



# STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR  
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES  
CHUCK GIPP, DIRECTOR

April 27, 2017

City of Grinnell  
Attn: Jan Anderson  
927 4<sup>th</sup> Ave  
Grinnell, IA 50112

RE: WWTF Improvements Project  
DNR Project No. 2014-0189A

Subject: Variance Request from 567 IAC 64.2(9) and Design Standards Section 16.3.1

Dear Mr. Anderson:

After careful and thorough consideration, the Department has approved your February 16, 2017 request for a variance from Iowa Administrative Code Subrule 64.2(9) and Chapter 16.3.1 of the Iowa Wastewater Facilities Design Standards, which requires installation of final clarifiers with a 12 foot depth following an activated sludge process.


Based on the documentation presented by your Engineer, it is the determination of this Department that satisfactory justification has been presented to warrant the granting of a variance for reusing existing equipment which will result in two clarifiers with 10 foot depths and a third clarifier with a 12 foot depth. The requested variance is deemed to be reasonable and necessary pursuant to the Iowa Code section 455B.181.

The facts presented for the project present unique circumstances and the variance is therefore justified to provide the narrowest exception possible to the provisions of the rule in accordance with Rule 561 IAC 10.5. Since the project planning and construction may last more than one year, the variance is considered to be of a permanent nature. The validity of this variance approval shall last for a period of one year from the date of the construction permit in accordance with Rule 561 IAC 10.5.

This decision is based on our review of justification presented to support the request. Our concurrence with the request is based on the Department's finding that the resulting project will provide substantially equivalent effectiveness as would be provided by technical compliance with the design standard on this issue.

Please feel free to call Laura Knispel at 515-725-8423 or email her at [laura.knispel@dnr.iowa.gov](mailto:laura.knispel@dnr.iowa.gov) if you have any further questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Jon Tack", with a stylized flourish at the end.

Jon Tack  
Water Quality Bureau Chief

Cc: Veenstra and Kimm – West Des Moines (Libby Patton)  
DNR FO #5  
CWSRF File CS1920762 01

**VARIANCE REQUEST**  
Iowa Department of Natural Resources

1. Date: April 27, 2017 2. Reviewer/Engr.: Laura Knispel  3. Date Received: February 16, 2017 4. Facility Name: Grinnell WWTF 5. Facility Number: 6-79-30-0-01 6. County Number: 79 (Poweshiek) 7. Program Area: CP (Wastewater Construction) 8. Facility Type: C04 9. Subject Area: 325-Clarifier Depth 10. Rule Reference: 567-64.2(9) a 11. Design Std. Ref.: 16.3.1 12. Consulting Engr.: Veenstra & Kimm 13. Variance Rule: 567-64.2(9) c	14a. Decision: Approved Date: April 27, 2017 <i>JM</i> Expiration Date (if any):  14b.   15. Appealed: Date:
16. <u>Description of Variance Request:</u> The City of Grinnell is upgrading their WWTF to an activated sludge process and is requesting to reuse their two existing final clarifiers that have 10 foot depths in addition to constructing a new third clarifier with a 12 foot depth. 16.3.1 requires final clarifiers following activated sludge processes to have 12 foot depths.	
17. <u>Applicant's/Consulting Engineer's Justification:</u> Stamford baffles would be installed on the two existing clarifiers which are designed to reduce the impact of density currents that typically form in clarifiers. The clarifier manufacturer modeled the operation of 10 foot deep clarifiers with conservative assumptions on the oxidation ditch effluent quality and the results indicated that the clarifiers' performance would be adequate. The overflow and solids loading rates are well below the maximums established in the Iowa Wastewater Design Standards and with one unit out of service, the remaining two exceed the reliability criteria. An WWTF in Wisconsin has a 10 foot deep final clarifier following an activated sludge process and has operated successfully for at least the last 18 months.	
18. <u>Department's Justification:</u> Recommend variance approval. The information provided by the applicant indicates that the 10 foot deep clarifiers should provide equivalent effectiveness for solids settling for the WWTF.	
19. <u>Precedents Used:</u> None	
20. Staff Reviewer: <i>L Knispel</i>	Date: <i>4/27/17</i> <i>JCO 4/27/17</i>
21. Supervisor: <i>Satya Chempati</i>	Date: <i>5/3/17</i>
22. Authorized by: <i>J. C. K.</i>	Date: <i>5/3/17</i>

