18B.5.1
18B.5.2

✓ 9-11-06

VARIANCE REQUEST

Iowa Department of Natural Resources

1.	Date:	April 13, 1993	13.	**Decision:** Approved
2.	Review Engineer:	Bill Graham		Date: 4/15/93
3.	Date Received:	April 7, 1993		
4.	Facility Name:	Tama WWTP	14.	**Appeal:**
5.	County Number:	86		Date:
6.	Program Area:	CP (wastewater)		
7.	Facility Type:	C 05		
8.	Subject Area:	374 (RAS pumping capacity)		
9.	Rule Reference:	900-64.2(9)a		
10.	Design Stds Ref:	18B.5.1 and 18B.5.2		
11.	Consulting Engr:	RUST Environmental & Infrastructure Inc.		
12.	Variance Rule:	900-64.2(9)c		

15. Description of Variance Request:

The city is requesting a variance for the Return Activated Sludge pumping capacity for extended aeration processes from the required 150 % of AWW flow to 100% of AWW flow (18B.5.1 - Return Sludge Rate). The city is also requesting a variance from the related design standard, 18B.5.2 Return Sludge Pumps, requiring that return sludge rates be attained with the largest pump out of service. The city proposes having an uninstalled backup pump which would be available to quickly replace one of the installed pumps in the event of failure.

16. Consulting Engineer's Justifications

The city installed two new submersible RAS pumps at the same time that a new final clarifier was built. These pumps were sized for a lower design flow than that proposed for the reconstructed WWTP. Together these two pumps provide a return sludge rate ranging from 25% to 100% of the increased 2.0 MGD AWW design flow. According to the city's consultant, the required 150% of AWW capacity is needed to accommodate peaking flows and loads beyond the AWW. However, plant improvements include a large new raw wastewater equalization lagoon (20 million gallon capacity) which will prevent the flow to the plant from exceeding the AWW flow of 2.0 MGD, even during wet weather. Therefore, there is not a need for an RAS pumping capacity of 150% to handle peaking flows greater than the AWW flow.

To provide reliability for RAS pumping the city proposes obtaining a third submersible pump identical to the two already installed. The city's consultant estimates that it will take 30 to 60 minutes to replace an installed RAS pump with the standby.

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To provide reliability for RAS pumping the city proposes obtaining a third submersible pump identical to the two already installed. The city's consultant estimates that it will take 30 to 60 minutes to replace an installed RAS pump with the standby.

17. Department's Justifications

Departmental approval for this variance is recommended because equivalent treatment effectiveness is provided by the city's proposal based on the following:

1. The AWW flow of 2.0 MGD, which is also the plant design flow, is the maximum flow rate that will be seen at the plant because of the 20 million gallon equalization basin. There will not be any peaking flow beyond the AWW flow and therefore a return sludge rate of 100% would provide approximately equivalent RAS capacity to the design standard of 150% AWW flow RAS pumping capacity. Without peaking, MLSS "washout" is avoided.

2. Conventional activated sludge MLSS concentrations range from 1500 to 3000 mg/l and typical extended aeration MLSS concentrations range from 3000 to 6000 mg/l (1991 WEF Manual of Practice No. 8 - Iowa Design Standard typical ranges are 1000-3000 mg/l for conventional A.S. and 3000-5000 mg/l for extended aeration). Under Design Standard 14.5.2.4A (Unit Process Reliability Exceptions), a single existing clarifier is allowed in a system that is being upgraded if it is large enough to provide 100% of the total design load capacity. The existing clarifier provides a maximum hydraulic loading at peak flow (2.0 MGD) of 1000 gpd/sf as required by design standard 16.3.2.4.2 (Final Settling Tanks - Activated Sludge) and so falls under the Process Reliability Exception standard. However, Design Standard 16.3.2.4.2 also requires that solids loading to the clarifier not exceed 30 pounds solids per day per square foot at AWW flow.

In two letters from the city's consultant dated September 28, 1992 and October 16, 1992, the solids loading to the final clarifier was discussed and it was stated, based on the solids loading limit of 30 pounds per day per square foot, that the maximum MLSS that the oxidation ditches will operate under in normal conditions will be 3500 mg/l. This maximum operating MLSS concentration significantly decreases the typical solids concentration range for this particular extended aeration process, bringing it closer to that of a conventional activated sludge process, where RAS pumping capacity of 100% AWW flow is the design standard requirement. The two letters from the city's consultant are attached.

