



IOWA DEPARTMENT OF NATURAL RESOURCES

GOVERNOR KIM REYNOLDS  
LT. GOVERNOR ADAM GREGG  
DIRECTOR KAYLA LYON

AUG 8 2022

August 2, 2022

MAYOR ERIC IMERMAN  
PRAIRIE CITY WATER WORKS  
PO BOX 607  
PRAIRIE CITY IA 50228

Subject: Prairie City Water Works Sanitary Survey  
Public Water Supply ID # IA5064055

Dear Mayor Imerman and Council Members:

Enclosed is the report of the recent sanitary survey of the public water supply referenced above.

No significant deficiencies were identified during this survey; however, several minor deficiencies, requirements, and recommendations are summarized at the end. Please submit the updated lead and copper and total coliform bacteria sampling plans to this office by September 2, 2022. Please also provide a copy of the elevated storage tower inspection report from 2022 when it is available from the contractor. Failure to correct the minor deficiencies and requirements is an enforceable violation; therefore, please review all deficiencies, observations, and recommendations noted in the survey report and take action accordingly.

You may contact Ms. Gastineau (515/250-4291 or [janet.gastineau@dnr.iowa.gov](mailto:janet.gastineau@dnr.iowa.gov)) or this office with any questions or comments.

The cooperation and assistance of Carl Van Der Kamp and Ryan Martin and in completing this survey was appreciated.

Sincerely,

Digitally signed by Ted Petersen  
Date: 2022.08.02 10:31:51 -05'00'

Ted Petersen  
Supervisor, Field Office #5

Enclosure(s): GP #8 Brochure and Data Integrity Checklist

c: Water Supply Operations (w/encl. via email: [pwsrecords@dnr.iowa.gov](mailto:pwsrecords@dnr.iowa.gov))  
Carl Van Der Kamp (w/encl. via email)  
Ryan Martin (w/encl. via email)

PUBLIC WATER SUPPLY INFORMATION		
SYSTEM	<b>NAME:</b> PRAIRIE CITY WATER WORKS	<b>PWS CLASSIFICATION:</b> Community
	<b>ADDRESS:</b> CITY OF PRAIRIE CITY, ATTN CITY ADMINISTRATOR, 203 E JEFFERSON BOX 607, PRAIRIE CITY, IA, 50228	<b>PHONE:</b> 515-994-2649
	<b>RESPONSIBLE AUTHORITY/OWNER:</b> CITY OF PRAIRIE CITY	
	<b>ADDRESS:</b> CITY OF PRAIRIE CITY, ATTN CITY ADMINISTRATOR, 203 E JEFFERSON BOX 607, PRAIRIE CITY, IA, 50228	<b>PHONE:</b> 515-994-2649
	<b>TREATMENT GRADE:</b> WT2	<b>DISTRIBUTION GRADE:</b> WD2
		<b>WATER USE PERMIT #:</b> 6399

<b>SOURCE/ENTRY POINT</b>	<b>SDWIS NAME:</b> WELLS 1_2R AFTER TR	<b>DESCRIPTION/PHYSICAL LOCATION:</b> TAP IN OPERATORS LABORATORY
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<b>RESPONSIBLE OPERATOR(S)</b>	<b>NAME:</b> CARL VANDER KAMP	<b>WT GRADE:</b> WT2	<b>WD GRADE:</b> WD2	<b>CERTIFICATION #:</b> 5587
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SURVEY INFORMATION				
<b>SURVEY</b>	<b>DATE THIS SURVEY:</b> 7/21/2022	<b>DATE LAST SURVEY:</b> 09/27/2019	<b>PURPOSE:</b> Routine Sanitary Survey	
<b>PERSON INTERVIEWED</b>	<b>NAME:</b> Carl Van Der Kamp Ryan Martin		<b>TITLE:</b> Water Superintendent Operator in training	
<b>CONSUMPTION</b>	<b>Period Reviewed:</b> 7/2021 to 6/2022	<b>AVERAGE DAILY USE (MGD):</b> 0.124	<b>MAXIMUM DAILY USE (MGD):</b> 0.185	<b>PE @100 GPCD:</b> 1238
<b>POPULATION SERVED</b>	<b>TOTAL NUMBER OF SERVICE CONNECTIONS:</b> 660		<b>POPULATION OUTSIDE CORPORATE LIMITS:</b> 3	
	<b>CENSUS POPULATION:</b> 1700		<b>TOTAL POPULATION SERVED*:</b> 1703	
	<b>MILES OF PIPE:</b> NA			

\*equals census pop. + population outside corp. limits(2.5 X # of service connections or actual pop.)

SURVEY INFORMATION		
ASSESSMENTS	<b>SOURCE CLASSIFICATION:</b> Ground water	<b>ORGANIC CHEMICAL PHYSICAL VULNERABILITY (SW/IGW SYSTEMS ONLY):</b> No
	<b>ORGANIC CHEMICAL VULNERABILITY (GW SYSTEMS ONLY):</b> No	<b>ORGANIC PHYSICAL VULNERABILITY (GW SYSTEMS ONLY):</b> No

AUTHENTICATION		
<b>INSPECTOR</b>	<b>NAME/TITLE:</b> Janet A. Gastineau Janet Gastineau, Environmental Specialist Senior <small>Digitally signed by Janet A. Gastineau Date: 2022.08.02 09:16:38 -0500</small>	<b>DATE:</b> 7/28/2022
<b>REVIEWER</b>	<b>NAME/TITLE:</b> Dennis Thielen Dennis Thielen, Environmental Specialist Senior <small>Dennis Thielen</small>	<b>DATE:</b> 08/02/22

## General Description

vial wells located on the west side of Colfax, approximately 6 miles s approximately 43 feet and is known locally as Well #1 and Well #2R id former Well #2, which was properly abandoned in 2006. Well 2R is wells operate separately and are manually alternated by the nately five miles south to the treatment plant on the west side of icy connections at the northeast and northwest and south parts of ociation. One well is wired for a portable generator, which the City

uced draft aeration followed by 12,000-gallon detention atop gravity r sand filter (US Filter Aeralator); transfer pump station with two ner; 2 anionic exchangers for nitrate removal; zinc orthophosphate i injection; and sodium hypochlorite injection for disinfection.