**Explanation of item numbers:**

- #1 – Date starting process
- #3 – Date stamped received by Iowa DNR
- #4 – Must always be filled in, even in variance for Iowa DNR
- #11 – If doesn't apply, note "n/a"
- #13 – Rule allowing for an exception
- #14a – "Approved" or "Denied "
- #14b – If variance is permanent, note "permanent" per legal.
- #15 – Date of Decision (#14)
- #16 – Summarize (4-5 short sentences) **with** attached documentation
- #17 – Summarize (4-5 short sentences) **with** attached documentation
- #18 – Summarize (4-5 short sentences) **with** attached documentation
- #19 – Summarize (4-5 short sentences) **with** attached documentation
- #21 – Supervisor
- #22 – Bureau Chief (sometimes same as supervisor)

**Note:**

#16, #17, #18, & #19: the Reviewer/Engineer summary is important as the technical and knowledgeable entity for the subject matter. Including the attachments is helpful but the Customer Service Team is uncomfortable attempting to summarize the attachments on your behalf.



February 17, 2017

Gina Andre  
Iowa Department of Natural Resources  
502 E. 9th Street  
Des Moines, Iowa 50319

GRINNELL, IOWA  
WASTEWATER TREATMENT FACILITY IMPROVEMENTS  
PETITION FOR VARIANCE

Veenstra & Kimm, Inc. submitted the Petition for Variance for the existing final clarifiers for the City of Grinnell on February 14, 2017 to your office. The City of Grinnell requests use of final clarifiers with a sidewater depth of 10 feet rather than the recommended sidewater depth of 12 feet due to an analysis of the conditions in the clarifier proposed for in the City of Grinnell and success in similar cases in other projects throughout Iowa.

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.



Signed:

Date:

2/17/2017

Forrest S. Aldrich, P.E.

Iowa License No. 12248

My license renewal date is December 31, 2017

Pages or Sheets Covered by this Seal:

Entire Petition for Variance



## **PETITION FOR VARIANCE**

### **Iowa Administrative Code 561-10.9**

**10.9(1) – Name of Petitioner:** City of Grinnell

**10.9(1) – Address & Telephone Number of Petitioner:**

**Address:** City of Grinnell  
927 4<sup>th</sup> Avenue  
Grinnell, Iowa 50112-2043

**Phone Number:** (641) 236-2600

**10.9(1) – Case Number of Related Contested Case:** Not Applicable

**10.9(2) – Description/Citation of Specific Rule:**

16 Settling  
16.3 Design Consideration  
16.3.1 Dimensions

The sidewater depth for primary settling tanks shall not be less than 7 feet. Settling tanks following the activated sludge process shall have sidewater depths of at least 12 feet to provide adequate separation zone between the sludge blanket and the overflow weirs. Settling tanks following the activated sludge process may have 10-foot sidewater depths provided that less than 340 lbs/day of BOD<sub>5</sub> is treated and provided the clarifier is followed by a 5 day pond. Intermediate settling tanks following first stage fixed film reactors shall have sidewater depths of at least 7 feet. Final settling tanks following fixed film reactors shall have sidewater depth of at least 10 feet.

**10.9(3) – Specific Variance Requested:** Request variance to allow sidewater depth of 10.0 feet for existing final clarifier following activated sludge process.

**10.9(4) – Relevant Facts & Justification:** The two existing 64-foot diameter final clarifiers were each designed and constructed with a side water depth of 10 feet. A third 64-foot diameter final clarifier would be constructed with a side water depth of 12 feet. The PHWW design flow for this facility would be 6.538 MGD. The Reliability Criteria for this facility is C, with a 75 percent reliability. Any one of the three final clarifiers out of service would result in a surface overflow rate of 772 gallons per day per square foot (gpd/ft<sup>2</sup>) which is well below the required surface overflow rate of 1,000 gpd/ft<sup>2</sup>. This variance is being requested due to the costs of constructing three new final clarifiers versus one. The reduced surface overflow rate of 772 gpd/ft<sup>2</sup> would provide substantially equivalent effectiveness at the same time reducing overall construction costs.