3. The existing RAS pumping facilities were constructed in 1988 and are in very good condition. To comply with the design standards the existing pumps would need to be removed and larger pumps installed. Major structural changes to the RAS pumping facility would also be required.

4. Since flows can be diverted to the equalization lagoon, the ability to change a failed RAS pump in one to two hours provides equivalent reliability. This capability is discussed in a letter from the city's consultant dated April 5, 1993.

18. Precedents Used

No precedents for variance from the Design Standard requirements for extended aeration RAS pumping capacity were found.

19.	Staff Reviewer: William Graham	Date:	April 13, 1993
20.	Supervisor:	Date:	4/13/93
21.	Authorized by:	Date:	4/15/93

5. As discussed by telephone, the environmental assessment in our August 27, 1992, letter should sufficiently address this item.

6. As discussed by telephone, the environmental assessment in our August 27, 1992, letter should sufficiently address this item.

7. A draft user charge ordinance and user charge system will be submitted to the DNR for review during the design phase of the project. A public hearing will be held as required.

8. The mass loading limitations for ammonium nitrogen cause the ammonium nitrogen concentration limits to become more stringent as the wastewater flow increases beyond 0.5 mgd. As an example, under the existing discharge effluent limitations, the 30-day average ammonium nitrogen effluent limit would amount to 12 mg/l at a flow of 0.5 mgd and 2.6 mg/l at a flow of 2.0 mgd.

   In a telephone conversation with Ralph Turkle of the DNR on August 26, 1992, Ralph mentioned that the DNR may be able to make the ammonium nitrogen mass limitations less stringent and base the limitations on a flow of 2.0 mgd if the wastewater treatment plant peak flows correlate with the high-flow conditions in the Iowa River. This comparison was made for the year 1991 and is illustrated in Attachment A to this letter. As shown in Attachment A, the treatment plant peak flows correlate closely with the high-flow conditions in the Iowa River.

   Therefore, on behalf of the City of Tama, we request that the mass-loading limitations for ammonium nitrogen be revised and be based on the average wet-weather flow (AWW) of 2.0 mgd.

9. Refer to our August 27, 1992, letter.

10. We reviewed the November, 1991, DNR Monthly Monitoring Report for the Tama WWTP and found that the average monthly BOD loading was 975 lbs/day instead of 1,236 lbs/day as indicated on the form. This figure seems reasonable and will be used for design purposes. Revised Attachment A indicates that the monthly average BOD loading for November, 1991, is 975 lbs/day. Revised Attachments B and L to our July 24, 1992, letter report indicate that the design maximum month BOD loading is 980 lbs/day.

    We also reviewed the April 16, 1991, BOD loading results again. Tama ByProducts discharges approximately 13,000 gpd. Based on 3 sampling programs in 1991 and 1992, the CBOD ranged from 159 to 276 mg/l which would amount to a mass loading

range of 17 to 30 lbs/day. Therefore, it appears that Tama ByProducts nor any other industry caused the high BOD loading at the WWTP. We suspect that a bad or poorly representative sample was collected that day which resulted in the high BOD readings. All the rest of the BOD readings were 888 lbs/day or less during April. Therefore, we still recommend using 1,500 lbs/day as the design maximum daily BOD loading.

11. Tama's wastewater treatment plant influent wastewater temperature averages around 50° F in the winter. Freezing should not be a problem with the oxidation ditches since the brush aerators will be covered. There is a possibility that the wastewater temperature in the final clarifier may get low enough to cause freezing problems in the clarifier.

    Our recommended approach to prevent freezing of the final clarifier is to install a 5-foot high wall around the outside of the clarifier. This wall will help prevent the winter winds from blowing across the surface of the clarifier and cooling down the wastewater. The treatment plant could be operated with one ditch in the winter in order to keep the detention time down to a minimum to reduce the potential of freezing in the final clarifier. If the plant operator experiences problems with freezing after the wall has been installed, then we would recommend the City to proceed with covering the final clarifier with a permanent cover which could be mounted on the wall.

