determine BOD removal rate; U_{BOD}**

$1 / \Theta c = Y_{BOD} * U - kd_{BOD}$

$U_{BOD} = (1 / \Theta c + kd_{BOD}) / Y_{BOD}$

UBOD = (1 / 2.6 + 0.06) / 0.5

U_{BOD} = 0.88 lb BOD5 removed/lb MLVSS * d

8 Determine required hydraulic detention time for BOD oxidation and nitrification:

BOD

Equation 8-45

$\Theta = (Si - Se - Sutilized) / (U_{BOD} * X)$

Θ = (340 - 5 - 86) / (0.9 * 4000)

Θ = 0.07 days

Θ = 1.70 hours

Ammonia Oxidation (Nitrification)

$\Theta = (Ni - Ne) / (U * X_N)$

$X_N = X * (F_N)$ fraction of nitrifiers

XN = 4000 * 0.08

X_N = 320 mg/L

$\Theta = (Ni - Ne) / (U * X_N)$

Θ = (40 - 1.5) / (2.14 * 320)

Θ = 0.06 days

Θ = 1.35 hours

BOD controls required hydraulic detention time

9 Determine the required aeration tank volume

V = Q Θ

V = 15.953 * 0.07

V = **1.13000** **million gal**

1,130,000 gallons

Actual Basin Size = 630,000 gallons

Anoxic Basin #1			
RAS Flow =		1	Q
	=	16.0	mgd
RAS ammonia concentration =		1	mg/L
RAS nitrate concentration=		3	mg/L
Nitrate Recycle=		3	Q
	=	47.9	mgd
Recycle nitate concentration::		35	mg/L
Total Influent Flow		79.8	mgd
Anoxic DO concentration =		0.25	mg/L
Anoxic #1 Volume =		1.120	MG
Recycle ammonia concentration =		2	mg/L

Influent ammonia concentration:

=(Ni*Q)+(Nrecycle*Qrecycle)+(Nras*Qras) / (Q + Qrecycle +Qras)

=((40 * 15.95) + (2 * 47.86)+(1 * 15.95) / (15.95 + 47.86 + 15.95)

= 11.6 mg/L

Influent Nitrate Concentration

=(NO3in*Q)+(NO3recycle*Qrecycle)+(NO3ras*Qras) / (Q + Qrecycle + Qras)

=((0 * 15.95) + (35 * 47.86) + (3 * 15.95)) / (15.95 + 47.86 + 15.95)

= 21.6 mg/L

Anoxic #1 Effluent Nitrate Concentration

Calculate the denitrification rate using Eq. 11-6 on p. 712.

Udn for wastewater	Udn	Temp
Wastewater	0.03 - 0.11	15-27
Udn =	0.07	

U'dn = Udn * 1.09exp(T-20)*(1-DO)

= 0.07 * 1.09exp(25-20) * (1 - 0.25)

U'dn = 0.081 lb NO3-N/ lb VSS*d

Calculate the residence time.

Θ = V / Q

= 1.12 / 15.9529269527792

= 0.07 day

Calculate the effluent nitrate concentration

U = (So - Se) / Θ X

Se = So - (Θ* U * X)

= 21.6 - (0.07 * 0.081 * 4000)

Se = 0.00 mg/L

BOD converted =	4	mg/L / 1 mg/L NO3-N
Influent Nitrate =	21.6	mg/L
BOD converted =	86.4	mg/L

Temp (°C)	Flow (MGD)	BOD (mg/L)	TKN (mg/L)	Aeration Basin V (MG)
8	2.25	340	40	0.63
10	2.6	340	40	0.63
15	3.78	340	40	0.63
20	5.72	340	40	0.63
25	8.89	340	40	0.63
Temp (°C)	**Flow (MGD)**			
8	4.04	340	40	1.13
10	4.64	340	40	1.13
15	6.78	340	40	1.13
20	10.26	340	40	1.13
25	15.95	340	40	1.13