The existing final clarifiers will be installed with Stamford baffles which are intended to reduce the impact of density currents that typically form in clarifiers. The Stamford baffles include an inclined

baffle mounted to the clarifier wall that intercepts the density currents and redirects them toward the center of the tank improving the clarifiers' hydraulic capacity and sludge retention.

A sludge level blanket monitor will be installed in each of the existing final clarifiers to provide continuous measurements of the sludge blanket elevation. This will allow for the operator to withdraw sludge when needed rather than on a time based schedule and to provide an alarm condition if the sludge level blanket gets too high.

**10.9(5) – History of Prior Contacts:** Construction Permit application submitted November 21, 2016.

**10.9(6) – Information Known to Petitioner Regarding IDNR Treatment of Similar Cases:**  
None.

**10.9(7) – Name, Address, and Telephone Number of Public Agency, Political Subdivision of the State or Federal Government which also Regulates the Activity in Question, or Might be Affected by the Granting of a Waiver or Variance:** None

**10.9(8) – Name, Address, and Telephone Number of any Person or Entity that Would be Adversely Affected by the Granting of the Petition:** None

**10.9(9) – Name, Address, and Telephone Number of any Person with Knowledge of Relevant Facts Relating to the Proposed Waiver or Variance:**

**Name:** Veenstra & Kimm, Inc. – Consultant  
**Contact Person:** Forrest Aldrich, P.E.

**Address:** 3000 Westown Parkway  
West Des Moines, Iowa 50266

**Telephone Number:** 515-225-8000

**Name:** City of Grinnell  
**Contact Person:** Jan B. Anderson, Water Resources Director

**Address:** 927 4<sup>th</sup> Avenue, Grinnell, Iowa 50112-2043

**Telephone Number:** (641) 236-2600

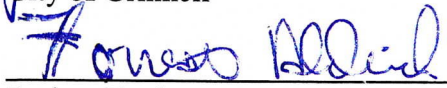
**10.9(10) – Signed Releases Authorizing Persons with Factual Knowledge of Relevant Facts Concerning the Variance:**

**IOWA ADMINISTRATIVE CODE 561 – 10.11**

**10.11(17a, 455A) – Notice by Certified Mail:**

This Petition is duly submitted this 14<sup>th</sup> day of February, 2017 by the City of Grinnell as Petitioner. The Petitioner attests to the accuracy of the facts provided in this Petition and the statements of reasons that the Petitioner believes justify this variance request.

  
\_\_\_\_\_  
City of Grinnell

  
\_\_\_\_\_  
Project Engineer  
Veenstra & Kimm, Inc.



# Modeling Information Provided by Clarifier Mfr.

Planned set up of clarifiers:

- 2 – existing clarifiers: 64 ft diameter, 10 ft SWD
- 1 – new clarifier: 64 ft diameter, 12 ft SWD

This means the clarifiers would have the following surface areas and weir lengths:

- Weir Diameter (per clarifier): 59 ft
- Total Weir Length: 556 ft
- Total Clarifier Surface Area: 9,651 sf

The oxidation ditches that are in front of the final clarifiers are designed to have effluent with the following parameters (these values have been confirmed by the oxidation ditch manufacturer):

- MLSS: 3,000-3,500 mg/L
- SVI: 200 mg/L - *Relatively Conservative* ✓

Using conservative assumptions (highest MLSS paired with the highest SVI), the clarifiers would be loaded and perform as follows:

	ADW	MWW	AWW
Flow (MGD)	1.66	6.54	4.23
Average RAS (MGD)	2.08	2.08	2.08
MLSS (mg/L)	3,500	3,500	3,500
SLR (lb/ft <sup>2</sup> /day) <i>30 · 10NR</i>	11.31 ✓	26.07 ✓	19.08 ✓
HLR (gal/ft <sup>2</sup> /day) <i>1000 · 10NR</i>	172	677	438
WLR (gal/lf/day) - 5' Inboard			
Weirs	2.985	11.758	7.607