r is stored in a 125,000 gallon ground storage reservoir at the o high service pumps to the distribution system and a 275,000 gallon of town.

has been developed but not implemented. If additional assistance is nplement the plan, please contact Matt Dvorak, Source Water at [matthew.dvorak@dnr.iowa.gov](mailto:matthew.dvorak@dnr.iowa.gov) or telephone 515-725-8468. cause a new residential development is planned to the south of the from the wellfield to the water plant will have to be relocated as a of securing ground to run the new line. This will require a construction ideration is also being given to construct a third well to ensure will be pulled this year for routine maintenance and cleaning. The two Well #1/north is currently the better producing well and was in ay.

ater Works 3.2.5.4 requires the owner of each well to retain all records ll has been properly abandoned. It is recommended that the system xtion log for the older, north well. This information may be available on [.edu/igs/geosam/home](http://www.igs.gov/geosam/home)

ater Works 3.2.7.3 requires that well discharge piping be properly pressure gauge, and a smooth nosed sampling tap located at a point ained. Well 1 or the north well appeared to have a tap but the inside i replaced with a smooth-nosed tap or the threads cut off.

Standards for Water Works 4.6.9] Please equip all discharge outlets with a non-corrosive 24-mesh screen.

- The anionic exchange units for nitrate removal are not currently removing nitrate because raw water nitrate levels are so low. The water system is working with WesTech to determine the condition of all ion exchange media and which valves can be operated to restore the anionic exchange system to its original condition.
- Fluoride chemicals should be isolated from other chemicals to prevent contamination. [Recommended Standards for Water Works 5.4.7.a] Consideration shall be given to providing a separate room for fluorosilicic acid storage and feed. Furthermore, unsealed storage units for fluorosilicic acid should be vented to the atmosphere at a point outside any building. The vents to atmosphere shall be provided with a corrosion resistant 24-mesh screen. [Recommended Standards for Water Works 5.4.7]
- To ensure proper operation and reliability it is recommended that tubing for peristaltic pumps be replaced according to manufacturer's instructions rather than as needed or when a leak is observed.
- The filter beds should be regularly inspected for cementing, mud balls, and uniform depth of media. WesTech is also going to be collecting a core sample to evaluate the need for replacement.
- The in-plant water supply shall be properly protected against backflow. [Recommended Standards for Water Works 5.1.8]
- Day tank refilling lines and chemical injection points shall be clearly labeled. [Recommended Standards for Water Works 5.1.11]
- Some portions of the piping associated with the zeolite softener needed painting, but overall the water plant was orderly and well maintained. New LED overhead lights were installed since the previous survey. A security fence will be installed along the west and north sides of the water plant now that a recreational trail has been constructed within 50 feet of the building and ground storage reservoir.

### 3. Distribution System

- Chlorinated water cannot be discharged to a water of the state unless it can meet water quality standards and the water system complies with NPDES General Permit #8. Information on NPDES General Permit #8 for discharges to the ground surface and surface waters of the state during flushing is attached. Best management practices, such as frequent visual examinations, dechlorination, and erosion control, during a discharge event from water line disinfection, flushing, or pressure testing may be necessary to comply with General Permit #8 or to prevent a violation of water quality standards. [567 IAC 64.3(4)"b"]
- It is recommended that the water system develop a water valve-exercise program that includes, but is not limited to, a schedule for regularly cleaning valve boxes, regularly exercising valves, and identifying problems with valves to ensure all valve locations are known and valves are accessible and operable.
- During this survey the operator reported the most recent water audit determined there to be a greater than 15 percent loss of water produced or purchased. Implementation of leak detection will reduce the cost of producing water, minimize public health risk, and help conserve water; therefore, it is recommended this system implement a leak detection program or perform a more comprehensive water audit to better assess and understand the occurrence of water and revenue losses. Free software is also available through the American Water Works Association at the following website: <https://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx>. A guidance document on implementing an effective water loss control plan published by the Water Research Foundation can also be found at <http://www.waterrf.org/PublicReportLibrary/4695.pdf>.
- The Community Center is primarily used for daily distribution system disinfection residual monitoring. However, operators should rotate among different locations throughout the distribution system when measuring and recording chlorine residuals daily for compliance purposes. [567 IAC 42.4(3)"a"(2)5 and 43.6(1)"c"(2)1]
- The minimum size of water main which provides for fire protection and serving fire hydrants shall be six-inch diameter. The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three inch diameter. When fire protection is provided, it

the distribution system that are served with adequately sized piping  
treatment plant and in accordance with the requirements of the State  
ommended Standards for Water Works 8.2.2 and 8.2.3]

ed services for inspecting finished water storage tanks using  
ers or remote operated vehicles (ROV) must follow the Iowa DNR  
tion & Cleaning Guidance; a copy can be downloaded from

or flat roof structure shall be elevated at least 24 inches above the top  
hever is higher, and be fitted with a solid water tight cover which  
xtends down around the frame at least two inches. The frame shall be  
over shall be hinged on one side, and shall have a locking device.  
[ater Works 7.0.8.2] During the next major modification event, the  
eservoir/clearwell must be properly constructed. This may require a  
a DNR Water Supply Engineering section.

ting the elevated storage tower in 2022. Please submit the inspection  
nes available.