12. As we previously discussed, our recommended approach for providing grit removal in Tama is to allow the grit to collect in the oxidation ditches. Each year, one of the oxidation ditches will be taken out of service for a short period of time for inspection and for routine maintenance. During that time, the operators will hose the grit to a sump in the bottom of the ditch where a portable slurry pump will pump the grit slurry out of the oxidation ditch and to the existing sludge drying beds. The grit would be dewatered there and hauled to a sanitary landfill. With this maintenance program, each oxidation ditch will be cleaned once every 2 years.

13. At a mixed liquid suspended solids (MLSS) of 3,500 mg/l and an AWW flow of 2.0 mgd, the solids loading to the final clarifier is approximately 30 pounds of suspended solids per square foot per day. At this operating condition and at maximum monthly BOD loading, the SRT would be 29.9 days. At an MLSS of 3,500 mg/l under design maximum daily conditions, the oxidation ditches will still operate within state criteria for providing sufficient operation while meeting the state standards for solids loading to the final clarifier. As we previously discussed, we feel that it is not necessary to go through the great expense of adding a second final clarifier at this time.

14. The average influent wastewater temperature in the winter is 50° F. During average winter conditions, the wastewater temperature is expected to drop 10 to 15 degrees throughout the treatment process. The lower temperature was taken into consideration when sizing the oxidation ditch.

    The oxygen transfer and mixing requirements are calculated by the equipment vendor. Calculations from Lakeside Equipment Corporation are enclosed with this letter.

    The existing return activated sludge pumps are sized to pump from approximately 25% to 100% of the AWW flow. The return rate of RAS is controlled by manually adjusting a telescopic valve. The pumps are equipped with floats which turn the pumps on and off. A separate uninstalled standby pump will be available for quick installation if required to replace a pump. The same pumps will be used for wasting sludge also.

    Design calculations for the oxidation ditch are contained in the enclosed vendor information from Lakeside Equipment Corporation.

15. The design flows of the RAS range from 400 gpm to 1,400 gpm. The average solids concentration of the RAS and WAS is 0.75%. The WAS design flows will range from 8,600 gpd at design average daily conditions to 20,000 gpd at design maximum daily conditions.

16. We used a discount rate of 8.5 percent for present worth cost comparisons for the fiscal year 1992.

17. An updated project construction schedule is provided in Attachment B.

18. A state revolving fund (SRF) cash flow schedule is contained in Attachment C.

19. A letter from the city's attorney and a resolution from the City are enclosed which demonstrate and certify that the City has legal, institutional, managerial, and financial capability to insure adequate construction, operation, and maintenance of the wastewater collection and treatment facilities.

We trust that this is all the information that is required by the DNR to approve the design report, environmental assessment and other documents submitted to allow the City to proceed with the preparation of the plans and specifications for the project. In the meantime, if you have any questions or require additional information, feel free to contact us at your convenience.

Sincerely,

James E. Hagley, P.E.

JEH:amc

enc: As Noted

cc: Mr. Ernest Buresh
Mr. Norm Miranda
Mr. Dan Rathjen
Mr. Marshall Coleman

R/Tama/AB3

TAMA SRF 01
wdg

SEC DONOHUE
Environment & Infrastructure

October 16, 1992

see page 2

Mr. William S. Graham
Department of Natural Resources
Wallace State Office Building
Des Moines, Iowa 50319

Re: Tama Design Report
BPSD Project No. 19742.102

Dear Mr. Graham:

On behalf of the city of Tama, we are responding to comments in your October 8, 1992, letter to the city of Tama. Our responses are in the same numerical order as the comments in your letter and are as follows:

1. A list of names and mailing addresses for those people present at the September 22, 1992, public hearing are enclosed with this letter. Also enclosed are the minutes of the public hearing and proof of the 30-day notice publication of the public hearing.

2. The name of the local newspaper is the Tama News Herald.

3. The paper "Flow and Load Variations in Treatment Plant Design" published in the April, 1978, Journal of the Environmental Engineering Division indicated that the maximum month BOD averaged 130 percent above the average annual daily BOD loading for the Ames, Iowa, treatment plant. The peak day BOD averaged 122 percent above the maximum month BOD loading. The peak 4-hour BOD loading and the peak 8-hour BOD loading were 150 percent and 140 percent over the peak day BOD loading respectively. Assuming that the peak 12-hour BOD loading would be approximately 125 percent above the peak day BOD loading, the peak 12-hour BOD loading would be approximately 198 percent above average annual daily loading.