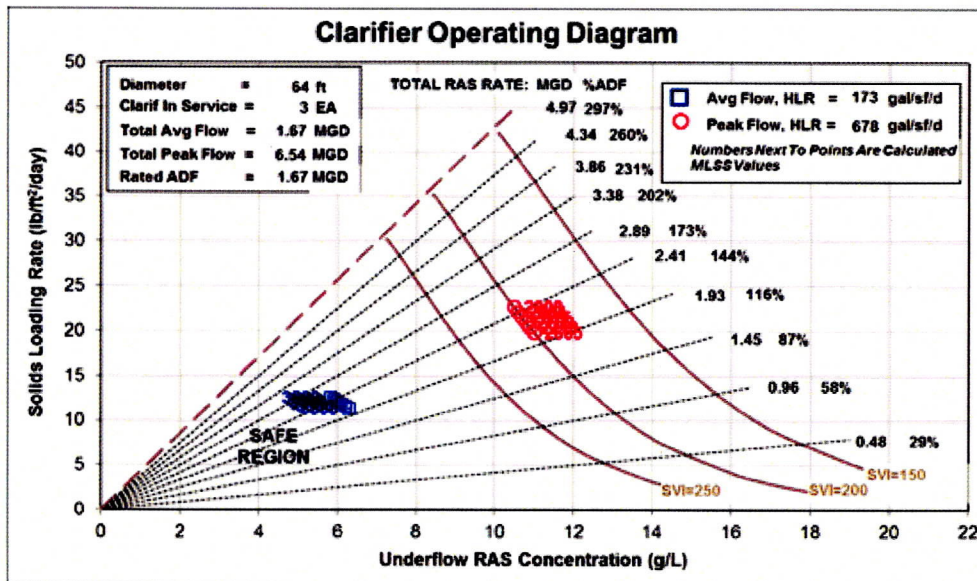
*20-30  $\frac{lb}{d \cdot sq ft}$  (Vesilind)*

Using these calculated clarifier loadings, the clarifiers would perform on the below curve as follows:

(\*Please note that to be conservative, it was assumed all clarifiers only had a 10 ft side wall depth, when in reality the new 3<sup>rd</sup> clarifier would have a 12 ft sidewall depth)

Number of Clarifiers	3	Biological	
Diameter (ft)	64		
Side water depth (ft)	10*		Basin Vol (MG)
Average Design Flow (MGD)	1.67		SVI (mg/L)
Mechanism Type	Scraper		MLSS (mg/L)
			1.8
			200
			3,500

	Average Flow Avg RAS	Peak Flow Avg RAS	Peak Flow Peak RAS
Flow Used in Evaluation	1.67	6.54	6.54
RAS (MGD)	2.08	2.08	2.51
Hydraulic Loading (gal/sf/day)	172	677	677
Solids Loading (lb/sf/day)	11.31	19.80	22.7
RAS solids	6.3	11.0	10.5
Aeration MLSS	3,500	2,665	2,908



Variance Request -LK Check

Final Clarifiers (3 - 2-10' & 1-12' Depth)

64 ft Diameter  
10 ft side water depth  
64 ft Diameter  
12 ft side water depth

Need to handle 75% with largest unit out of service

Surf Area 3215.36 SF  
OFR 677.78828 gpd/SF - OK  
OFR - 1 offline 1016.6824

MLSS 3500 mg/L  
0.029106 lb/gal  
ADW + RAS 109031.08 lb/day  
AWW + RAS 183833.5 lb/day  
MWW + RAS 250835.51 lb/day

SLR - ADW 11.3 lb/SF/day  
SLR - AWW 19.1 lb/SF/day  
SLR - MWW 26.0 lb/SF/day

Weir Length (each) 201.0 LF  
Weir Loading - ADW 6213.5 gal/day/LF  
Weir Loading - AWW 10476.4 gal/day/LF  
Weir Loading - MWW 14294.7 gal/day/LF

Capacity Check (75% with one out of service) - OK  
AWW MLSS 192921.6 lb/day  
AWW Flow (+RAS) 6.63 MGD  
MWW MLSS 321536 lb/day  
MWW Flow (+RAS) 11.05 MGD