### Controls

reen on the air relief discharge piping outlets on the high service

### Verification

ectant residuals were measured at the Community Center. The free  
.52 mg/L and total residual chlorine was 0.67 mg/L, which is

total coliform sampling plan that identifies sample locations and a  
s representative of water throughout the distribution system. [567 IAC  
ance sample locations for each routine compliance sample location  
n template is available at [www.iowadnr.gov/ws-forms](http://www.iowadnr.gov/ws-forms). The system  
sampling plan every two years and update it as needed and shall  
t the facility. [567 IAC 41.2(1)c]

red Data Integrity Checklist be used each time instruments used for  
d for general operation and maintenance to help ensure the integrity  
it provides.

i lead and copper sample sites to be selected according to a three-  
npling plan must be updated to include as many Tier 1 sample sites  
ils evaluation. Keep the materials evaluation survey with your records  
he system and new information is found on buried water lines or

- Intrusion deterrence measures (e.g., physical barriers such as fences, window grates and security doors; traffic flow and check-in points; effective lighting; lines of sight; etc.) are recommended to protect critical assets and security sensitive areas.
- Operation and maintenance records assist the system owner/operator in keeping equipment operating properly and extending its life. It is recommended that all records of routine maintenance be kept on file.
- It is recommended that water system management develop and implement an Operation Succession Plan to ensure identification of an operator-in-charge in the event of retirement. The Water Supply Operation Permit requires all water systems to have an adequate number of properly trained and knowledgeable operators for the efficient operation and maintenance of the system. An Excel spreadsheet that helps operators consolidate system information into one location, enabling increased organization and coordination among operators, can be found at <https://www.epa.gov/dwcapacity/interactive-tools-owners-and-operators>. This spreadsheet is designed to assist in personnel transition.
- A viability assessment was submitted to and reviewed by the Iowa DNR as part of the SRF loan process for a recent distribution system project. The conclusion was that the water system demonstrated technical and managerial viability but the financial viability must be evaluated by a municipal advisor.

## **8. Operator Certification Compliance**

- Subparagraph 567 IAC 81.2(4) requires proper certification of a shift operator. Two of the three shift operators have at least a grade 1 water treatment certification. Mr. Martin is encouraged to test for this certification as soon as he is eligible.

### **Summary of Minor Deficiencies**

1. Protect the in-plant water supply against backflow. [Recommended Standards for Water Works 5.1.8]
2. Follow the Iowa DNR Underwater Storage Tank Inspection & Cleaning Guidance when inspecting finished water storage tanks using underwater methods such as divers or remote operated vehicles (ROV).
3. Develop a bacteria sampling plan that meets the minimum requirements. [567 IAC 41.2(1)"c"]
4. Rotate among different locations throughout the distribution system when measuring and recording chlorine residuals daily for compliance purposes. [567 IAC 42.4(3)"a"(2)5 and 43.6(1)"c"(2)1]
5. Develop a lead and copper sampling plan in accordance with Subrule 567 IAC 41.4(1).
6. Properly equip the north well with a smooth nosed sampling tap located at a point where positive pressure is maintained. [Recommended Standards for Water Works 3.2.7.3]
7. Provide smooth-nose sampling taps for the collection of influent, effluent and blended water associated with the anionic exchange units. [Recommended Standards for Water Works 4.5.2.12 and 4.6.8]
8. Protect all air relief discharge pipe outlets associated with the high service pumps, zeolite softener, and anion exchange units with 24-mesh non-corrodible screen. [Recommended Standards for Water Works 4.6.9]
9. Review the written bacterial sampling plan every two years and update it as needed. [567 IAC 41.2(1)c]
10. Ensure the presence of a locking device on the cover(s) of the brine/salt storage tank. [Recommended Standards for Water Works 4.4.2.13]
11. Label all chemical injection points and day tank refilling line points. [Recommended Standards for Water Works 5.1.11]

### **Summary of Requirements**

not discharged to a water of the state unless it meets water quality requirements that comply with NPDES General Permit #8. [567 IAC 64.3(4)"b"]

### **Summary of Recommendations**

install pumps according to manufacturer's instructions.

re-exercise program.

other chemicals to prevent contamination. [Recommended 4.7.a]

appropriately where fire protection is provided. [Recommended 2.2 and 8.2.3]

Checklist each time the portable instrument(s) is calibrated and for accuracy.

instruction logs. [Recommended Standards for Water Works 3.2.5.4]

program or perform a more comprehensive water audit to better assess level of water and revenue losses.

install pumps according to manufacturer's instructions.

maintenance are kept on file.

ground level or flat roof structure at least 24 inches above the top of the structure is higher. [Recommended Standards for Water Works 7.0.8.2]

ground level or flat roof water storage structure with a solid water-tight cover and extends down around the frame at least two feet and at least four inches high. Each cover shall be hinged on one side, and [Recommended Standards for Water Works 7.0.8.2]

for cementing, mud balls, and uniform depth of media.

or fluorosilicic acid to the atmosphere at a point outside any building through a corrosion resistant 24 mesh screen. [Recommended Standards for

measures to protect critical assets and security sensitive areas.

Operation Succession Plan.

Protection Plan.

### **Summary of Reminders**

inventory and submit it to the Iowa DNR by October 16, 2024.

mentioned during this sanitary survey and discussed with the operator.



## PUBLIC WATER SUPPLIES

ENVIRONMENTAL SERVICES DIVISION | [WWW.IOWADNR.GOV](http://WWW.IOWADNR.GOV)

### What the changes mean

The new permits will allow regulated facilities and communities a legal way to discharge during certain activities without getting an individual permit. General Permits 8 and 9 will ensure these discharges happen in a way to reduce negative impacts on water quality.

### When to follow a permit

#### *General Permit 8:*

If you need to disinfect, flush, or pressure test water lines or new sanitary sewer lines.

#### *General Permit 9:*

If you need to dewater an area for construction or maintenance activities.

#### *If you have another general permit or MS4 permit:*

If your existing permits already cover the situations addressed by General Permits 8 and 9, you do not need to get additional permits. Stormwater general permits and MS4 permits cover discharges from uncontaminated groundwater and discharges from fire hydrant flushing, discharges from potable water sources, and discharges from water line flushing.

Not sure if you're an MS4 community? These larger Iowa towns can be found at <http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Storm-Water/MS4-Permittees>.

#### *If you're repairing water lines:*

General Permit 9 does not cover discharges from dewatering needed to repair water lines. Water line repair should continue to follow the existing DNR procedures at <http://www.iowadnr.gov/Environmental-Protection/Water-Quality/Drinking-Water-Compliance/Public-Notice>.