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In comparison with the city of Tama, the maximum month BOD loading is calculated to be 151 percent above the average annual daily BOD loading. The peak daily BOD loading is approximately 153 percent above the maximum month BOD loading. The end result is that the peak daily BOD loading is 231 percent above the average annual daily BOD loading.

During the last two years, some of the peak day BOD loadings have been as low as 493 lbs per day. Since February, 1992, the peak day BOD loading has not exceeded 859 lbs per day.

As we discussed during our telephone conversation of October 15, 1992, we still recommend using the design criteria of 1.8 lbs of oxygen per lb of BOD using the figure of 1,500 lbs per day of BOD. We are recommending that the peak 12-hour BOD be 1,500 lbs per day since the BOD loading peaking factor is already well above the peaking factor that would be used for determining the peak 12-hour BOD loading based on literature.

4. No response required.

5. The maximum MLSS that the oxidation ditches will operate under normal conditions is 3,500 milligrams per liter.

6. No response required.

7. No response required.

8. No response required.

9. No response required.

10. No response required.

11. If the city receives a block grant, the loan request will be reduced by the amount of the grant.

We would appreciate your expedient preparation of the FNSI so that the facilities plan can be approved. If you have any questions or need additional information, feel free to contact us at your earliest convenience.

Sincerely,

BRICE, PETRIDES-SEC DONOHUE

James E. Hagley, P.E.

JEH:mcm

enc: As Noted

cc: Mr. Ernest Buresh
Mr. Dan Rathjen
Mr. Marshall Coleman

T/L/XT2

RUST ENVIRONMENT & INFRASTRUCTURE

Formerly Brice, Petrides-SEC Donohue

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Tel. (319) 232-6531 • FAX (319) 232-0271

April 5, 1993

Mr. William Graham
Iowa Department of Natural Resources
900 East Grand
Des Moines, Iowa 50319

Re: Tama WWTP Design Project
RUST Project No. 50726.010

Dear Mr. Graham:

This letter is in response to your March 29, 1993, letter. Our response to your comments are in the same numerical order as your comments and are as follows:

1. No comment.

2. The ventilation system in the main lift station will operate continuously.

3. A specification section will be added to the project contract documents which will require the contractor to provide an uninstalled stand-by pump for the RAS pump system. The city currently does not have a third RAS pump which would be considered an uninstalled stand-by pump.

   Equipment supplier field personnel take about 30 to 60 minutes to replace an existing RAS pump with a stand-by RAS pump. The equipment suppliers are located in Des Moines and are usually available at a moment's notice to change out pumps.

   We request that the Iowa DNR grant a variance to the city of Tama from the requirement of Iowa Design Standard (IDS) 18B.5.1 which requires that an RAS rate be variable from 50 to 150 percent of average wet weather flow and IDS 18B.5.2 which requires maximum return sludge capacity be obtained with the largest pump out of service. We request that the city be granted a variance from these two conditions since the existing RAS pump facilities were constructed around 1988 and are in very good shape. The pumps are only 5 years old. In order to meet the IDS conditions, the RAS pumps would need to be larger and a third pump would need to be added to the facilities. These changes would result in a major increase in total project cost. We feel that the RAS pumps will normally operate in the range of 50 to 100 percent of the

AWW flow. The major expense will not only include three larger submersible pumps but also an addition to the existing RAS pump structure to accommodate a third pump.

4. Sludge Storage Tank Nos. 1 and 2 can also be used as aerobic digesters by increasing the air flow to one of the tanks through valve operation. Therefore, we request that a variance be granted to the city from IDS 17.3.2.2a.1. which requires that diffusers be removable without dewatering the tank.

5. WAS samples are collected at the RAS pump wet well next to the secondary clarifier.

If you have any questions or need additional information, feel free to contact us at your convenience.

Sincerely,

James E. Hagley, P.E.

JEH:blc

cc: Mr. Norm Miranda
Mr. Marshall Coleman
Mr. Dan Rathjen
Ms. Judy Welch

T/L/ZH1