Knispel, Laura &lt;laura.knispel@dnr.iowa.gov&gt;

## Grinnell WWTF - Equalization Basin Improvements

Olivia M. Patton &lt;opatton@v-k.net&gt;

Fri, Apr 21, 2017 at 3:34 PM

To: "Knispel, Laura" &lt;laura.knispel@dnr.iowa.gov&gt;

Cc: Jan Anderson &lt;JAnderson@grinnelliowa.gov&gt;, "Forrest S. Aldrich" &lt;faldrich@v-k.net&gt;, "Todd M. Penisten" &lt;tpenisten@v-k.net&gt;

Laura,

Thank you for the update on the EQ Basin plan changes!

For the Clarifier Variance, here is additional information for your use/review.

Attached are data and calculations from the oxidation ditch and clarifier manufacturers confirming that the existing 10ft clarifiers at Grinnell's facility would be able to perform with a 3<sup>rd</sup> new clarifier and the effluent from an oxidation ditch.

The calculations take into account what the most conservative effluent from the oxidation ditches will be (MLSS and SVI concentrations), various design flows (ADW, AWW, MWW), and various RAS rates (125% and 150%).

From all of these scenarios, the manufacturers of the clarifiers plotted performance points onto their "Clarifier Operating Diagram", and all values fell on the "Safe Region" graph.

Please note that for simplicity and a conservative view, all 3 clarifiers were assumed to only have a 10ft SWD, while in reality, the 3<sup>rd</sup> new clarifier would have a 12ft SWD.

Furthermore, the clarifier manufacturer sent us data from an existing installation they have of a 10ft SWD clarifier in Wisconsin. The installation is in Chippewa Falls, WI and they have a 65' diameter clarifier with just under 10ft SWD. They sent us about a year and a half of TSS data at the clarifier influent and effluent to see the TSS removal rate with only a 10ft SWD clarifier. That data is listed below:

(Following Conventional  
Activated Sludge)

	Influent	Effluent
Chippewa Falls, WI Data	TSS	TSS
Jul-11	176	5
Aug-11	1991	4

Sep-11	184	2
Oct-11	178	3
Nov-11	171	4
Dec-11	182	4
Jan-12	185	5
Feb-12	223	4
Mar-12	195	4
Apr-12	175	3
May-12	176	5
Jun-12	205	5
Jul-12	192	5
Aug-12	202	3
Sep-12	193	4
Oct-12	218	6
Nov-12	188	5
Dec-12	203	5

Please let me know if you have any questions on the attached data or could use additional information for the Clarifier Variance.

Thanks,

Libby Patton



**VARIANCE REQUEST NOTIFICATION**  
**Iowa Department of Natural Resources**

**All Fields are Required**

1. Reviewer/Engr.: <u>Laura Knispel</u>	7. Decision: <u>Approval</u>
2. Date Received: <u>4/27/2017</u>	Date: <u>4/27/2017</u>
3. Facility Name: <u>Grinnell WWTF</u>	
4. Program Area: <u>CP Wastewater Construction</u>	
5. Subject Area: <u>325-Clarifier Depth</u>	
6. Rule Reference: <u>16.3.1</u>	

**8. Description of Variance Request: Summarize (250 characters)**

The City of Grinnell requested a variance to reuse two existing 10-foot depth clarifiers (and construct an additional 12-foot depth clarifier) after an activated sludge process

**9. Department's Justification: Summarize (250 characters)**

Approved. Stamford baffles will be installed on the clarifiers to reduce the impacts of currents. The clarifier manufacturer provided modeling data with conservative assumptions that resulted in satisfactory operation.

**10. Type name:**

Jon Tack

\_\_\_\_\_  
Supervisor/Bureau Chief/DA

5/3/2017

\_\_\_\_\_  
Date

\*The original, approvals, letters, code and other supporting documentation is to be maintained by the program in accordance with the [Records Retention Schedule](#).

**To Submit: Attach this form to an email and send it to [Webmaster@dnr.iowa.gov](mailto:Webmaster@dnr.iowa.gov) with the subject line: Variance Submittal (542-0541)**