### Additional resources

#### GP 8 Website:

[www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Wastewater-Permitting/NPDES-General-Permits/GP8-Hydrostatic](http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Wastewater-Permitting/NPDES-General-Permits/GP8-Hydrostatic)

#### GP 9 Website:

<http://www.iowadnr.gov/Environmental-Protection/Water-Quality/NPDES-Wastewater-Permitting/NPDES-General-Permits/GP9-Dewatering>

Electronic Notice of Intent submittal Website (only needed if Attachment 2 shows it is required):  
<http://programs.iowadnr.gov/generalpermits/>

### How to use the permits

#### *General Permit 8:*

Always avoid direct discharge into a surface water whenever possible, while minimizing erosion of soil or other materials into a surface water. If you add any chemicals to the wastewater, you must use them in accordance with the manufacturer's instructions. This includes any dechlorination agents.

If you discharge into a surface water, it must not cause:

1. sludge deposits;
2. floating debris, oil, grease, scum, and other floating materials in amounts that can create a nuisance;
3. objectionable color, odor, or other aesthetically objectionable conditions;
4. acutely toxic conditions to human, animal, or plant life; or
5. substances in quantities that would produce undesirable or nuisance aquatic life.

You are automatically covered; there is no Notice of Intent. There are no monitoring, reporting or recordkeeping requirements for this permit.

#### *General Permit 9:*

Determine if contaminated soil or groundwater may be present.

- If the site does not have a history of industrial or commercial use, you may presume that contamination does not exist if there is no obvious reason to expect contamination (e.g. unusual color or odor; known spills).
- For all other sites, you must follow Attachment #1
- When the initial inquiry indicates the possibility for contamination, conduct and document a more in-depth inquiry. In addition to or instead of conducting such an inquiry, the permittee may analyze representative samples of soil and/or groundwater at the site for the likely pollutant(s).
- Follow Attachment #2 once you determine whether contamination is likely.

### For more information

#### *Iowa DNR Wastewater*

Wendy Hieb, 515-725-8405, [wendy.hieb@dnr.iowa.gov](mailto:wendy.hieb@dnr.iowa.gov)

Julie Faas, 515-725-8409, [julie.faas@dnr.iowa.gov](mailto:julie.faas@dnr.iowa.gov)



## Soil and Groundwater Contamination

	Yes/No/ Unknown/Not applicable	Comment
al color or	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> U <input type="checkbox"/> NA	
ave an unusual tion?	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> U <input type="checkbox"/> NA	
ctivities azardous es include but etc. ... [Not ial]	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> U <input type="checkbox"/> NA	
i to suspect he water to be ip lien, there etc.)	<input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> U <input type="checkbox"/> NA	

e above questions, you must conduct a more thorough inquiry into the site and its  
 no" to all questions, dewatering may proceed according to the terms and conditions  
 keep it for your records.

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Date Completed

## Attachment 2: General Permit 9 Decision Matrix

1. Will the discharge be to the ground surface or to a surface water?

- ground surface - go to item 2
- surface water - go to item 7

2. Will the discharge leave the property being dewatered?

- yes - go to item 3
- no - go to item 4

3. Can pollutants, due to soil or groundwater contamination, reasonably be expected in the discharge?

- yes - go to item 5
- no - go to item 6

4. **Ground surface discharge that does not leave the property being dewatered**

- *No Notice of Intent* (eNOI) is required.
- An antidegradation document is not required.
- Coverage is in effect from first day of discharge through the last day of discharge.
- You must meet the requirements in III.D.
- You must conduct daily visual monitoring. (III.E.1)
- You must keep a daily log of date, location, estimated volume, (III.G.1), unless you are exempted by III.G.3

5. **Ground surface discharge with expected contamination that leaves the property being dewatered**

- Yes, an eNOI is required.
- An antidegradation document is not required.
- Coverage is in effect between the dates given on the eNOI.
- You must meet the requirements in III.D.
- You must conduct daily visual monitoring. (III.E.1)
- You must keep a daily log of date, location, estimated volume, visual monitoring, and analysis results. (III.G.1)

6. **Ground surface discharge with no expected contamination that leaves the property being dewatered**

- *No eNOI* is required.
- An antidegradation document is not required.
- Coverage is in effect from first day of discharge through the last day of discharge.
- You must meet the requirements in III.D.
- You must conduct daily visual monitoring (III.E.1), unless you are exempted by III.E.2.
- You must keep a daily log of date, location, estimated volume, visual monitoring, and analysis results (III.G.1), unless you are exempted by III.G.3.

7. Can pollutants due to soil or groundwater contamination reasonably be expected in the discharge above applicable water quality standards?

- no - go to item 8
- yes - go to item 9

8. **Surface water discharge with no expected contamination above water quality standards**

- *No eNOI* is required.
- An antidegradation document is not required.
- Coverage is in effect from first day of discharge through the last day of discharge.
- You must follow the operating requirements in IV.F.
- You must conduct daily visual monitoring (IV.I.1), unless you are exempted by IV.I.2.
- You must keep a daily log of date, location, estimated volume, visual monitoring, and analysis results (IV.K.1), unless you are exempted by IV.K.3

9. **Surface water discharge with expected contamination above water quality standards**

- Yes, an eNOI is required.
- An antidegradation document is required.
- Coverage is in effect between the dates given on the eNOI.
- You must follow the operating requirements in IV.F.
- You must develop and implement a DwPPP. (IV.G and IV.H)
- Daily visual monitoring is required. (IV.I.1)
- A daily log of date, volume, location, and analysis results is required. (IV.K.1)

# Instrumentation Data Integrity Checklists

Online DPD Colorimetric Chlorine Analyzer (Example: Hach CL17)	
	Sample tap is a sufficient distance downstream of chemical feed points to ensure adequate mixing and sufficient reaction time (in turbulent flow conditions 10 x pipe diameters is suggested, in laminar flow conditions more than 100 x pipe diameters is suggested)
	Sample tap orientation is "good" or "best" per Figure 1
	Sample tap location is appropriate for measuring desired parameters (e.g., not measuring free chlorine after the addition of ammonia)
	Sample conditioning kit is installed correctly (see Figure 2; the drain tee should be installed 2' above the instrument cabinet to ensure the needed sample pressure in the analyzer)
	Sample line length is not excessive (i.e., less than one minute residence time)
	Sample flow rate to sample conditioning is between 200 to 500 mL/min
	Correct reagents are installed (i.e., free chlorine indicator is installed when free chlorine is intended to be measured)
	Reagents are not expired
	Reagents bottles are connected to correct delivery tubes labeled "buffer" or "reagent" inside the instrument
	Indicator reagent is prepared as specified by the manufacturer (indicator powder is mixed and fully dissolved in the indicator solution)
	Stir bar is installed in the colorimeter cell (remove plug on the colorimeter and insert paper clip to remove)
	Pressure plate on peristaltic pump is securely attached (to avoid backflow of the sample into the reagents)
	Signal Averaging (SIGAVG) feature, which is used to average reading and prevent erratic recorder output, is disabled (default is SIGAVG = 1, which disables this feature)
	Calibration settings are at factory default (OFFSET = 0.00), the analyzer is factory calibrated and does not require recalibration unless specified by regulatory agency
	Record output span settings bracket the expected chlorine range of chlorine residual (i.e., factory default RECMIN = 0.00 mg/L @ 4 mA and RECMAX = 5.00 mg/L @ 20 mA)
	Verify that the reading on the display of the online analyzer is the same as what is being shown on SCADA
	Alarm settings are configured at desired trip points, if this feature is activated (i.e., toggle to ALARM menu and then RECALL WARNINGS to display active alarms)
	Colorimeter cell is cleaned monthly when temperatures are less than 80 F and biweekly when temperatures are more than 80°F with 19.2 N sulfuric acid solution and cotton swabs
	Pump tubing is replaced per manufacturers recommendation (i.e., if ambient temperature is <80° F, replace at six-month intervals; if >80°F, replace at three-month intervals)
	Remaining analyzer tubing is replaced annually, per manufacturers recommendation
	Analyzer performance is verified at least once per week (within $\pm 0.10$ mg/L or $\pm 15\%$ of expected value [whichever is larger], per EPA Method 334) with an EPA approved grab sample method (e.g., DPD colorimetric method), which has also been verified (e.g., Spec Check Secondary Gel Standards)

## Chlorine Analyzer (Example: Hach CL10sc with pH Sensor)

stance downstream of chemical feed points to ensure adequate mixing (in turbulent flow conditions 10 x pipe diameters is suggested, in laminar 100 x pipe diameters is suggested)

ood" or "best" per Figure 1

ropriate for measuring desired parameters (e.g., not measuring free ammonia)

cessive (i.e., as close and direct as reasonably possible )

ied in the desired range of 500 to 833 mL/min, which can be confirmed if sensor is on (the exact flow rate is not important as long as flow is in that range)

sample conditioning; see Figure 2) is installed if analyzer if it is under the variations (e.g., under the influence of a storage tank or pumps)

fluence of a heat source or in direct sunlight

asure the desired parameters (toggle to sensor setup menu), such as pH (optional), and temperature (optional)

replaced annually, per manufacturers recommendation

(i.e., free of sediment deposits and film, not discolored)

ne sensor is replaced at least once per year (during replacement the electrolyte solution should be replaced)

Chlorine sensor is replaced every 3 to 6 months

pired

every three years

are at desired range (toggle to sensor setup menu)

d at desired trip points, if this feature is activated (i.e., toggle to Sensor Watch to display active alarms)

ice is verified (and calibrated if needed) at least once per week (within expected value [whichever is larger], per EPA Method 334) with an EPA approved (e.g., DPD colorimetric method), which has also been verified (e.g., EPA Standards)

Chlorine Sensor User Manual for details) at least weekly

spected every 90 days (see pH Sensor User Manual for details)

ard cell solution and salt bridge is replaced) every 3 to 6 months,

4 to 5 years

### Online Nephelometric Turbidimeter w/90° Detector (Example: Hach 1720E)

	Sample tap is a sufficient distance downstream of chemical feed points to ensure adequate mixing and sufficient reaction time (in turbulent flow conditions 10 x pipe diameters is suggested, in laminar flow conditions more than 100 x pipe diameters is suggested)
	Sample line tapped into larger process pipe and sample tap orientation is "good" or "best" per Figure 1
	Sample tap location is appropriate for measuring desired parameters (e.g., filter-to-waste sample location is representative of filter-to-waste sample).
	Sample line length is not excessive (i.e., as close and direct as reasonably possible)
	Sample line does not have excessive elevation changes
	Sample pumping is to be avoided, if possible
	Sample flow rate to turbidimeter is between 200 and 750 mL/min and is verified quarterly (samples with high turbidity should operate at as high as flow rate as possible and without a bubble trap, while samples with low turbidity should operate at as low as flow rate as possible)
	Turbidimeter is installed indoors or in a location that is isolated from vibration, heat, and direct sunlight
	Turbidimeter head is securely seated on the turbidimeter body
	Lamp is replaced once per year, per manufacturers recommendation
	Turbidimeter is calibrated per manufacturer's specifications at least once every three months during normal operation and after any significant maintenance or repair (check calibration/verification history)
	Turbidimeter body, bubble trap, and photocell window (do not disassemble or scratch) is thoroughly cleaned and rinsed as needed, or prior to calibration (see user's manual for details)
	Verify that the reading on the display of the online analyzer is the same as what is being shown on SCADA
	Turbidimeter photocell contains a small air bubble
	Turbidimeter output mode is set to "HOLD" during calibration and maintenance activities
	Turbidimeter error mode is set to "TRANSFER" during normal operation and transfer value is set to 0.00 or 20.00 NTU
	Turbidimeter calibration is verified at least once every weekly
	Turbidimeter date and time stamp is verified during calibration and after power outages
	Turbidimeter sample line is inspected during calibration and replaced as needed (raw water sample lines will need to be replaced more frequently than filtered water sample lines)
	Turbidimeter lamp assembly is replaced at least once per year (per manufacturer's specifications)
	Turbidimeter data log interval (DATA LOG INTRVL) is at desired setting ( $\leq 1$ minute is recommended)
	Turbidimeter output signal span is set to 0.00 to 5.10 NTU
	Turbidimeter bubble reject (BUBBLE REJECT) setting is at desired setting (enabled, or yes, is recommended)
	Turbidimeter signal averaging setting (SIGNAL AVG) is at desired interval (30 second interval is recommended)
	Turbidimeter offset value (OFFSET) is at desired setting (0.00 NTU is factory default)

**er (Example: Hach FilterTrak 660sc)**

distance downstream of chemical feed points to ensure adequate mixing  
(in turbulent flow conditions 10 x pipe diameters is suggested, in laminar  
100 x pipe diameters is suggested)

er process pipe and orientation is adequate (see Figure 1)

cessive (i.e., as close and direct as reasonably possible )

eter is between 100 and 750 mL/min (samples with high turbidity should  
ite as possible, while samples with low turbidity should operate at as low

ports in location that is isolated from vibration, heat, and direct sunlight

ly seated on the turbidimeter body

er manufacturer's specifications at least once every three months during  
any significant maintenance or repair (check calibration/verification history)

at least once per month and prior to calibration (see user's manual for details)

set to "hold" during calibration and maintenance activities

erified at least once every month (check calibration/verification history)

al (DATALOG INTRVL) is at desired setting ( $\leq 1$  minute is recommended)

BUBBLE REJECT) setting is at desired setting (enabled, or yes, is

g setting (SIGNAL AVG) is at desired interval (30 second interval is

FFSET) is at desired setting based on calibration (0 mNTU is factory

**Online Nephelometric Laser Turbidimeter w/360° x 90° Detector (Example: Hach TU5300 sc, Hach TU5400 sc)**

	Sample tap is a sufficient distance downstream of chemical feed points to ensure adequate mixing and sufficient reaction time (in turbulent flow conditions 10 x pipe diameters is suggested, in laminar flow conditions more than 100 x pipe diameters is suggested)
	Sample line tapped into larger process pipe and sample tap orientation is "good" or "best" per Figure 1
	Sample tap location is appropriate for measuring desired parameters (e.g., filter-to-waste sample location is representative of filter-to-waste sample).
	Sample line length is not excessive (i.e., as close and direct as reasonably possible)
	Sample line does not have excessive elevation changes
	Sample pumping is to be avoided, if possible
	Sample line pressure does not exceed 87 psi
	Sample flow rate to turbidimeter is between 200 and 500 mL/min and is verified quarterly (samples with high turbidity should operate at as high as flow rate as possible and without a bubble trap, while samples with low turbidity should operate at as low as flow rate as possible); if equipped, confirm flow rate on flow sensor
	Turbidimeter is installed indoors or in a location that is isolated from vibration, heat, and direct sunlight
	Turbidimeter is not installed in immediate proximity of televisions, radios, computers, or other electronic equipment. This instrument is sensitive to electromagnetic and electromechanical interference.
	Turbidimeter is installed in a vertical position and is level
	Vial is cleaned at least once every three months
	Vial is replaced at least every two years
	Desiccant cartridge is replaced at least every two years or as identified by instrument notification
	Turbidimeter is calibrated per manufacturer's specifications at least once every three months during normal operation and after any significant maintenance or repair (check calibration/verification history)
	Verify that the reading on the display of the online analyzer is the same as what is being shown on SCADA
	Turbidimeter output mode is set to "HOLD" during calibration and maintenance activities
	Turbidimeter error mode is set to "TRANSFER" during normal operation and transfer value is set to 0.00 or 20.00 NTU
	Turbidimeter calibration is verified at least once every week
	Turbidimeter date and time stamp is verified during calibration and after power outages
	Turbidimeter sample line is inspected during calibration and replaced as needed (raw water sample lines will need to be replaced more frequently than filtered water sample lines)
	Turbidimeter data log interval (DATA LOG INTRVL) is at desired setting ( $\leq 1$ minute is recommended). The default setting for this instrument is 10 minutes, which is greater than desired.
	Turbidimeter output signal span is set to 0.00 to 5.1 NTU
	Turbidimeter bubble reject (BUBBLE REJECT) setting is at desired setting (enabled, or yes, is recommended)
	Turbidimeter signal averaging setting (SIGNAL AVG) is at desired interval (30 second interval is recommended)
	Turbidimeter offset value (OFFSET) is at desired setting (0.00 NTU is factory default)

**Portable Colorimeter (Example: Hach Pocket II, DR800, or DR900 Colorimeters)**

	Appropriate method (or program number) is used for anticipated sample concentration (LR, MR, HR; see Table 1)
	Appropriate sample volume is used (10 or 25 mL; see Table 1)
	Appropriate sample cell is used (plastic or glass; see Table 1)
	Appropriate sample reaction time is used (total chlorine reaction time is temperature dependent; see Table 1 and/or user's manual)
	Sample cells are clean and not scratched
	Sample cells are consistently oriented in the appropriate position in the colorimeter (i.e., white diamond consistently faces towards the front of the instrument)
	Sample cells are consistent material and condition (e.g., visually identical)
	Instrument cap is securely placed on top of instrument prior to analysis
	Excess liquid (e.g., condensation) and finger prints are wiped from sample cells prior to analysis with a lint-free cloth
	Appropriate reagent is used (free or total chlorine; for 10 or 25 mL samples; see Table 1)
	If a reagent dispenser is used (e.g., Hach SwiftTest kit), confirm that humidity is not causing reagent to clog in the dispenser
	If a reagent dispenser is used (e.g., Hach SwiftTest kit), confirm that the reagent cartridge is used within 6 months after opening
	Reagents are not expired
	Reagent blank value is determined for each new lot of reagent (i.e., replace the sample in the test procedure with deionized water to determine reagent blank value, which will be subtracted from all sample results to account for "baseline" color development). It is recommended that the reagent blank value is written on the package of reagent, including date and operator initials.
	Separate sample cells are labeled and used for free and total chlorine analysis
	Colorimeter performance is verified (e.g., Spec Check Secondary Gel Standards, primary standards) at least weekly during routine use or before each use during infrequent use
	Instrument is using the most current software/firmware (check manufacturer's website)
	Instrument is re-zeroed at each sample location (if used for distribution system sampling)
	Instrument is displaying the desired test results (concentration, Abs, %T)
	Instrument is displaying the desired units (e.g., mg/L as $\text{NH}_3\text{-N}$ vs. $\text{NH}_3$ )
	Sample cells are rinsed well between samples using deionized water or fresh sample
	Sample cells are capped and gently inverted prior to analysis (after the reaction time is complete) to remove any bubbles that may have accumulated on the sample cell wall (common issue with plastic sample cells)
	Samples are not left in direct sunlight (both before and after the addition of reagent)
	Factory default calibration is not adjusted (unless asked to do so by regulatory agency)
	Samples are analyzed immediately and are not preserved for later analysis
	Sample locations are adequately flushed, so that the sample is representative water quality at the desired location (i.e., calculated flush time concept)
	Plastic containers are not used to collect samples (plastic can have chlorine demand)
	Operator is following the most recent version of the method procedure (method procedures are updated periodically to improve performance; check manufacturer's website)
	Operator is aware of potential interferences with reagents (e.g., oxidized manganese can interfere with DPD reagent)

**Portable Parallel Analyzer (Example: Hach SL1000)**

	Instrument is using the most current software/firmware (check manufacturer's website)
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ified with a primary or secondary standard (e.g., System Verification week during routine use or before each use during infrequent use

ly) are calibrated before each use

st recent version of the method procedure (method procedures are ove performance; check manufacturer's website)

al interferences with reagents (e.g., manganese can interfere with DPD

ately flushed, so that the sample is representative water quality at the ated flush time concept)

id for desired method; the analyzer automatically identifies the d when Chemkey(s) are installed and/or probe(s) are connected

recognized by the analyzer without receiving an error message (e.g., eaked) prior to placing in sample tray

etween samples using deionized water or fresh sample

is added to sample tray (i.e., filled to line)

mediately and are not preserved for later analysis

<b>Benchtop Turbidimeter (Example: Hach 2100 Series)</b>	
	Turbidimeter is located on stable, level surface that is free of vibration
	Turbidimeter is not located in direct sunlight or near a heat source
	Turbidimeter is calibrated at least every three months or as specified by regulatory agency
	Turbidimeter is calibrated per manufacturers recommendations (e.g., Hach 2100Q should be calibrated at 20, 100, and 800 NTU and then verified at 10 NTU)
	Turbidimeter is calibrated using formazin or other approved standards. Consult safety data sheet to determine appropriate handling and disposal.
	Turbidimeter and standards are both at ambient temperature during calibration
	Sealed vial standards (e.g., StablCal) standards are stored at approximately 40°F, if used less than once per month
	Turbidimeter is left "on" 24 hours a day if it used regularly (per manufacturer's recommendation)
	Turbidimeter is "on" at least 30 minutes (ratio on) and 60 minutes (ratio off) prior to analysis
	Silicone oil is used on sealed vial standards and sample vials prior to calibration/analysis (see user's manual for procedure)
	Vials are placed in the cell holder with the triangle on the vial aligned with the reference mark on the sample cell holder
	Turbidimeter calibration is verified at least once per week using secondary standards (e.g., Gelex), which should be $\pm 5\%$ of the value recorded on the secondary standard vial
	Sample cells are not dirty, scratched, or damaged (see user's manual for cleaning procedure)
	Sample cells are free of condensation (common when water temperature is cooler; see user's manual)
	Sample cells are filled with distilled or deionized water during storage
	Sample cells are indexed and matched (see user's manual for procedure)
	Samples are mixed by gentle inversion prior to analysis
	Air bubbles are removed, if present (see user's manual for various techniques)
	Samples are analyzed immediately after they are collected (changes in temperature and settling can occur)
	Turbidimeter ranging setting (RANGE) is set to "automatic" (recommended by manufacturer)
	Turbidimeter signal averaging setting (SIGNAL AVG) is "on" (recommended by manufacturer)
	Turbidimeter ratio setting (RATIO) is "on" (recommended by manufacturer)

## Appendix A: Supplemental Information

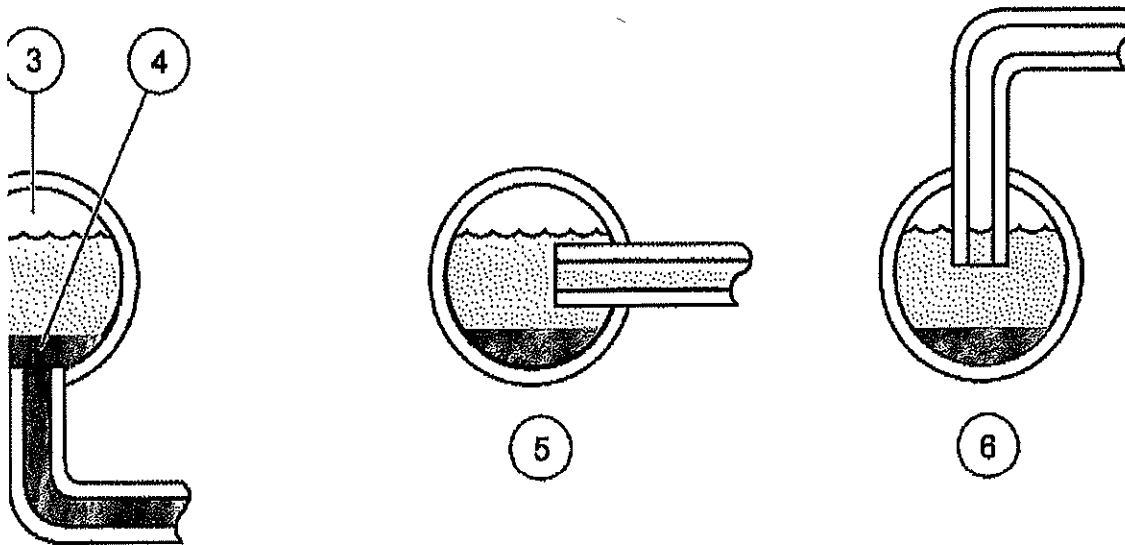


Figure 6 Sample line location in the process stream

3	Sediment (typical)
4	Good
5	Best

Sample Line Location in Process Stream (Hach Company)

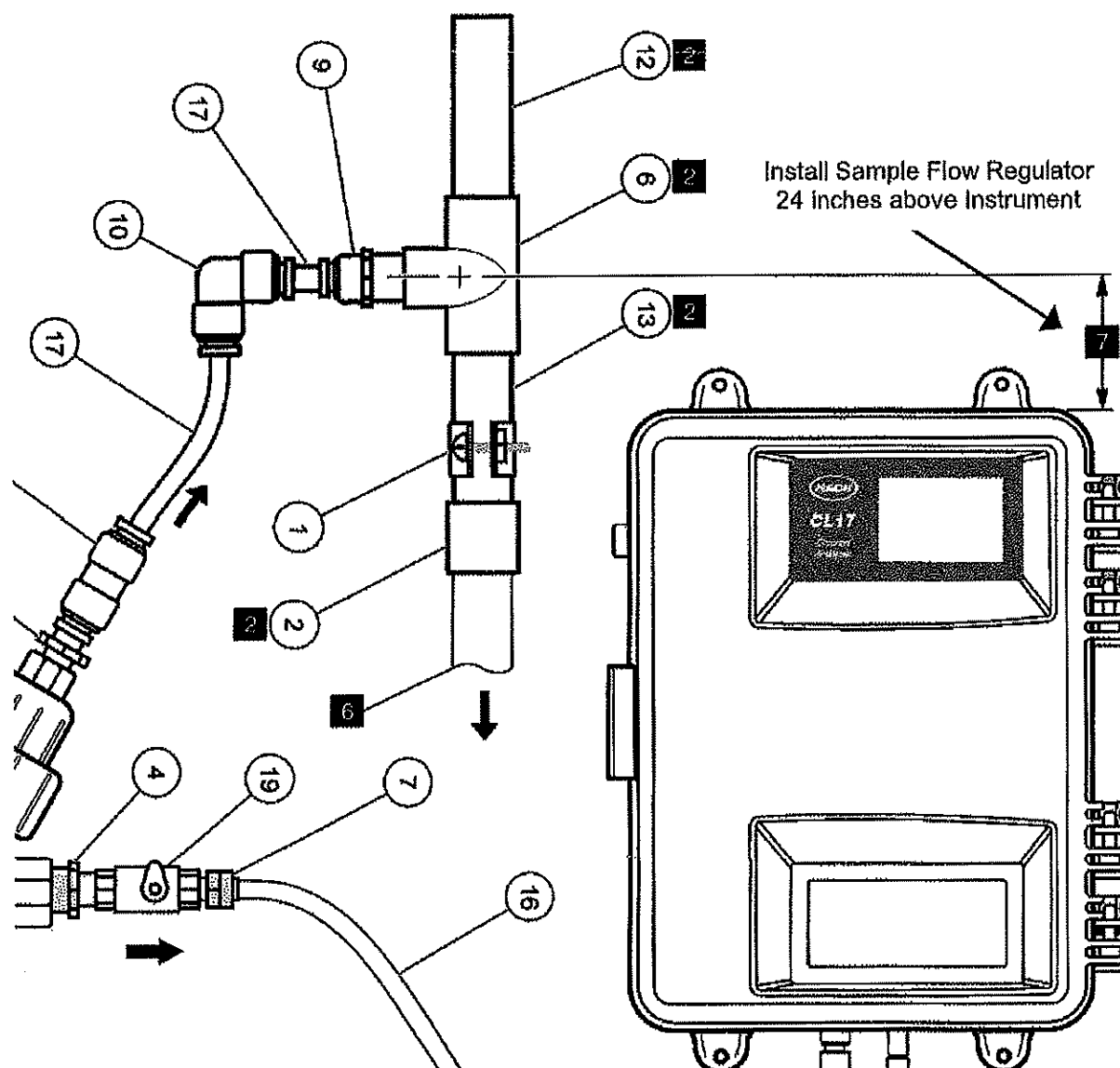


Table 1: DPD Chlorine Method Summary for Portable Colorimeters (Hach Company)

Colorimeter Type	Method Specifications	Low Range	Mid-Range	High Range
		(0.02 to 2.00 mg/L)	(0.05 to 4.00 mg/L)	(0.1 to 8.0 mg/L)
Hach Pocket II	Method	Total: 8167 Free: 8021	N/A	
	Cell Type	Glass		Plastic (1 cm)
	Sample Volume	10 mL		5 mL
	Powder Pillow	1 x 10 mL pillow		2 x 10 mL pillows
	Precision	@ 1.00 mg/L $\pm$ 0.05 mg/L		@ 5.0 mg/L $\pm$ 0.2 mg/L
	Reaction Time	Total: 3 min (varies by temp.) Free: Immediate (< 1 min)		Total: 3 min (varies by temp.) Free: Immediate (< 1 min)
Hach DR 800 Series	Method	Total: 8167 Free: 8021	Total: 10250 Free: 10245	N/A
	Program Number	9	114	
	Cell Type	Glass	Glass	
	Sample Volume	10 mL	10 mL	
	Powder Pillow	1 x 10 mL pillow	1 x 25 mL pillow	
	Precision	@ 1.00 mg/L $\pm$ 0.01 mg/L	@ 1.50 $\pm$ 0.02 mg/L	
	Reaction time	Total: 3 min (varies by temp.) Free: Immediate (< 1 min)	Total: 3 min (varies by temp.) Free: Immediate (< 1 min)	
Hach DR 900 Series	Method	Total: 8167 Free: 8021	Total: 10250 Free: 10245	N/A
	Program Number	80	87	
	Cell Type	Glass	Glass	
	Sample Volume	10 mL	10 mL	
	Powder Pillow	1 x 10 mL pillow	1 x 25 mL pillow	
	Precision	@ 1.25 mg/L $\pm$ 0.02 mg/L	@ 2.10 mg/L $\pm$ 0.02 mg/L	
	Reaction Time	Total: 3 min (varies by temp.) Free: Immediate (< 1 min)	Total: 3 min (varies by temp.) Free: Immediate (< 1 min)	